

## APPENDIX 12B: BIRD BASELINE REPORT

### VOLUME III: BIOPHYSICAL VALUED COMPONENTS

#### 6 Terrain Features

- 6A Surficial Geology, Terrain and Soils Baseline
- 6B Terrain Hazards Assessment for Proposed Access Roads and Airstrip
- 6C Preliminary Geotechnical Study
- 6D Terrain Hazards Assessment for Proposed Mine Site
- 6E Fluvial Geomorphology Hazard Assessment for Proposed Access Roads

#### 7 Water Quality

- 7A Water and Sediment Quality Baseline
- 7B Baseline Hydrology Report
- 7C 2012 Baseline Hydrogeology Report
- 7D Geochemistry Reports
- 7E Numerical Groundwater Modelling
- 7F Water Balance Report
- 7G Water Quality Model Report
- 7H Project Effects on Water Quantity

#### 8 Air Quality

- 8A Baseline Climate Report
- 8B Met, Dustfall, and Noise Data Summary Report 2011
- 8C Air Quality Baseline 2013

#### 9 Noise

#### 10 Fish & Aquatic Resources

- 10A Fish and Aquatic Resources Baseline Report
- 10B Freegold Road Fish and Aquatic Baseline
- 10C Preliminary Fish Habitat Compensation Plan
- 10D Freegold Road Extension S&EC Risk Assessment

#### 11 Rare Plants & Vegetation Health

- 11A Vegetation Baseline Report

#### 12 Wildlife

- 12A Wildlife Baseline Report
- 12B Bird Baseline Report



# Casino Project: Bird Baseline Report

## ***Prepared for:***

### **Casino Mining Corporation**

2050-1111 West Georgia St.

Vancouver, BC

V6E 4M3

## ***Prepared by:***

### **EDI Environmental Dynamics Inc.**

2195-2nd Avenue

Whitehorse, Yukon

Y1A 3T8

## ***EDI Contact:***

Mike Setterington

867-393-4882

## ***EDI Project No:***

13-Y-0045

October 2013



PRINCE GEORGE • VANCOUVER • NANAIMO • GRANDE PRAIRIE • WHITEHORSE

[www.edynamics.com](http://www.edynamics.com)





*Suggested citation:*

EDI Environmental Dynamics Inc. 2013. Casino Project: Bird Baseline Report. Prepared for Casino Mining Corporation, Vancouver, BC by EDI, Whitehorse, YT. 18 October 2013



## EXECUTIVE SUMMARY

The Casino Project (the Project) is a proposed 33 year operational mine located in central Yukon. The Project includes the construction of mine facilities and an access road, mine operation and closure/reclamation. The Project proposes to mine a large porphyry copper-gold-molybdenum deposit that will be developed as an open pit and will process approximately 44 million tonne-per-annum (Mt/a). The objective of the bird baseline report is to provide information on existing bird fauna, including diversity, density and habitat use. The baseline report will be used as a basis to assess the potential effects of the Project on birds and inform mitigation initiatives.

The Project area contains a wide variety of habitats ranging from alpine peaks to forested valley bottoms resulting in a diverse assemblage of bird species present. Field studies for birds were conducted in 2010, 2011, and 2013, consisting of point count surveys for songbirds and other upland bird species, encounter transects, aerial surveys for cliff-nesting raptors, a stand-watch survey for short-eared owl, and a collection of incidental sightings. In total, 116 bird species have the potential to occur within the study area, 82 of which were confirmed present. The diversity of birds in the area is generally reflective of the avian community in this portion of the central Yukon. The only primary bird habitat type not present within the study area is lakes or other large water bodies and as such, species associated with those habitats are generally not present.

Raptors within the Local Study Area (LSA) include a mixture of cliff-nesting raptors such as peregrine falcon, golden eagle and gyrfalcon, and forest-dwelling species like northern goshawk, sharp-shinned hawk, red-tailed hawk, northern hawk-owl and boreal owl among others. Tors, cliffs and rocky outcrops on steep slopes are essential to cliff-nesting raptors within the LSA, while forest-dwelling raptors inhabit a variety of forested habitats.

Waterfowl (i.e. ducks, swans, and geese) and other waterbirds (e.g. loons, grebes, gulls) are relatively uncommon in the LSA due to the limited availability of suitable habitats. In addition to the lack of lakes, open water wetland and pond habitats are infrequent and generally small in size. However, species such as mallard, American green-winged teal and bufflehead can be found in parts of the LSA, particularly in the Dip Creek drainage. Shorebirds within the LSA include two broad groups: (1) those which breed in wetlands and along stream margins, and (2) those which breed in upland tundra habitats. The most common shorebirds in the LSA are spotted sandpiper which occurs regularly along the large streams and rivers, and solitary sandpiper, which is typically found near small ponds and wetlands.

A diverse assemblage of upland bird species are found throughout the LSA including grouse, ptarmigan, kingfisher, woodpeckers, and passerines (songbirds). Passerine species include the following general groups: flycatchers, shrikes and vireos, jays and crows, swallows, chickadees, kinglets, thrushes, waxwings, warblers, sparrows, blackbirds and finches. Virtually all habitats within the LSA provide breeding habitat for songbirds and other upland bird species, but bird density and species diversity varies greatly. In general, higher elevation habitats show lower bird densities and lower species diversity than valley bottom habitats.



Forested habitats have some of the highest bird density and diversity, but the richest habitats are usually associated with riparian features (e.g. riparian forest and riparian shrub habitats).

Within the Project LSA, there are a number of bird species at risk or species of conservation concern which have been documented present or are likely to occur based on regional survey data or known distributions within the Yukon. Eight species — horned grebe, peregrine falcon, common nighthawk, short-eared owl, olive-sided flycatcher, bank swallow, barn swallow, and rusty blackbird — are listed as species at risk by the Committee on the Status of Endangered Wildlife in Canada, and four of these — peregrine falcon, common nighthawk, short-eared owl, and olive-sided flycatcher — have also been listed under Schedule 1 of the federal Species at Risk Act. The Project species list also includes 14 species which are on the Yukon Conservation Data Centre's track list and 53 species that have been identified as priority species for conservation under the recent bird conservation strategy for Bird Conservation Region 4.

## ACKNOWLEDGEMENTS

Bird baseline field studies for the Casino Project were conducted by AECOM in 2010 and Summit Environmental Consultants Inc. in 2010 and 2011. EDI Environmental Dynamics Inc. conducted bird surveys in 2013. Regional biologists from Yukon Environment and Environment Canada provided valuable background information on regional bird populations and input into the design of field studies and baseline analysis.

## AUTHORSHIP

This report was prepared by the EDI Environmental Dynamics Inc. EDI staff who contributed to this project include:

Anne MacLeod, R.P. Bio .....	Author and 2013 field surveys
Ben Schonewille, R.P. Bio .....	Author and 2013 field surveys
Matt Power, A.Sc.T. ....	GIS mapping
Laura Grieve, B.Sc. ....	GIS mapping
Mike Settrington, R.P. Bio, CWB.....	Senior review



## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	STUDY OBJECTIVES.....	1
1.2	STUDY AREA.....	2
1.2.1	<i>Ecological Description .....</i>	<i>2</i>
<b>2</b>	<b>BACKGROUND .....</b>	<b>5</b>
2.1	SURVEY HISTORY .....	6
2.2	SURVEY METHODS .....	7
2.2.1	<i>Raptors .....</i>	<i>7</i>
2.2.2	<i>Waterfowl.....</i>	<i>8</i>
2.2.3	<i>Upland Birds .....</i>	<i>8</i>
<b>3</b>	<b>BIRD SPECIES OVERVIEW .....</b>	<b>12</b>
<b>4</b>	<b>RAPTORS .....</b>	<b>18</b>
<b>5</b>	<b>WATERBIRDS, WATERFOWL, AND SHOREBIRDS .....</b>	<b>24</b>
<b>6</b>	<b>UPLAND BIRDS .....</b>	<b>25</b>
6.1	DISTRIBUTION .....	25
6.2	DENSITY AND DIVERSITY — 2013 FIELD RESULTS.....	27
6.2.1	<i>Species Accumulation Curves .....</i>	<i>27</i>
6.2.2	<i>Bird Density and Diversity by Habitat Type.....</i>	<i>30</i>
<b>7</b>	<b>SPECIES AT RISK AND CONSERVATION CONCERN .....</b>	<b>32</b>
7.1	BIRD CONSERVATION STRATEGY FOR BCR 4 .....	32
7.2	YUKON CONSERVATION DATA CENTRE .....	33
7.3	COSEWIC AND SARA .....	33
<b>8</b>	<b>HABITAT MODELING.....</b>	<b>39</b>
<b>9</b>	<b>SUMMARY.....</b>	<b>50</b>
<b>10</b>	<b>REFERENCES.....</b>	<b>51</b>
10.1	LITERATURE CITED.....	51



## LIST OF TABLES

Table 2.1	Short-term and long-term population trends in upland bird species as derived from the North American Roadside Breeding Bird Survey (Yukon routes only) .....	6
Table 2.2	Summary of upland bird surveys conducted in the Project area during 2010, 2011, and 2013...	8
Table 3.1	Bird species and conservation status of birds that may occur within the LSA during the breeding season (species with an “*” were confirmed present during Project surveys) .....	13
Table 4.1	Known nest sites of cliff-nesting raptors within 5 km of the proposed Project infrastructure <sup>1</sup>	20
Table 4.2	Estimated nesting dates for cliff-nesting raptors in the LSA <sup>1</sup> .....	22
Table 6.1	Most common upland bird species detected during 2013 point count surveys .....	26
Table 6.2	Density and diversity of upland birds within the Casino LSA based on 2013 point count survey results .....	31
Table 8.1	Habitat ratings for specific bird species or species groups for vegetation classes from the Casino Project’s ecological land classification mapping .....	42
Table 8.2	Baseline summary of habitat quantity in the Casino Project LSA .....	44

## LIST OF FIGURES

Figure 1.1	Overview of the Casino Project Bird Study Areas .....	4
Figure 2.1	Casino Project 2013 raptor survey areas and identified raptor Wildlife Key Areas. ....	10
Figure 2.2	Casino Project point count survey locations: 2010 to 2013 .....	11
Figure 6.1	Species accumulation curve for point counts conducted in alpine habitats .....	28
Figure 6.2	Species accumulation curve for point counts conducted in subalpine habitats .....	29
Figure 6.3	Species accumulation curve for point counts conducted in boreal forest habitats .....	29
Figure 7.1	Bird species at risk observations: 2010 to 2013 .....	38
Figure 8.1	Baseline habitat quality for passerine bird species in the Casino Project LSA .....	45
Figure 8.2	Baseline habitat quality for short-eared owl in the Casino Project LSA. ....	46



Figure 8.3	Baseline habitat quality for olive-sided flycatcher in the Casino Project LSA.....	47
Figure 8.4	Baseline habitat quality for horned grebe in the Casino Project LSA .....	48
Figure 8.5	Baseline habitat quality for rusty blackbird in the Casino Project LSA.....	49

## LIST OF PHOTOS

Photo 1.	Suspected gyrfalcon nest located 15 June 2013 during the cliff-nesting raptor surveys .....	22
Photo 2.	Old stick nest being used by peregrine falcon in 2012 .....	23
Photo 3.	Black-headed grosbeak observed at Casino camp, 28 June 2009.....	27

## LIST OF ATTACHMENTS

Attachment A	Summary of Project Observations and Regional Knowledge for Birds of Conservation Concern Potentially Occurring in the Project LSA.....	1
--------------	--	---

## ACRONYMS AND ABBREVIATIONS

CDC.....	Conservation Data Centre
CMC.....	Casino Mining Corporation
COSEWIC .....	Committee on the Status of Endangered Wildlife in Canada
EC. ....	Environment Canada
GPS.....	Global Positioning System
LSA .....	Local Study Area
Project.....	Casino Project
RSA.....	Regional Study Area
SARA.....	Species at Risk Act
YESAB.....	Yukon Environmental and Socio-economic Assessment Board





# 1 INTRODUCTION

The Casino Project (the Project) is a proposed mining development in west-central Yukon Territory (YT) that is owned by the Casino Mining Corporation (CMC). It is located at latitude 62° 44'N and longitude 138° 50'W, approximately 300 km northwest of Whitehorse, YT (Figure 1.1). The primary Project features are the mine site (open pit and mining facilities), an extension and upgrade of the Freegold Road, a new airstrip, and an access road and water pipeline to the Yukon River. The mine site will include an open pit mine, low grade ore stockpiles, a gold ore stockpile, plant site, heap leach facility, topsoil/overburden stockpile, and a tailings management facility. The existing 70 km of the Freegold Road will require upgrading and route adjustments to meet design standards, and will be extended to connect to the mine site. The final road will be approximately 200 km long and maintained as an all-season gravel road suitable for ore and fuel transport. The Project will be active for 33 years and be operated in four phases: construction (3 years), operation (22 years), closure and decommissioning (3 years), and post closure (5 years).

Within Canada, birds are protected under a variety of federal and provincial/territorial legislation. These include:

- The Species at Risk Act (SARA) — provides for the protection and recovery of species of conservation concern; SARA also requires that environmental assessments include any species at risk or critical habitats for those species that are likely to be affected by a proposed development;
- The Migratory Birds Convention Act — provides for the protection and conservation of migratory birds (e.g. most waterfowl, shorebird, and passerine species), their nests and eggs; and
- The Yukon Wildlife Act — provides for the protection of birds, eggs, and nests not covered by the Migratory Birds Convention Act (e.g. game birds, raptors).

EDI Environmental Dynamics Inc. (EDI) was retained by CMC in 2010 to conduct a wildlife baseline inventory and impact assessment in support of the eventual Project proposal submission to the Yukon Environmental and Socio-Economic Assessment Board (YESAB). This report summarizes the current knowledge of birds within the Project area and presents the results of Project surveys for breeding birds within the area.

## 1.1 STUDY OBJECTIVES

Regulatory approvals for the Project require an assessment of the potential environmental effects of the Project by YESAB. The bird baseline summarizes information related to birds within the Project area and was prepared in support of an environmental effects assessment for the Project. The objective of this report is to characterize the current status of the bird populations within the Project area including:

- Species occurrence, abundance, distribution, and diversity;
- The presence of any Species at Risk; and



- The location of any critical habitats or habitat features for bird species.

## 1.2 STUDY AREA

The proposed mine site is located at approximately 1,300 m elevation, between the headwaters of Casino Creek and Canadian Creek. The tailings management facility will be located in a valley formed by the headwaters of Casino Creek, approximately 1 km south of the pit and plant site. The new airstrip will be located 15 km southwest of the mine on flat terrain adjacent to Dip Creek. The Freegold Road extension will be located largely within the valley bottoms of the Hayes Creek and Big Creek drainages.

The Local Study Area (LSA) boundary for bird surveys contains the Project footprint and a buffer around Project facilities. Around the mine site, the LSA encompasses the watersheds of Britannia Creek and its tributary Canadian Creek (which encompass the Yukon River access road), as well as upper Dip Creek and its tributary Casino Creek. Along the Freegold Road extension, the study area includes the proposed road alignment plus a 1 km buffer on either side of the road. In total, the LSA encompasses an area of approximately 886 km<sup>2</sup>. Field surveys in 2010 and 2011 split the LSA into two separate LSAs — the Casino Mine LSA (as described above minus the Freegold Road extension), and the Freegold Road Extension LSA (the proposed road alignment with a 1 km buffer on either side). These two study areas were combined into the current LSA for the 2013 field surveys. Unless otherwise specified, this report refers the combined LSA.

The majority of the field studies and analyses for the Project bird baseline were conducted within the LSA; however, for the assessment of cliff-nesting raptors, a Regional Study Area (RSA) was developed to provide a broader context to observations noted within the LSA. The RSA encompasses the entire LSA plus a 5 km buffer on all Project components including the mine site, Yukon River access road, and the Freegold Road extension. In total, approximately 1,711 km<sup>2</sup> are located within the RSA.

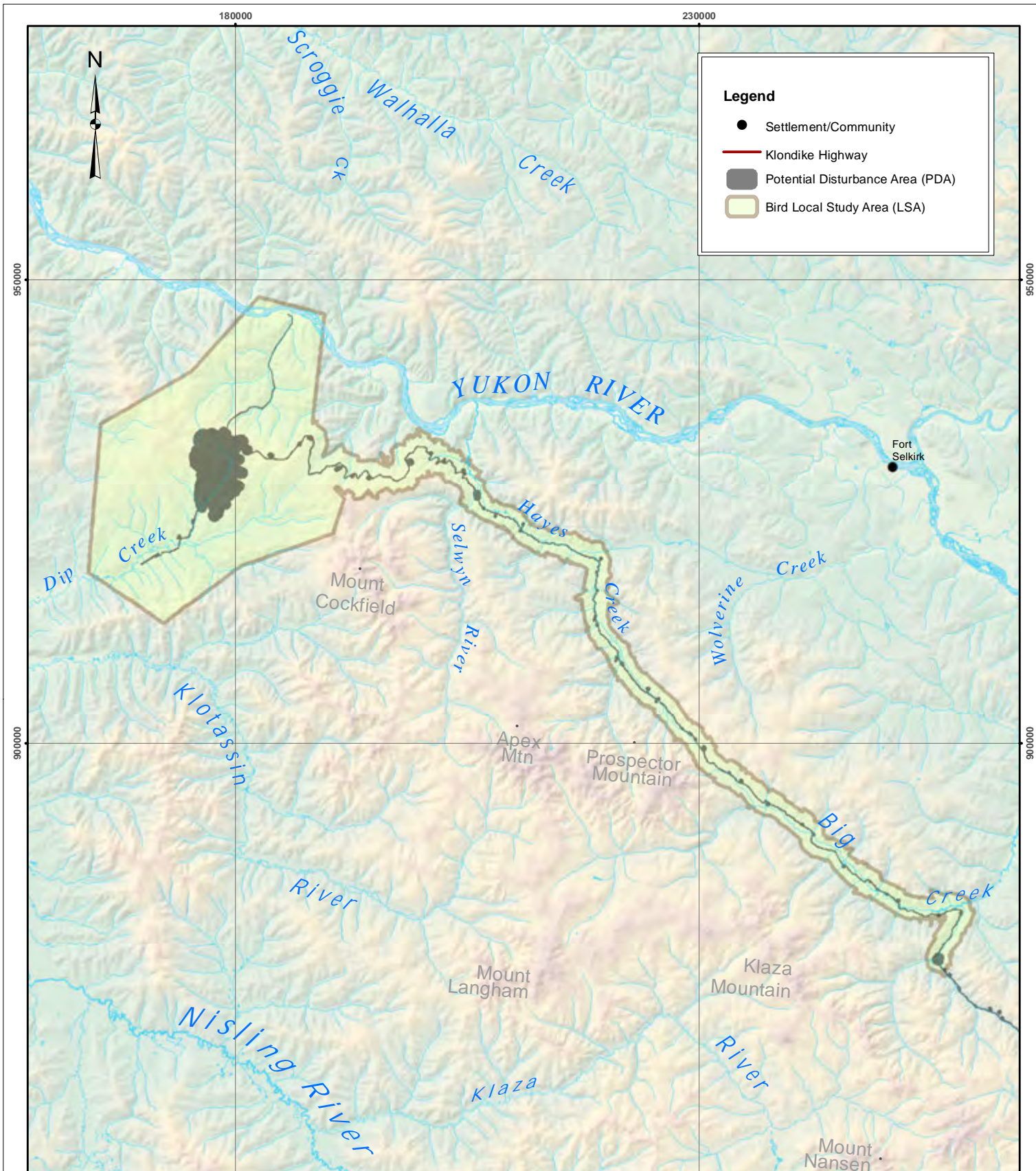
### 1.2.1 Ecological Description

The Project is located in the Dawson Range Mountains of west-central Yukon. This area is found within the Boreal Cordillera Ecozone, and within that, overlaps the Klondike Plateau Ecoregion and the Yukon Plateau-Central Ecoregion (Yukon Ecoregions Working Group 2004). The area is dominated by high mountain peaks and extensive plateaus. Much of the study area is unglaciated and the colluvial surface deposits have been deeply incised, forming steep-sided V-shaped valleys containing small streams. One of the most notable physical features is the Yukon River which intersects the northern end of the LSA. Elevations range from around 400 m along the Yukon River to over 1,500 m. Lakes are absent from the study area and open-water wetlands and ponds are mainly limited to slope toes and valley floors and are generally infrequent and small in size, with the exception of the Dip Creek area.



The LSA includes boreal forest, subalpine and alpine habitats, with areas of subalpine and alpine occurring mostly in the western sections. Alpine areas are typically characterized by un-vegetated and sparsely vegetated tundra, while subalpine areas are dominated by dense stands of scrub birch (*Betula glandulosa*) and willow (*Salix* sp.), with low and dwarf shrubs dominating as elevation increases. Tors and felsenmeer are common features on many high-elevation ridges. Boreal forest habitats are generally dominated by white spruce (*Picea glauca*) and/or black spruce (*P. mariana*) forests, with mixed forests and stands of aspen (*Populus tremuloides*), balsam poplar (*P. balsamifera*), and/or birch (*Betula neoalaskana*) on warmer aspects, well-drained slopes, and valley bottoms. Understory vegetation varies across aspect and slope position with nutrient-rich sites supporting willows, alders, and a variety of other shrubs, grasses, horsetails and forbs, while poorly drained depressions and upland sites include sphagnum mosses, tussock grass, sedges, shrubs, and lichens. In the south-east sections of the study area, steep dry slopes dominated by grasses, forbs, and stunted aspen can be found on south-facing slopes. Forest fires occur regularly in this region, and regenerating forest stands are common.





#### Notes:

1:250,000 Topographic Spatial Data, National Road Network; courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

PDA provided by Knight Piesold Ltd. 2013.

LSA developed by EDI and is based on boundary ELC vegetation data collected by AECOM and Summit Environmental Consultants and provided by Knight Piesold Ltd. 2013.

Digital Elevation Models (30 m and 90 m) provided by Yukon Government - Geomatics Yukon; online Corporate Spatial Warehouse. [www.geomaticsyukon.ca](http://www.geomaticsyukon.ca)



#### Overview of Casino Project Bird Study Area

Drawn:  
MP/LG

Checked:  
MAS

Date:  
18/10/2013

Figure:  
1.1

0 5 10 15 20  
kilometres

Map scale 1:560,000 (printed at 8.5x11)  
North American Datum 1983 CSRS Yukon Albers

**CASiNO**  
COPPER AND GOLD





## 2 BACKGROUND

The Yukon Territory provides permanent and seasonal habitats for a diverse assemblage of birds, with approximately 303 species documented as of 2008, including 236 species that occur annually (Yukon Bird Club 2008). However, many of these species are found in only small areas of the Yukon; for example, the extreme southeast portion of the territory hosts numerous songbird species not found elsewhere in the territory.

The majority of bird species in the Yukon are migratory and spend only the summer months in the Yukon. The earliest spring migrants such as northern shrike and some finches arrive as early as February or March; however, the majority of migrants arrive during April (raptors and waterfowl) and May (songbirds and shorebirds; Sinclair et al. 2003). Breeding occurs during June and July. During this time, birds are distributed in relatively low densities across the landscape with small areas of high diversity and density scattered throughout but particularly near wetlands or riparian forests in the valley bottoms. Fall migration begins in late July or early August and is complete for most species by the end of September. The harsh winter weather limits the ability for most bird species of overwinter, although 39 species regularly spend the winter months in the Yukon (Yukon Bird Club 2008) including species such as northern goshawk, gray jay, ruffed and spruce grouse, boreal and black-capped chickadees, and most species of finches (pine grosbeak, common redpoll, etc.).

Information on the regional population status and trends for most birds within the Yukon is limited due in part to the remoteness of the region and the small number of people documenting bird observations. Within the larger western boreal forest in Canada, many individual species of birds have shown large population changes over the last couple of decades, however, the overall trend has been relatively stable (North American Bird Conservation Initiative (NABCI) 2012). In general, across Canada, raptor and waterfowl populations are increasing, and forest bird populations are relatively stable, while shorebirds and aerial insectivores are undergoing steep declines (NABCI 2012). However there are exceptions to the general trends within these larger groups, for example, while many raptor species within the boreal forest show a stable or slightly increasing trend across Canada over the last couple of decades, species such as northern harrier and American kestrel show evidence of decline (USGS 2013). A few sources of bird population trend data are available for the Yukon, including the following:

***Waterfowl*** — Environment Canada has conducted roadside waterfowl breeding population surveys in the southern Yukon for 21 years. Based on those data, dabbling duck populations are generally stable or slightly increasing and diving ducks are stable or slightly decreasing (CWS 2012). Significant population trends include a continued long term decline in lesser scaup over the past 10 to 20 years and a moderate 15 to 20 year decline in American wigeon (CWS 2012).

***Upland birds*** — In the Yukon, the primary method of monitoring upland birds is through the North American Roadside Breeding Bird Survey (BBS). Each year, 12 to 21 standardized surveys are



conducted throughout the Yukon to provide long-term trend information for numerous species. A summary of short and long-term population trends in the Yukon are shown in Table 2.1 for common upland bird species and regional species of interest (USGS 2013). Although numerous species are observed on BBS routes in the Yukon, many are not encountered in sufficient numbers to calculate a population trend.

**Table 2.1** Short-term and long-term population trends in upland bird species as derived from the North American Roadside Breeding Bird Survey (Yukon routes only)

Common Name	1966–2011 Trend		2001–2011 Trend	
	% Change / Year	95% CI	% Change / Year	95% CI
Olive-sided flycatcher	-2.2	-3.6/-0.6	-1.9	-4.1/ 0.7
Alder flycatcher	-1.6	-2.8/-0.5	-3.2	-5.4/-1.4
Ruby-crowned kinglet	-0.2	-2.3/1.9	-3.1	-5.7/ 0.4
Swainson's thrush	0.5	-0.4/1.4	1.3	-0.2/2.9
American robin	1.0	0.2/1.9	1.3	-0.2/2.8
Blackpoll warbler	-7.2	-9.1/-5.2	-6.1	-9.1/-2.0
Yellow-rumped warbler	0.1	-1.3/1.4	-0.3	-2.3/1.7
Lincoln's sparrow	2.7	0.8/4.5	4.6	1.6/8.0
White-crowned sparrow	-3.6	-4.9/-2.4	-0.8	-3.0/1.5
Dark-eyed junco	-0.2	-1.2/0.8	0.2	-1.4/2.0
Rusty blackbird	-1.2	-5.2/2.7	-2.6	-13.0/3.2

## 2.1 SURVEY HISTORY

Prior to the initiation of Project bird baseline studies in 2010, there was a limited amount of information on birds within the study area. Available information included:

- An assessment of breeding birds in the Dawson Range conducted by Frisch (1983) which included an area to the southwest of the Freegold Road extension in the vicinity of Klaza, Apex, and Prospector mountains; much of this assessment focused on high elevation alpine areas and provided a regional overview of the bird species and their habitat associations within the region;
- Incidental observations from the Birds of the Yukon Database (Sinclair et al. 2003), but there are few observations from the area;
- Raptor nest locations within and adjacent to the study area that were identified and monitored during raptor surveys conducted by Yukon Environment during the late 1970s and early 1980s; and
- Roadside Breeding Bird surveys conducted annually in the central Yukon. Although not located within the study area, there are several Roadside Breeding Bird survey areas in the larger region





which are applicable for comparison to the study area including: Dempster Highway, McQuesten, Mayo Landing, Ethel Lake, and Little Salmon Lake.

## 2.2 SURVEY METHODS

Since 2010, several surveys were conducted for birds within the LSA including aerial surveys for cliff-nesting raptors, a stand-watch survey for short-eared owl, and point count surveys for breeding songbirds and other upland bird species. In addition to focussed surveys, incidental observations on bird species within the LSA were collected during the course of other field work between 2010 and 2013. Field surveys for birds were conducted by AECOM (Casino Mine LSA; 2010), Summit Environmental Consultants Inc. (Freegold Road Extension LSA; 2010-2011), and EDI Environmental Dynamics Inc. (entire LSA; 2012–2013).

### 2.2.1 Raptors

Aerial surveys for cliff-nesting raptors were conducted in 2010 and again in 2013 to document the location and status of any nests that may interact with Project infrastructure. All aerial surveys were conducted by helicopter, and consisted of a visual search of suitable habitats such as prominent outcrops and cliff faces. Surveyors watched for signs of nesting, including adults flushing from a nest, nest platforms, whitewash, and orange lichen growing on the rocks. Any raptors or raptor nests observed during the survey were recorded using a GPS unit and photos were taken of any nests. Nest site information was collected including: species using the nest, number of adults present, number of eggs or young present, type of nest structure, habitat type, and aspect of the nest. The track file of the helicopter flight path was recorded to document the search area. Specific details on each of the surveys are included below:

- 10–11 May 2010 — an aerial survey of all suitable habitats was conducted within the Casino Mine LSA;
- 22–24 June 2010 — an incidental cliff-nesting raptor survey was conducted within high-elevation habitats along the Freegold Road extension in combination with a reconnaissance flight; and
- 15–17 June 2013 — an aerial survey of all suitable habitats was completed within two to three kilometers of the proposed mine infrastructure and the Freegold Road extension (Figure 2.1).

Prior to the 2013 survey, Project biologists compiled a list of all known raptor nests based on previous Project surveys and from raptor surveys conducted by Yukon Environment. The 2013 survey revisited all documented sites within 3 km of the proposed Project to document the current status of the nests. The location of the 1970-80 Yukon Environment nest sites were not always accurate, so during the 2013 survey an observed nest site was assumed to be the same nest as a historic site if it was of the same species and located within 500 m of the historic site. Any nests beyond 500 m were generally assumed to be a different site.



Also in 2013, a stand-watch survey was conducted for short-eared owl in the vicinity of the proposed mine site. Project surveys in 2011 documented a short-eared owl hunting in shrub tundra habitats near the current Casino camp. As short-eared owl are listed as a species at risk within Canada (COSEWIC 2013), a survey was conducted to determine their presence within the proposed development area. The stand-watch survey (or crepuscular scan) was conducted for one hour at dusk (9:40 pm to 10:40 pm). It consisted of two biologists perched on Paton Hill — one situated to view the area north of Paton Hill and the other to view south. The biologists used binoculars and a spotting scope to scan for foraging birds and locate any perch or nesting sites.

### 2.2.2 Waterfowl

The LSA contains no large lakes and pond habitats are limited; therefore, no large-scale surveys for waterfowl were conducted during Project fieldwork. However, biologists did make an effort to visit pond and wetland habitats to search for waterfowl and other waterbirds during other survey work. Wherever possible, biologists walked the shoreline of suitable ponds or wetlands, watching for any sign of waterfowl or other birds. All observations were documented, along with coordinates for the site.

### 2.2.3 Upland Birds

Standardized point counts were used to survey for upland breeding birds in the LSA during 2010, 2011, and 2013 (Figure 2.2). These surveys were conducted during the breeding season, from 15 to 29 June, to coincide with the peak in singing activity of territorial males (Table 2.2). The survey data is intended to provide information on the abundance of breeding birds within the LSA and to detect species of conservation concern.

**Table 2.2** Summary of upland bird surveys conducted in the Project area during 2010, 2011, and 2013

Year	General Survey Area	Survey Timing
2010	Casino Mine LSA	15, 17–20 June
2010	Freegold Road Extension	23–27 June
2011	Freegold Road Extension	21–29 June
2013	Entire LSA	15–21 June

The surveys consisted of fixed radius point count (100 m) surveys where all birds were recorded within or flying over the plot over a 10 minute period (the 2010 surveys in the Casino Mine LSA were an exception to this and were five minutes in duration). The activity of each individual observed was recorded as was the sex and behaviour (singing, calling, flying overhead, etc.) of the individual when possible. The 2013 surveys assigned individual birds observed to four separate zones with the 100 m radius count: 0–25 m, 25–50 m, 50–75 m and 75–100 m. Birds were also recorded outside of the 100 m radius.



In general, surveys were placed within a single vegetation type based on stand type, age, and vegetation species composition. However, certain habitat types did not lend themselves to a single habitat 100 m radius plot (e.g. riparian shrub habitats are typically distributed in narrow strips and are rarely large enough to encompass an entire plot). In order to survey these habitats and document any species using these areas, mixed habitat plots were conducted. Whenever more than one habitat type was present within a plot, surveyors estimated the percent of each habitat within the plot and documented which habitat type any birds were observed within.

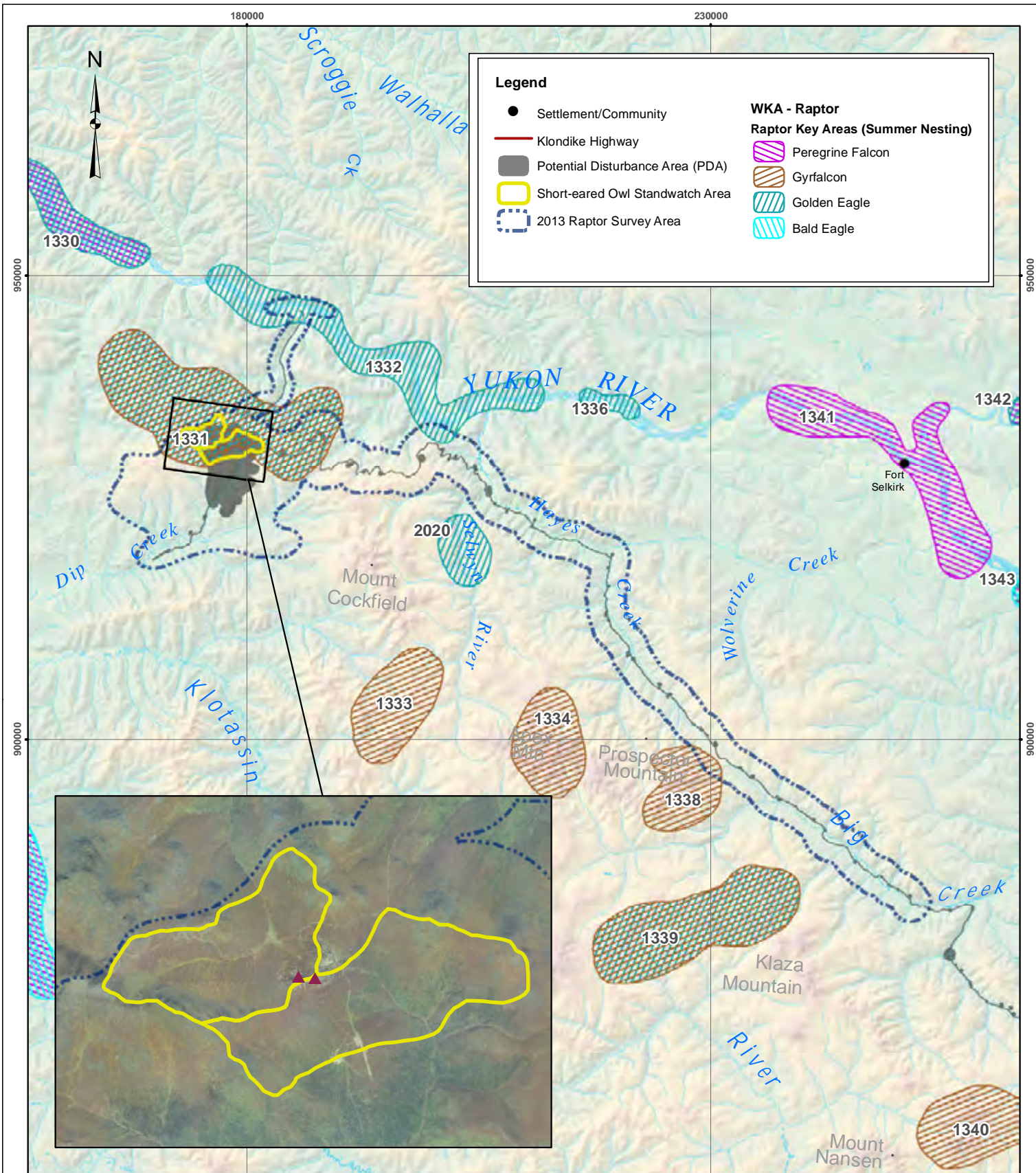
In addition to bird observations, additional information recorded at each point count included the following: surveyor, date, start time, wind (Beaufort scale), sky conditions, air temperature, precipitation, UTM co-ordinates, photo documentation, and a general description of habitat (2010 and 2011). During 2013 surveys, a more detailed description of the habitat was conducted at each point count location that included the following data:

- General habitat type (forest, wetland, shrubland, etc.)
- Wetland type, if present (lake, marsh, bog, swamp, fen, flood)
- Forest age/class (regenerating, young, mature, old, logged, burn)
- Forest type (deciduous, coniferous, mixed wood)
- Composition of dominant tree species (% of each)
- Canopy coverage (open, sparse, closed, dense)
- Average shrub height and percent cover
- Percent cover of herbs

To maximize species detection, the 2013 surveys also conducted encounter transects between adjacent point counts whenever practical. During the encounter transect, a running list of all bird species heard or seen outside of the point count plots was recorded. The start and end time and coordinates of each transect were recorded, as well as the general habitat type, and weather conditions.

The daily timing of the breeding bird surveys during 2010 and 2013 was scheduled to begin one half hour prior to official sunrise until approximately 1000 hrs. During 2011, the majority of surveys were not started prior to 0600 hrs due to constraints on helicopter availability. All point counts were surveyed in near ideal conditions (minimal wind or precipitation) and surveys were postponed when weather conditions were unsuitable.





#### Notes:

1:250,000 Topographic Spatial Data, National Road Network, Ecoregions; courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

PDA provided by Knight Piesold Ltd. 2013.

Digital Elevation Models (30 m and 90 m) and Wildlife Key Areas (WKA Shapefile 2009Sep16) provided by Yukon Government - Geomatics Yukon; online Corporate Spatial Warehouse. [www.geomaticsyukon.ca](http://www.geomaticsyukon.ca)



#### Casino Project 2013 raptor survey areas and identified raptor Wildlife Key Areas

Drawn:  
MP/LG

Checked:  
MAS

Date:  
19/09/2013

Figure:  
2.1

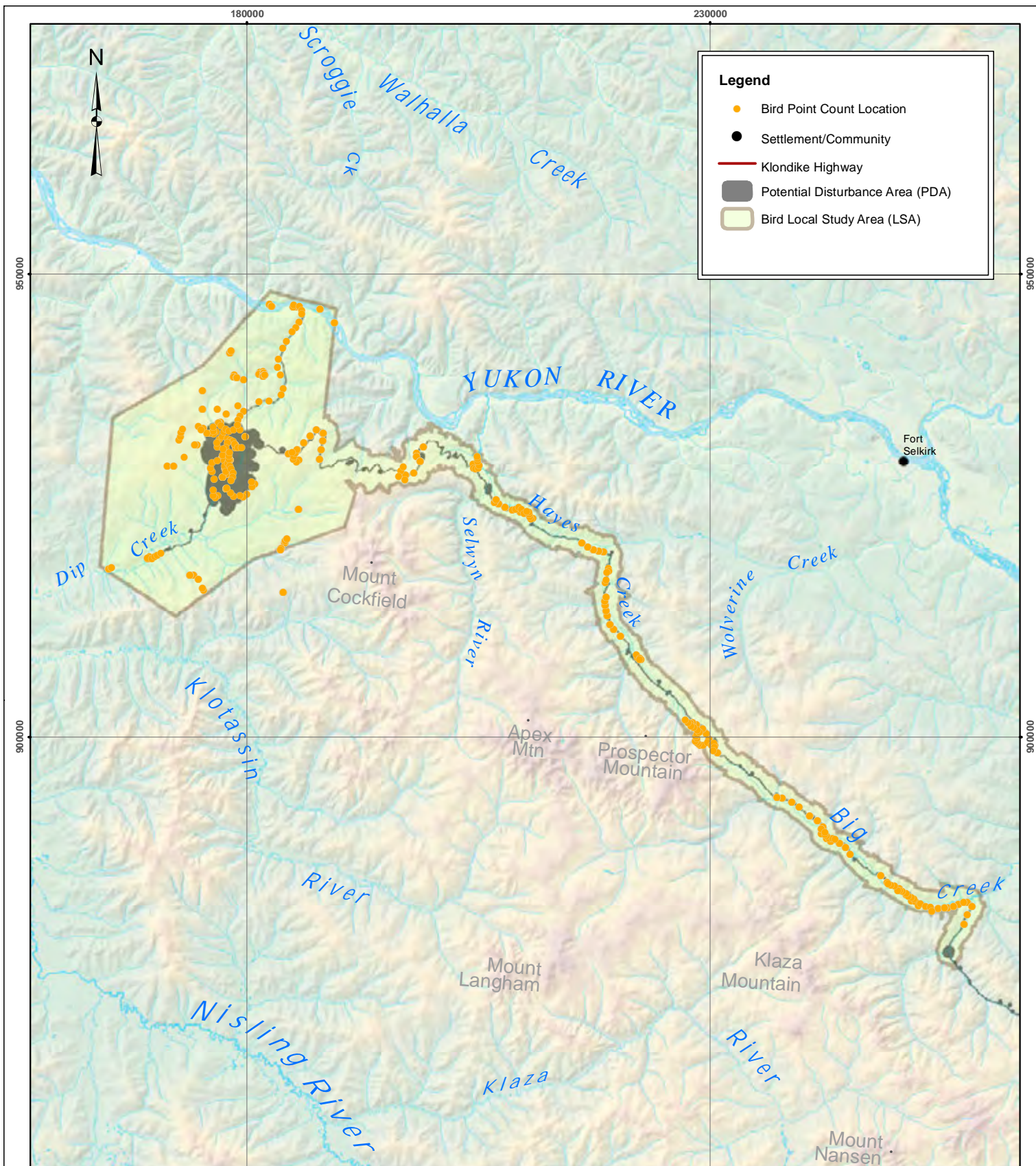
0 5 10 15 20  
kilometres

Map scale 1:560,000 (printed at 8.5x11)  
North American Datum 1983 CSRS Yukon Albers

**CASINO**  
COPPER AND GOLD







**Notes:**

1:250,000 Topographic Spatial Data, National Road Network; courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

PDA provided by Knight Piesold Ltd. 2013.

Digital Elevation Models (30 m and 90 m) provided by Yukon Government - Geomatics Yukon; online Corporate Spatial Warehouse. [www.geomatics.yukon.ca](http://www.geomatics.yukon.ca)



**Casino Project point count survey locations: 2010 to 2013**

Drawn: MP/LG	Checked: MAS	Date: 19/09/2013	Figure: 2.2
-----------------	-----------------	---------------------	----------------

Map scale 1:560,000 (printed at 8.5x11)  
North American Datum 1983 CSRS Yukon Albers

**CASINO**  
COPPER AND GOLD



### 3 BIRD SPECIES OVERVIEW

The Project area provides breeding habitat for a variety of bird species including raptors, waterbirds, waterfowl, shorebirds and upland birds. The majority of bird species found within the study area are widespread throughout much of the central Yukon. However, portions of the Dawson Range are known to contain some tundra-related species (e.g. surfbird, Smith's longspur; Frisch 1983) that are unique breeding species for the central Yukon as they are typically found further north.

Based on Project field surveys, previous studies in the region, and other background information on bird distributions within the Yukon, a list of 116 species having the potential to occur within the LSA was compiled (Table 3.1). Of those species, 82 were confirmed present during field surveys within the LSA. Overall, the diversity of birds in the study area is reflective of the avian community in this portion of the central Yukon. Habitats within the LSA are highly variable and range from rugged mountain peaks and tundra plateaus to heavily forested areas along large streams. As a result of this habitat diversity, there is a diverse assemblage of bird species found throughout the study area. The only primary bird habitat type not present within the study area is lakes or other large water bodies and as such, species associated with this type of habitat (e.g. loons, many species of diving ducks) are generally not present and have not been included in the species list.





**Table 3.1** Bird species and conservation status of birds that may occur within the LSA during the breeding season (species with an “\*” were confirmed present during Project surveys)

Common name	Latin name	COSEWIC, SARA <sup>1a</sup>	Yukon CDC Tracklist <sup>1b</sup>	BCR 4 Priority <sup>1c</sup>	Common name	Latin name	COSEWIC, SARA <sup>1a</sup>	Yukon CDC Tracklist <sup>1b</sup>	BCR 4 Priority <sup>1c</sup>
Horned grebe*	<i>Podiceps auritus</i>	Special Concern, Not Listed		✓	Olive-sided flycatcher*	<i>Contopus cooperi</i>	Threatened, Sched 1	Imperiled-Vulnerable	✓
Canada goose*	<i>Branta canadensis</i>			✓	Western wood-pewee*	<i>Contopus sordidulus</i>			
American wigeon	<i>Anas americana</i>			✓	Yellow-bellied flycatcher*	<i>Empidonax flaviventris</i>		Vulnerable	
Mallard*	<i>Anas platyrhynchos</i>			✓	Alder flycatcher*	<i>Empidonax alnorum</i>			✓
Blue-winged teal	<i>Anas discors</i>			✓	Hammond's flycatcher*	<i>Empidonax hammondi</i>			
Northern shoveler	<i>Anas clypeata</i>			✓	Say's phoebe*	<i>Sayornis saya</i>			
Northern pintail	<i>Anas acuta</i>			✓	Northern shrike*	<i>Lanius excubitor</i>			✓
American green-winged teal*	<i>Anas crecca</i>			✓	Warbling vireo*	<i>Vireo gilvus</i>		Vulnerable	
Ring-necked duck	<i>Aythya collaris</i>				Gray jay*	<i>Perisoreus canadensis</i>			✓
Harlequin duck*	<i>Histrionicus histrionicus</i>		Vulnerable	✓	Common raven*	<i>Corvus corax</i>			
Bufflehead*	<i>Bucephala albeola</i>			✓	Horned lark*	<i>Eremophila alpestris</i>			
Common goldeneye	<i>Bucephala clangula</i>			✓	Tree swallow*	<i>Tachycineta bicolor</i>			
Barrow's goldeneye	<i>Bucephala islandica</i>			✓	Violet-green swallow*	<i>Tachycineta thalassina</i>			



Common name	Latin name	COSEWIC, SARA <sup>1a</sup>	Yukon CDC Tracklist <sup>1b</sup>	BCR 4 Priority <sup>1c</sup>	Common name	Latin name	COSEWIC, SARA <sup>1a</sup>	Yukon CDC Tracklist <sup>1b</sup>	BCR 4 Priority <sup>1c</sup>
Common merganser	<i>Mergus merganser</i>				Bank swallow*	<i>Riparia riparia</i>	Threatened, Not Listed	Secure	
Osprey*	<i>Pandion haliaetus</i>		Vulnerable		Cliff swallow	<i>Petrochelidon pyrrhonota</i>			
Bald eagle*	<i>Haliaeetus leucocephalus</i>				Barn swallow	<i>Hirundo rustica</i>	Threatened, Not Listed		√
Northern harrier	<i>Circus cyaneus</i>				Black-capped chickadee*	<i>Poecile atricapilla</i>			
Sharp-shinned hawk*	<i>Accipiter striatus</i>				Boreal chickadee*	<i>Poecile hudsonica</i>			√
Northern goshawk*	<i>Accipiter gentilis</i>			√	Red-breasted nuthatch*	<i>Sitta canadensis</i>			
Red-tailed hawk*	<i>Buteo jamaicensis</i>				American dipper	<i>Cinclus mexicanus</i>			
Golden eagle*	<i>Aquila chrysaetos</i>			√	Golden-crowned kinglet*	<i>Regulus satrapa</i>			
American kestrel*	<i>Falco sparverius</i>		Imperiled	√	Ruby-crowned kinglet*	<i>Regulus calendula</i>			
Merlin	<i>Falco columbarius</i>				Townsend's solitaire*	<i>Myadestes townsendi</i>			
Gyr Falcon*	<i>Falco rusticolus</i>				Gray-cheeked thrush*	<i>Catharus minimus</i>			
Peregrine falcon*	<i>Falco peregrinus</i>	Special Concern, Sched 1	Vulnerable	√	Swainson's thrush	<i>Catharus ustulatus</i>			
Ruffed grouse	<i>Bonasa umbellus</i>				Hermit thrush*	<i>Catharus guttatus</i>			
Spruce grouse	<i>Falcipennis canadensis</i>				American robin*	<i>Turdus migratorius</i>			



Common name	Latin name	COSEWIC, SARA <sup>1a</sup>	Yukon CDC Tracklist <sup>1b</sup>	BCR 4 Priority <sup>1c</sup>	Common name	Latin name	COSEWIC, SARA <sup>1a</sup>	Yukon CDC Tracklist <sup>1b</sup>	BCR 4 Priority <sup>1c</sup>
Willow ptarmigan*	<i>Lagopus lagopus</i>				Varied thrush*	<i>Ixoreus naevius</i>			✓
Rock ptarmigan*	<i>Lagopus mutus</i>				American pipit*	<i>Anthus rubescens</i>			
White-tailed ptarmigan*	<i>Lagopus leucurus</i>			✓	Bohemian waxwing*	<i>Bombycilla garrulus</i>			✓
Dusky grouse	<i>Dendragapus obscurus</i>			✓	Northern waterthrush*	<i>Parkesia noveboracensis</i>			
Sharp-tailed grouse	<i>Tympanuchus phasianellus</i>		Vulnerable		Tennessee warbler*	<i>Oreothlypis peregrina</i>			
American golden-plover	<i>Pluvialis dominica</i>			✓	Orange-crowned warbler*	<i>Oreothlypis vermivora</i>			
Semipalmated plover	<i>Charadrius semipalmatus</i>				Common yellowthroat*	<i>Geothlypis trichas</i>			
Lesser yellowlegs	<i>Tringa flavipes</i>			✓	Yellow warbler*	<i>Setophaga petechia</i>			
Solitary sandpiper*	<i>Tringa solitaria</i>			✓	Blackpoll warbler*	<i>Setophaga striata</i>			✓
Wandering tattler	<i>Heteroscelus incanus</i>		Vulnerable	✓	Myrtle warbler*	<i>Setophaga coronata</i>			
Spotted sandpiper*	<i>Actitis macularia</i>			✓	Townsend's warbler*	<i>Setophaga townsendi</i>			✓
Upland sandpiper*	<i>Bartramia longicauda</i>			✓	Wilson's warbler*	<i>Cardellina pusilla</i>			✓
Whimbrel	<i>Numenius phaeopus</i>		Vulnerable	✓	Lapland longspur	<i>Calcarius lapponicus</i>			
Surfbird	<i>Aphriza virgata</i>			✓	Smith's longspur	<i>Calcarius pictus</i>		Vulnerable	✓



Common name	Latin name	COSEWIC, SARA <sup>1a</sup>	Yukon CDC Tracklist <sup>1b</sup>	BCR 4 Priority <sup>1c</sup>	Common name	Latin name	COSEWIC, SARA <sup>1a</sup>	Yukon CDC Tracklist <sup>1b</sup>	BCR 4 Priority <sup>1c</sup>
Least sandpiper	<i>Calidris minutilla</i>				American tree sparrow*	<i>Spizella arborea</i>			
Wilson's snipe*	<i>Gallinago delicata</i>			✓	Chipping sparrow*	<i>Spizella passerina</i>			
Long-tailed jaeger	<i>Stercorarius longicaudus</i>				Savannah sparrow*	<i>Passerculus sandwichensis</i>			
Mew gull	<i>Larus canus</i>			✓	Fox sparrow*	<i>Passerella iliaca</i>			
Herring gull*	<i>Larus argentus</i>			✓	Lincoln's sparrow*	<i>Melospiza lincolni</i>			
Great horned owl	<i>Bubo virginianus</i>				White-crowned sparrow*	<i>Zonotrichia leucophrys</i>			✓
Northern hawk owl*	<i>Surnia ulula</i>			✓	Golden-crowned sparrow*	<i>Zonotrichia atricapilla</i>			✓
Great gray owl	<i>Strix nebulosa</i>			✓	Slate-colored junco*	<i>Junco hyemalis</i>			
Short-eared owl*	<i>Asio flammeus</i>	Special Concern, Sched 1	Vulnerable	✓	Black-headed grosbeak <sup>2*</sup>	<i>Pheucticus melanocephalus</i>			
Boreal owl	<i>Aegolius funereus</i>			✓	Red-winged blackbird	<i>Agelaius phoeniceus</i>			
Common nighthawk	<i>Chordeiles minor</i>	Threatened, Sched 1	Imperiled	✓	Rusty blackbird*	<i>Euphagus carolinus</i>	Special Concern, Not Listed	Vulnerable	✓
Belted kingfisher*	<i>Ceryle alcyon</i>				Gray-crowned rosy finch	<i>Leucosticte tephrocotis</i>			✓
Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>				Pine grosbeak*	<i>Pinicola enucleator</i>			✓



Common name	Latin name	COSEWIC, SARA <sup>1a</sup>	Yukon CDC Tracklist <sup>1b</sup>	BCR 4 Priority <sup>1c</sup>	Common name	Latin name	COSEWIC, SARA <sup>1a</sup>	Yukon CDC Tracklist <sup>1b</sup>	BCR 4 Priority <sup>1c</sup>
Hairy woodpecker*	<i>Picoides villosus</i>				Purple finch*	<i>Carpodacus purpureus</i>			
American three-toed woodpecker*	<i>Picoides dorsalis</i>			v	White-winged crossbill*	<i>Loxia leucoptera</i>			v
Black-backed woodpecker	<i>Picoides arcticus</i>				Common redpoll*	<i>Acanthis flammea</i>			
Northern flicker*	<i>Colaptes auratus</i>				Pine siskin*	<i>Spinus pinus</i>			

<sup>1a</sup> COSEWIC 2012, Environment Canada 2012. <sup>1b</sup> Yukon Conservation Data Centre 2012. <sup>1c</sup> Environment Canada 2013.

<sup>2</sup> Extralimital species for the area – a black-headed grosbeak was photo documented at a feeder outside the Casino kitchen bunkhouse on 28 June 2009 (Photo 3).

<sup>3</sup> An additional seven extralimital species were recorded within the LSA during 2010 and 2011 baseline studies; however, those sightings were not reliably documented and therefore were not included in the species lists due to a lack of proper documentation (photographs or recordings). These include American goldfinch, Clark's nutcracker, grey catbird, hoary redpoll, least flycatcher, red crossbill, and western tanager.



## 4 RAPTORS

Raptors within the LSA include a mixture of year-round residents and migratory species. In the forested portions of the study area, northern goshawk, great horned owl, northern hawk owl, great gray owl, and boreal owl are year-round residents. Migratory raptors include bald eagle, northern harrier, sharp-shinned hawk, red-tailed hawk, American kestrel, merlin, and peregrine falcon. In subalpine and alpine habitats, gyrfalcon is a year round resident, while golden eagles and peregrine falcons are seasonal inhabitants that nest on rocky outcrops in alpine areas or on rock cliffs near the Yukon River along the north margin of the LSA. In total, 16 raptor species are expected within the LSA — both bald and golden eagle, nine hawk or falcon species, and five species of owls (Table 3.1). Of these, 12 were confirmed present in the LSA. Breeding was confirmed for peregrine falcon and northern hawk owl, however, it is expected that most raptor species present likely nest in the area. Additionally, although true passerines, common ravens are often considered ‘functional raptors’ (e.g. Poole and Bromley 1988) since they nest on cliffs, interact with raptors for nesting territories and build stick nests which can be used by raptors for nesting.

Field surveys for the Project focussed on cliff-nesting raptors. Aerial surveys for cliff-nesting raptors were conducted in both 2010 (Mine LSA and parts of the Freegold Road extension) and 2013 (within 2–3 km of the Freegold Road extension and the proposed mine infrastructure). The 2010 surveys did not locate any active nests within the surveyed area, but did document several inactive nests. The 2013 survey located an active peregrine falcon nest and a suspected gyrfalcon nest which was inactive at the time of the survey but showed evidence of having been used earlier in the year (Photo 1). Both of these nests were located along the proposed Freegold Road extension. The survey also documented large stick nests (believed to be golden eagle in origin) in five different locations (two near the proposed mine site and three along the proposed Freegold Road extension). One of these sites was being used by the peregrine falcon mentioned above; however, the remaining sites were vacant (Table 4.1). The 2013 raptor survey was timed to coincide with the nesting period of peregrine falcons. It was too late in the season to survey for gyrfalcons (although evidence of previously active gyrfalcon sites was noted), but should have been adequate to capture golden eagle nesting, unless the nest failed early in the nesting period (Table 4.2).

Prior to the 2013 survey, Project biologists compiled a list of all known cliff-nesting raptor nests in the RSA based on previous Project surveys and information from Yukon Environment. The Yukon Environment data included the location of nine nests (hereafter referred to as historic sites — most were identified during surveys in the late 1970s and early 1980s) located within 5 km of the proposed Project. The 2013 survey visited all sites within 3 km of the proposed Project. In total, 20 potential nest sites (recent and historical) were located within 5 km of the Project. However the 2013 survey determined that a few of the potential nest sites identified in 2010 were likely perch sites, and while some of the historic sites could not be located in 2013 there were several nest identified in in 2010 and 2013 that were within a few kilometers of these historic nests. Assuming that the historical nest sites not surveyed during 2013 still exist, surveyors estimate that there are currently 12 nest sites within this area — six around the proposed mine site and Yukon River access road and six along the proposed Freegold Road extension.





Based on the 2010 and 2013 survey data, occupancy in recent years appears to be rather low (only two of eight nest sites located in 2013 were active that year). Most notably, a large number of inactive golden eagle nests are present in the area—nine of the 12 cliff-nesting raptor sites located within 5 km of the proposed Project are known or suspected golden eagle nests and of the seven surveyed in 2013, the only active nest was being used by a peregrine falcon. According to Kochert et al. (2002), golden eagles often construct alternate nests, and in some cases, these nests can be more than 5 km apart; so it is possible that these nine nest sites do not represent nine separate nesting territories. Additionally, studies in interior Alaska have found that the percentage of golden eagle pairs that lay eggs in a given year is highly variable (ranged from 33% to 90%) and is closely tied to the availability of snowshoe hare and ptarmigan, both of which undergo dramatic population cycles approximately every nine to 11 years, often in synchrony (McIntyre and Adams 1999). Snowshoe hare populations within the southern and central Yukon have been in a population low for the last few years (Krebs et al. 2012, 2013) so it is likely that most golden eagle pairs in the Project area are not initiating nesting or that nests are failing early in the nesting period due to a low abundance of prey.

Peregrine falcons were observed during Project surveys within the LSA every year between 2010 and 2013, although not in large numbers. The 2013 cliff-nesting raptor survey that encompassed the entire LSA located a single active peregrine falcon nest, and observed one other peregrine falcon hunting in subalpine/alpine habitats. In total, two active peregrine falcon nests have been documented during Project surveys in the LSA:

- On 16 June 2013, the raptor survey located an active peregrine falcon nest on a steep, south-facing slope above Big Creek. The bird was using an old stick nest located on a rocky outcrop; one adult and three eggs were present.
- On 18 July 2012, a peregrine falcon nest was discovered during rare plant surveys in the LSA. One adult and two juveniles were present on an old stick nest, located on a rocky outcrop along a steep south-facing slope above Big Creek (Photo 2). This nest was vacant during the 2013 survey.

Data from the Yukon Environment raptor nest database indicates that peregrine falcon also nest on the south-facing slopes along the Yukon River (general area identified in the Wildlife Key Areas illustrated in Figure 2.1). Individual birds have been observed in other portions of the LSA including the high elevation areas surrounding the proposed mine and the Hayes Creek drainage; but no nests have been recorded in these areas to date.

In addition to surveys for cliff-nesting raptors, the 2013 surveys included a stand-watch survey for short-eared owl around the proposed mine site. This survey was precipitated by an observation in 2011 of a short-eared owl near the current Casino camp. The stand-watch survey was conducted on June 19, 2013. No short-eared owls were observed during the survey, and biologists noted that most of the area was dominated by thick shrub, not ideal for nesting.



**Table 4.1 Known nest sites of cliff-nesting raptors within 5 km of the proposed Project infrastructure<sup>1</sup>**

Study Area Location	ID	Source	Species	Habitat Type	2010 Observations	2013 Observations
Mine site	1244	Yukon Environment	Golden eagle	Tors	Whitewash noted	Unoccupied stick nest; not in great shape but some recent whitewash nearby
	1254	Yukon Environment	Golden eagle	Unknown	Not surveyed	Not surveyed
	1255	Yukon Environment	Golden eagle	Cliffs	Surveyed but nest not located; unoccupied stick nest was found 0.5 km northwest (see nest 2010-24)	Surveyed – no nest located
	1256	Yukon Environment	Golden eagle	Cliffs	Surveyed but nest not located; unoccupied nest was found 1 km west (see nest 2010-21)	Surveyed – no nest located
	1257	Yukon Environment	Golden eagle	Unknown	Not surveyed	Not surveyed
	2010-08	2010 Survey	Golden eagle	Tors	Unoccupied nest	Unoccupied stick nest – in poor shape; doesn't look as though it's been used in several years (moss growing over it)
	2010-21	2010 Survey	Unknown raptor	Cliffs	Unoccupied stick nest	Surveyed – no nest located but cliff habitat is extensive and highly suitable – possibly missed?
	2010-24	2010 Survey	Unknown raptor	Cliffs	Unoccupied nest	Surveyed – no nest located but cliff habitat is extensive and highly suitable – possibly missed?
Freegold Road extension	1243	Yukon Environment	Gyrfalcon	Tors	Unoccupied nest	Rock ledge unoccupied at time of survey but active earlier this year – abundant whitewash. Suspect gyrfalcon.
	1294	Yukon Environment	Gyrfalcon	Unknown	Not surveyed	Not surveyed
	1295	Yukon Environment	Gyrfalcon	Unknown	Not surveyed	Not surveyed
	1296	Yukon Environment	Golden eagle	Alpine	Not surveyed	Surveyed – no nest located; unoccupied nest was found 2.5 km away (on same mountain block; see nest 2013-15)
	2010-11	2010 Survey	Unknown raptor	Tors	Possible nest site	Surveyed – no nest located; suspect 2010 observation may be perch site
	2010-12	2010 Survey	Unknown raptor	Tors	Possible nest site	Surveyed – no nest located; suspect 2010 observation may be perch site



Study Area Location	ID	Source	Species	Habitat Type	2010 Observations	2013 Observations
Freegold Road extension	2010-13	2010 Survey	Unknown raptor	Tors	Possible nest site	Surveyed – no nest located; suspect 2010 observation may be perch site
	2010-15	2010 Survey	Unknown raptor	Tors	Possible nest site	Surveyed – no nest located; suspect 2010 observation may be perch site
	2010-17	2010 Survey	Unknown raptor	Tors	Possible nest site	Surveyed – small amount of whitewash present, but no nest
	2012-01	EDI – incidental observation	Peregrine falcon\ golden eagle	Rocky outcrop on steep slope	Not surveyed	Unoccupied large stick nest (likely golden eagle in origin) – was used by peregrine falcon in 2012 (incidental observation on 18 July 2012 – 1 adult and 2 juveniles present)
	2013-11	2013 Survey	Peregrine falcon\ golden eagle	Rocky outcrop on steep slope	Not surveyed	3 large stick nests present (likely golden eagle in origin); peregrine falcon is using middle one – 1 adult and 3 eggs present
	2013-15	2013 Survey	Golden eagle	Rocky outcrop in alpine\ subalpine	Not surveyed	Unoccupied stick nest; large nest in good condition (presumed golden eagle)

<sup>1</sup>At the request of Yukon Environment and for the protection of the nest sites, specific coordinates for the nest sites and/or a map have not been provided here.

Table 4.2 Estimated nesting dates for cliff-nesting raptors in the LSA<sup>1</sup>

Species	Eggs laid	Hatching	Fledging
Golden Eagle	Late April–Early May	Early June	August
Gyr Falcon	Early April	Early May	Mid-June
Peregrine Falcon	Late May	Late June	Mid-August

<sup>1</sup> Based on dates reported in Sinclair et al. (2003) for nesting in the southern Yukon.



Photo 1. Suspected gyrfalcon nest located 15 June 2013 during the cliff-nesting raptor surveys



**Photo 2. Old stick nest being used by peregrine falcon in 2012**  
(18 July 2012 – 1 adult and 2 juveniles present)



## 5 WATERBIRDS, WATERFOWL, AND SHOREBIRDS

The LSA contains no lakes and open-water wetlands and pond habitats are generally infrequent and small. As a result, the study area does not contain a high density or diversity of waterfowl (i.e. ducks, swans, and geese) and other waterbirds (e.g. loons, grebes, gulls). Species such as Canada goose, mallard, green-winged teal, bufflehead, and goldeneye can be expected in small wetlands within the study area, particularly in the Dip Creek drainage to the southwest of the mine site. Harlequin duck and common merganser may also be found along larger streams and rivers within the project area including Big Creek, Hayes Creek, and the Selwyn River; while herring gull can be found along the portion of the study area which is adjacent to the Yukon River. In total, 17 species of waterfowl and other waterbirds are expected within the LSA, seven of which were confirmed present, however, numbers are very low. The 2013 bird surveys located only three mallards, three American green-winged teal, and one herring gull over more than 80 hours of field surveys throughout the entire LSA.

Shorebirds within the study area are separated into two broad groups based on their habitat requirements: (1) those which breed in wetlands and along stream margins, and (2) those which breed in upland tundra habitats. The most common shorebirds in the LSA are spotted sandpiper that occurs regularly along the large streams and rivers, and solitary sandpiper, which is typically found at small ponds and wetlands. Other wetland and stream-oriented species that may occur at low densities in the LSA include semipalmated plover, wandering tattler, lesser yellowlegs, least sandpiper, and Wilson's snipe, although only Wilson's snipe was confirmed present. Tundra-related species such as American golden-plover, whimbrel, and upland sandpiper occur in low densities within high elevation tundra plateaus within the region (Frisch 1983). Intensive surveys of the tundra habitats near Prospector Mountain, Apex Mountain, and Magpie Creek by Frisch (1983) also revealed a number of surfbirds within this area which is a unique observation for the central Yukon as this species is typically found further north. The 2013 breeding bird surveys confirmed the presence of upland sandpiper within the LSA. Surveyors also recorded a surfbird calling on the northeast slopes of Prospector Mountain, just outside of the LSA. In total, 11 shorebird species have the potential to be found within the LSA.





## 6 UPLAND BIRDS

Habitats within the LSA are highly variable and range from rugged mountain peaks and tundra plateaus to heavily forested areas along large streams. As a result, there is a diverse assemblage of upland bird species found throughout the study area. Upland birds include game birds (grouse, ptarmigan), nighthawks, kingfishers, woodpeckers, and passerines (songbirds). The study area provides breeding habitat for numerous species of songbirds including the following general groups: flycatchers, shrikes and vireos, jays and crows, swallows, chickadees, kinglets, thrushes, waxwings, warblers, sparrows, blackbirds, and finches. Included in these species are habitat generalists such as dark-eyed junco or yellow-rumped warbler and habitat specialists such as Townsend's warbler. In total, there are 72 species (seven game bird, one nighthawk, one kingfisher, five woodpecker, and 58 passerine species) within this group that may be found within the LSA.

Field surveys for upland breeding birds were conducted within the LSA in 2010, 2011, and 2013. Surveys consisted of 100 m point counts and encounter transects between point counts to maximize species detection (2013 only). Point count surveys are primarily designed to detect passerine species, however along with encounter transects, can provide at least an index of most other upland bird species within an area. In total, 173 point counts were conducted by EDI in 2013. In 2011, 50 point counts were conducted by Summit within the Freegold Road extension LSA; and in 2010, 36 point counts were completed by Summit within the Freegold Road extension LSA while 50 were carried out by AECOM within the mine LSA. Analysis of the survey data looked at all three years, but focussed on the 2013 data, in part, due to inconsistencies in the survey methods used earlier. Data analysis considered species distributions, species density (number of birds/plot  $\pm$  standard error), and species diversity.

### 6.1 DISTRIBUTION

Project surveys confirmed the presence of 59 upland bird species within the LSA — 53 species were detected during the 2013 field surveys and six additional species were documented in the 2010 and 2011 point counts and during incidental observations within the LSA. Of the species that had the fewest observations, five species were only confirmed once during all three years of surveys, including northern shrike, warbling vireo, Tennessee warbler, black-headed grosbeak, and purple finch. Black-headed grosbeak is an extralimital species for the central Yukon; the bird was observed and photographed at Casino camp on 28 June 2009 (Photo 3).

Passerine species comprised the majority (>90%) of the survey observations. In 2013, the most common species detected during point count surveys (in descending order) were dark-eyed junco, myrtle warbler, American robin, white-crowned sparrow, Lincoln's sparrow, and Swainson's thrush. However species distributions varied greatly across habitat types and elevation. Table 6.1 lists the five most common species found in the different ecozones (plots were assigned to ecozones based on observed habitats and site characteristics; in general alpine was defined as areas greater than 1,250 m in elevation with no trees and limited shrub cover, subalpine occurred between 1,050 m and 1,350 m, and boreal forest was defined as areas below 1,050 m; however, the elevational range of ecozones varied by aspect and location).



Table 6.1 Most common upland bird species detected during 2013 point count surveys

Ecozone	Number of plots	Birds detected/plot	Five most common species (birds/plot) <sup>1</sup>
Alpine	17	2.41	White-crowned sparrow (0.59 birds/plot), American pipit/Savannah sparrow (0.29 birds/plot), common redpoll (0.24 birds/plot), American tree sparrow/horned lark (0.18 birds/plot)
Subalpine	55	5.22	White-crowned sparrow (0.84 birds/plot), dark-eyed junco (0.78 birds/plot), American tree sparrow (0.60 birds/plot), Wilson's warbler (0.49 birds/plot), orange-crowned warbler (0.35 birds/plot)
Boreal Forest	101	6.17	Myrtle warbler (0.86 birds/plot), dark-eyed junco (0.76 birds/plot), American robin (0.61 birds/plot), Swainson's thrush (0.41 birds/plot), Hammond's flycatcher/Ruby-crowned kinglet/Townsend's warbler (0.32 birds/plot)

<sup>1</sup> Densities are calculated as simply the number of birds detected per plot with no attempt made to account for birds not detected (i.e. the majority of the birds detected are singing males, in many cases female birds are likely also present but are silently sitting on nests; however, only those birds seen or heard by the observer are included here).

Other upland bird species detected during surveys included ptarmigan, grouse, belted kingfisher, and woodpeckers. All three species of ptarmigan (willow, rock, and white-tailed) were found in alpine and subalpine habitats within the LSA, with a combined density of 0.20 ptarmigan/ alpine and subalpine plots in 2013. Willow ptarmigan were the most common species observed, with white-tailed ptarmigan only documented once in 2013 and once in 2010. The only grouse species confirmed present during surveys was spruce grouse; however, ruffed grouse is also expected in the lower elevation deciduous and mixedwood forests and dusky grouse and sharp-tailed grouse may also be present in select habitats within the study area. Belted kingfisher was found along the major streams and rivers within the LSA. Woodpecker species documented in the LSA include hairy woodpecker, American three-toed woodpecker, and northern flicker, with northern flicker being the most commonly observed species.





**Photo 3.** Black-headed grosbeak observed at Casino camp, 28 June 2009.

Photo credit: Scott Casselman

## 6.2 DENSITY AND DIVERSITY — 2013 FIELD RESULTS

Detailed analyses of bird density and species diversity were conducted using the 2013 point count data. Analysis of the 2013 field data also included an assessment of species accumulation curves to determine if the level of survey effort was sufficient to detect most of the upland bird species present in the LSA.

### 6.2.1 Species Accumulation Curves

A species accumulation curve is a visual representation of the accumulation of the number of species detected with increasing sampling effort. Since the species communities observed within the LSA varied greatly among the various habitat types and elevations, point count surveys were divided into three groups by ecozone. Point counts were then organized by date and time that the survey occurred and the species detected were listed to assess the rate at which new species were encountered. Analysis of the data included only those species documented within point counts (i.e. excluded transect observations, species detected outside of point count plots, and incidental observations), but included all bird species recorded. The rate of species detection was then graphed and fitted with a logarithmic trend line.

The 2013 breeding bird surveys included 173 point counts — 17 in alpine habitats, 55 in subalpine, and 101 in the boreal forest. The species accumulation curves (Figure 6.1 to Figure 6.3) show that the rate of new species detection had begun to plateau within each of these ecoregions, indicating that the sampling was



likely sufficient to detect most of the upland bird species present in the LSA while the surveys were being conducted.

- Alpine habitats — 13 species were detected during point count surveys; 92% of these were detected in the first six counts.
- Subalpine habitats — 24 species were identified during point counts, with no new species detected in the last 13 plots.
- Boreal forest habitats — 44 species were documented during point counts, 93% of which were recorded in the first 48 plots.

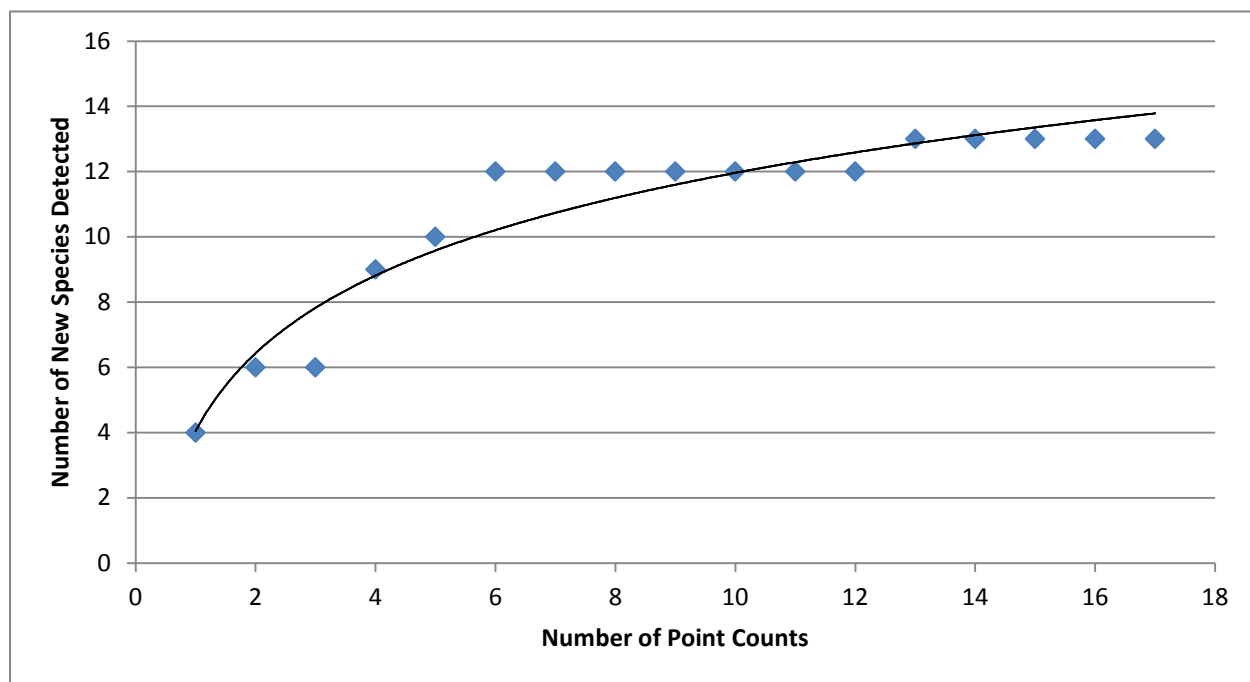


Figure 6.1 Species accumulation curve for point counts conducted in alpine habitats

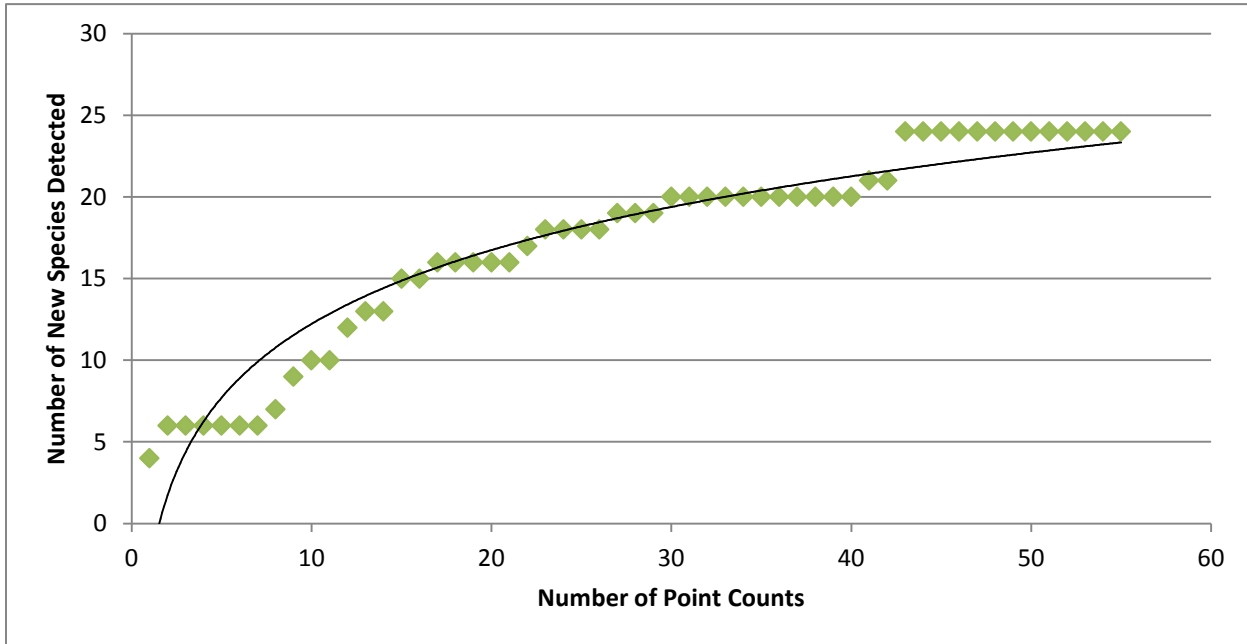


Figure 6.2 Species accumulation curve for point counts conducted in subalpine habitats

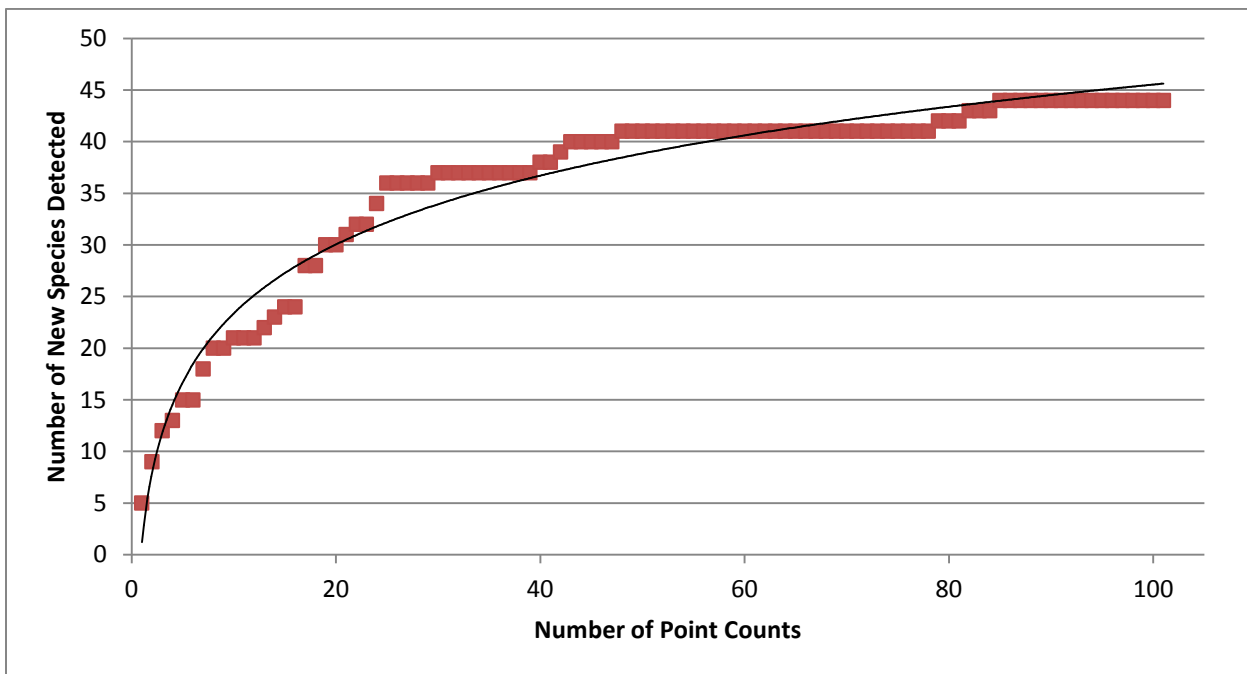


Figure 6.3 Species accumulation curve for point counts conducted in boreal forest habitats



### 6.2.2 Bird Density and Diversity by Habitat Type

Bird density and species diversity were calculated for a variety of habitat types within the LSA. Species diversity is a measure of the variety and abundance of species within a data set and it includes two components: species richness (the number of different species in a community) and species evenness (the relative abundance of each species within the community). Species richness was assessed based on the range and mean number of species detected at plots. To incorporate an assessment of species evenness, the Shannon-Wiener Index was also calculated.

The 2013 point counts included both single habitat plots ( $n = 130$ ) and mixed-habitat plots ( $n = 43$ ). In general, Project biologists attempted to place plots within a single habitat type to get a clear picture of the densities and species composition of that habitat type. However, certain habitat types, particularly riparian habitats, did not lend themselves to a single habitat 100 m radius plot. To sample these habitat types, mixed-habitat plots were conducted. Analysis of the data focussed on single habitat plots to minimize the effect of habitat edges and was restricted to those habitats which had a minimum of five plots within them.

Virtually all habitats within the LSA, ranging from rocky alpine areas to lowland coniferous forests, provide breeding habitat for songbirds and other upland bird species, but bird density and species diversity varies greatly among the different habitat types. Analysis of the 2013 data indicates that bird density and species diversity are generally correlated, so that habitats with the highest densities of birds typically also have higher species diversity (Table 6.2). The data also demonstrates an elevational gradient with higher elevation habitats typically showing lower bird densities and lower species diversity than valley bottom habitats (Table 6.1 and Table 6.2). Overall, the number of birds detected averaged 5.5 birds/plot but ranged from an average of 2.3 birds/plot in alpine tundra to 6.8 birds/plot in riparian coniferous forest (typically at or near valley bottom) or 7.6 birds/plot in riparian mixed-habitat plots. The number of species detected per plot averaged 3.9 species/plot but ranged from an average of 1.9 species/plot in alpine tundra to 4.9 species/plot in riparian coniferous forest or 5.4 species/plot in riparian mixed-habitat plots (Table 6.2). Forested habitats showed some of the highest bird density and diversity, but the richest habitats were associated with riparian features (e.g. riparian forest and riparian shrub habitats).

**Table 6.2** Density and diversity of upland birds within the Casino LSA based on 2013 point count survey results

Habitat type <sup>1</sup>	# birds/plot <sup>2</sup>		# species/plot		Shannon- Wiener Index ( $\pm$ SE)
	Mean $\pm$ SE	Range	Mean $\pm$ SE	Range	
Alpine/Subalpine Tundra (n=7)	2.3 $\pm$ 0.6	0 to 4	1.9 $\pm$ 0.6	0 to 4	0.49 $\pm$ 0.25
Alpine/Subalpine Shrub (n=27)	4.8 $\pm$ 0.7	0 to 13	3.0 $\pm$ 0.3	0 to 7	0.86 $\pm$ 0.12
High Elevation <sup>3</sup> Open/Sparse Coniferous Forest (n=13)	5.2 $\pm$ 0.6	1 to 9	3.5 $\pm$ 0.4	1 to 6	1.13 $\pm$ 0.12
Low Elevation <sup>3</sup> Open/Sparse Coniferous Forest (n=14)	5.6 $\pm$ 0.8	0 to 11	4.2 $\pm$ 0.6	0 to 7	1.28 $\pm$ 0.14
Closed/Dense Coniferous Forest (n=10)	6.0 $\pm$ 1.1	1 to 11	4.2 $\pm$ 0.7	1 to 8	1.24 $\pm$ 0.19
Riparian Coniferous Forest (n=8)	6.8 $\pm$ 1.0	2 to 10	4.9 $\pm$ 0.6	2 to 7	1.47 $\pm$ 0.15
Mixedwood Forest (n=10)	4.8 $\pm$ 0.7	2 to 8	3.9 $\pm$ 0.6	1 to 6	1.19 $\pm$ 0.18
Riparian Mixedwood Forest (n=5)	6.6 $\pm$ 2.0	3 to 14	4.8 $\pm$ 1.5	2 to 10	1.33 $\pm$ 0.28
Old Burn (n=7)	6.4 $\pm$ 0.8	4 to 10	4.7 $\pm$ 0.7	2 to 7	1.40 $\pm$ 0.18
Coniferous Treed Wetland (n=15)	4.8 $\pm$ 0.7	0 to 10	3.6 $\pm$ 0.4	0 to 6	1.12 $\pm$ 0.14
All Single Habitat Plots (n=130)	5.0 $\pm$ 0.3	0 to 15	3.7 $\pm$ 0.2	0 to 10	1.09 $\pm$ 0.05
Riparian mixed habitat plots (n=31)	7.6 $\pm$ 0.8	2 to 20	5.4 $\pm$ 0.4	2 to 10	--
All mixed habitat plots (n=43)	6.9 $\pm$ 0.6	2 to 20	5.1 $\pm$ 0.3	2 to 10	--
All Plots Combined (n=173)	5.5 $\pm$ 0.3	0 to 20	3.9 $\pm$ 0.2	0 to 10	--

<sup>1</sup> 2013 point counts were conducted in several additional habitat types not included here due to small sample sizes; these include anthropogenic, felsenmeer, tors, deciduous forest, grassland, gravel bar, and marsh habitats.

<sup>2</sup> Densities are calculated as simply the number of birds detected per plot with no attempt made to account for birds not detected (i.e. the majority of the birds detected are singing males, in many cases female birds are likely also present but are silently sitting on nests; however, only those birds seen or heard by the observer are included here).

<sup>3</sup> Open/Sparse Coniferous Forest was broken into two categories: High Elevation Open/Sparse Coniferous Forest which typically consisted of sparse or open forests at or near the treeline (generally defined as areas above 1,050 m asl), and Low Elevation Open/Sparse Coniferous Forest which encompassed sparse or open forests at lower elevations (below 1,050 m asl), often the result of poor site conditions.





## 7 SPECIES AT RISK AND CONSERVATION CONCERN

Within the LSA there are a number of bird species at risk or of conservation concern that were documented as present or are likely to occur based on regional survey data or known distributions within the Yukon. Bird populations within the Yukon are assessed by the Yukon Department of Environment, Environment Canada, and nation-wide by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Many species have been assigned a status based on their abundance, population trends, and depth of knowledge of populations. Based on the COSEWIC status, some species are listed under the federal Species at Risk Act (SARA). Additionally, Environment Canada has recently released a Bird Conservation Strategy for Bird Conservation Region (BCR) 4 (including northern British Columbia and most of the Yukon) that identifies 77 priority species for conservation within this region.

### 7.1 BIRD CONSERVATION STRATEGY FOR BCR 4

The Project is located within BCR 4, the Northwestern Boreal Forest which overlaps Alaska and northwestern Canada. The Canadian subregion includes most of the Yukon, and extends into parts of northern B.C. and western N.W.T. The recently completed bird conservation strategy for BCR 4 (Environment Canada 2013) includes 77 priority species for conservation in the region, of which 53 were documented within the LSA or are expected to occur during the breeding season.

Regional population trends for most priority species in BCR 4 are unknown, and as a result, the population objective for most species is to “*assess and maintain*” populations (Environment Canada 2013). However, there are seven priority species with evidence of regional declines; of which, six (American wigeon, lesser yellowlegs, olive-sided flycatcher, blackpoll warbler, white-crowned sparrow, and rusty blackbird) were documented or are expected to occur within the LSA. The population objective for these species is to “*increase regional populations*” (Environment Canada 2013).

An assessment of threats to birds in BCR 4 identified eight priority species that face threats of high magnitude (threats were assigned a relative magnitude of low, medium, high, or very high; no specific threats in BCR 4 were assessed as having very high magnitude). These include seven alpine species (white-tailed ptarmigan, American golden-plover, wandering tattler, whimbrel, surfbird, Smith’s longspur, and gray-crowned rosy-finch) threatened by reduction in alpine tundra due to climate change (Environment Canada 2013). All seven of the alpine species threatened by climate change have been documented or are expected to occur in the LSA.

Table 3.1 highlights the 53 priority species that have been recorded in the LSA or are expected based on previous studies in the region and other background information on bird distributions within the Yukon. Attachment A provides a summary of Project observations and regional knowledge for each of the priority species which have shown evidence of regional decline or have been assessed as facing high magnitude threats within BCR 4.



## 7.2 YUKON CONSERVATION DATA CENTRE

The Project species list includes 14 species which are on the Yukon Conservation Data Centre's track list (Yukon Conservation Data Centre 2012) and are considered vulnerable (at moderate risk of extirpation due to fairly restricted range, relatively few occurrences, recent and widespread declines, threats or other factors) or imperiled (high risk of extirpation due to restricted range, few occurrences, steep declines, severe threats or other factors) within the Yukon. This list includes species which are of regional conservation concern and may be candidate species for more detailed assessments in the future. Attachment A provides a summary of Project observations and regional knowledge for each of those 14 species.

## 7.3 COSEWIC AND SARA

Of the 116 species that are known or potentially found in the LSA, eight have been designated as species of Special Concern (a species that may become threatened or endangered due to biological characteristics and/or identified threats) or Threatened (a species likely to become endangered if limiting factors are not reversed) within Canada by COSEWIC. These include horned grebe, peregrine falcon, common nighthawk, short-eared owl, olive-sided flycatcher, bank swallow, barn swallow, and rusty blackbird (COSEWIC 2012). Four of these species — peregrine falcon, common nighthawk, short-eared owl, and olive-sided flycatcher — have also been listed under Schedule 1 of SARA (Environment Canada, SARA 2012). Further details on each of these species at risk are provided in Attachment A and in the sections below. Figure 7.1 shows the location of all species at risk observations made within the LSA.

***Horned Grebe*** — Horned grebe is one of two common grebe species found in the Yukon. It is a breeding species throughout the territory although it is most common in the southern portion. The preferred breeding habitat includes small lakes and ponds (approximately 0.5 to 10 ha) with aquatic vegetation and 'marshy' margins (Stedman 2000, Sinclair et al. 2003). Nests are typically located on a floating mound of emergent vegetation (Sinclair et al. 2003).

The western population of horned grebe has been assessed by COSEWIC as a species of Special Concern. This assessment is based on short and long term population declines (COSEWIC 2013). Identified threats include degradation of wetland breeding habitat, droughts, increases in nest predation and oil spills within the marine wintering grounds (COSEWIC 2013). It is not listed under SARA, and is not included on the Yukon CDC Tracklist; however, it is designated as a priority species within BCR 4 (Environment Canada 2012, 2013; Yukon Conservation Data Centre 2012).

Horned grebe were documented only once during Project surveys when a single male was observed swimming on a pond in the Dip Creek valley during point count surveys on 18 June 2010. Suitable breeding habitat for horned grebe within the LSA is limited to ponds and is mostly concentrated in the Dip Creek valley, although a couple of backchannel ponds along Hayes and Big Creek may also be suitable.

***Peregrine Falcon*** — Peregrine falcon is one of four species of falcon which breeds in the Yukon. It can be found through many of the large river valleys in the central and northern portions of the territory, although



the largest subpopulation is found along the Yukon River between the Pelly River and the Alaska border. Within this area, active nests can be located as close together as every 5 km although the spacing is often much greater (Sinclair et al. 2003). This species nests almost exclusively on cliffs adjacent to or near water, most often large rivers, particularly if there are wetlands located nearby (Sinclair et al. 2003).

The *anatum* subspecies of peregrine falcon was originally listed (1978) as Endangered; however, it has been downlisted to Special Concern as a result of population increases throughout the range, primarily due to the ban of organochlorine (DDT) pesticides in Canada (COSEWIC 2007b). Peregrine falcon is listed on Schedule 1 of SARA, is considered a Vulnerable species within the Yukon, and has been assessed as a priority species for conservation within BCR 4 (Environment Canada 2012, 2013; Yukon Conservation Data Centre 2012). Project-specific surveys for peregrine falcon and distribution in the LSA were described above in Section 4.

**Common Nighthawk** — Common nighthawk is the only species of nightjar which breeds in the Yukon. They are found throughout the central and southern portions of the territory as far north as Dawson City, but are considered relatively rare in the central Yukon (Sinclair et al. 2003). During the breeding season, common nighthawks favor open habitats such as lodgepole pine forests and old burned areas. Wetlands are also an important habitat component as they provide suitable foraging sites for insects (Sinclair et al. 2003). In B.C., the species has been reported to breed from sea level to 1,250 m elevation, approximately treeline (Campbell et al. 1990).

Common nighthawk were listed as threatened by COSEWIC in 2007 due to short and long term population declines — a 49% decline was determined for areas surveyed over the past three generations of the species (COSEWIC 2007c). As with other aerial insectivorous bird species, the reduction of food sources may be a primary cause for this decline although other factors such as changes in habitat availability may be related factors of this decline. Common nighthawk is included on Schedule 1 of SARA, and is listed as Imperiled in the Yukon (Environment Canada 2012; Yukon Conservation Data Centre 2012). It is also listed as a priority species for conservation within BCR 4 (Environment Canada 2013).

Common nighthawk has not been documented in the LSA, however, no surveys were conducted specifically for this species. Common nighthawk are most active during dawn and dusk, and are rarely observed during daylight hours, therefore, standard surveys for breeding birds do not adequately sample this species (Resource Inventory Committee 1998). Suitable habitat including old burns, open forests and wetlands, is present in the LSA, however, the Project is located at the northern extent of their range and if present, common nighthawk is not expected to be widespread or a regular occurrence.

**Short-eared Owl** — One of six regularly occurring owl species in the Yukon, short-eared owl is the only species that is truly migratory. Within North America, short-eared owl are found in open habitats from the high arctic to mid-latitudes. They typically inhabit large expanses of open country such as prairie or coastal grasslands, heathlands, shrub-steppe, and tundra (Wiggins et al. 2006). In the Yukon, the species breeds primarily in tundra habitats, including arctic tundra in the north and alpine tundra in the central and southern areas. They are most often found in open alpine habitats, meadows and open wetland areas. Nesting typically occurs in tundra habitats such as low or dwarf shrub tundra, and wet sedge meadows, but



may also occur in open wetland habitats at lower elevations (Sinclair et al. 2003). Nests are built on the ground, usually on a dry site with enough vegetation to conceal the incubating female (Wiggins et al. 2006).

Short-eared owl was listed by COSEWIC as Special Concern in 2008 due primarily to a continuing population decline over the past 40 years including by 23% in the last 10 years (COSEWIC 2008). Short-eared owl is included on Schedule 1 of SARA, is listed as Vulnerable in the Yukon, and a priority species within BCR 4 (Environment Canada 2012, 2013; Yukon Conservation Data Centre 2012). The primary threat to this species is habitat loss and degradation on the wintering grounds (COSEWIC 2008).

There was a single short-eared owl sighting during Project surveys in the LSA. The 2011 sighting was in alpine moist shrub tundra close to the Casino camp, where a bird was observed perched on a dwarf spruce, hunting in the willow thickets. According to Sinclair et al. (2003), short-eared owls are known to hunt over low shrub conifers, and subalpine willow and birch, however, nesting typically occurs in more open habitats. The description of hunting habitats is consistent with the 2011 observation. As described above (Section 2.2.1) a standwatch survey was conducted in the evening in the mine area in June 2013 but no birds were observed. The 2013 surveys also noted that most of the proposed mine site and adjacent high elevation sections of the Freegold Road extension are dominated by moist shrub (characterized by thick stands of willow and dwarf birch) and sparse coniferous forest (also dominated by a thick shrub layer) habitat type. While that habitat is suitable for hunting, it is not ideal for nesting short-eared owl. The most suitable habitat for short-eared owl nesting in the Project area is expected to be alpine tundra habitats.

***Olive-sided Flycatcher*** — Olive-sided flycatcher is a highly migratory species that breeds throughout the Yukon to the northern limit of trees. Across its range, olive-sided flycatcher is found in coniferous and mixed forests where it is usually associated with forest edges and forest openings; it frequently occurs along the wooded shorelines of streams, rivers, lakes, ponds and wetlands where natural edge habitat occurs and standing dead trees are present. It is also frequently associated with burned habitats (Altman and Sallabanks 2012). In the Yukon, the preferred breeding habitat of this species includes a variety of forest types including black and white spruce, lodgepole pine, and mixed forests, and is often associated with wetland or bog edges where large dead trees provide singing and foraging perches (Sinclair et al. 2003). In the interior of B.C. studies have found that it is most common at higher elevations and relatively scarce in valley bottoms (Campbell et al. 1997).

Olive-sided flycatcher was designated as Threatened by COSEWIC in 2007 due to large, widespread population declines. The Canadian population has declined by 70% from 1968 to 2006 and 29% from 1996 to 2006; the reasons for this decline are unknown (COSEWIC 2007a). The species is also included on Schedule 1 of SARA, and is listed as Vulnerable in the Yukon (Environment Canada 2012, 2013; Yukon Conservation Data Centre 2012). Environment Canada (2013) has also identified olive-sided flycatcher as a priority species for conservation with evidence of regional decline within BCR 4.

Project surveys documented olive-sided flycatcher in forested habitats throughout the LSA. The 2013 point count surveys observed olive-sided flycatcher in 5% of plots below treeline with an average density of 0.05 birds/plot. Olive-sided flycatcher were found in a variety of treed habitats, but were most common in sparse coniferous forest, and in coniferous bog habitats.



**Bank Swallow** — One of six species of swallow found in the Yukon, bank swallow is found throughout much of the territory, primarily along large rivers where suitable nesting habitat is located. Nesting colonies are located in gravel, silt, and clay banks along roadsides, gravel pits, lakes and especially along rivers. Known nesting colonies in the central and southern Yukon range from 2 to 400 birds, with an average colony size of 50 birds (Sinclair et al. 2003). Designated as Threatened by COSEWIC in 2013, bank swallows have experienced a severe population decline of 98% in the last 40 years, although the decline has been at a slower rate since the 1980s (COSEWIC 2013). There are a number of possible threats to the species including loss of breeding and foraging habitat, destruction of nests during aggregate excavation, collision with vehicles, widespread pesticide use affecting prey abundance, and impacts of climate change (COSEWIC 2013). The species is also listed as a priority species for conservation in BCR 4 (Environment Canada 2013).

Bank swallows were observed in the LSA in both 2011 and 2013. All observations were at low elevations along the Selwyn River and Hayes Creek and generally consisted of one or two birds seen flying. However, a mixed flock of bank and violet-green swallows (eight bank swallows and six violet-green) was observed in June 2013 at a pond and sedge wetland along the Selwyn River (just outside the LSA). Surveyors suspected that the birds were nesting in an exposed slope above the wetland, but were unable to confirm this.

**Barn Swallow** — One of the least common species of swallow in the Yukon, barn swallow is most common in the southern portion of the territory although it is also found occasionally in the central and northern portions of the territory. This species can be found in a variety of open habitats from valley bottom to treeline and builds mud cup nests under covered ledges including human built structures (Sinclair et al. 2003). Similar to many other aerial insectivorous bird species, barn swallow has experienced drastic population declines and as such was designated as Threatened by COSEWIC in 2011; the reasons for this decline are currently unknown (COSEWIC 2011). Barn swallow is listed as a priority species for conservation in BCR 4 (Environment Canada 2013).

Barn swallows have not been documented within the LSA. Suitable habitat is present within the study area; however, the species is only occasionally found in this part of the Yukon (Sinclair et al. 2003), and may not be present.

**Rusty Blackbird** — Rusty blackbird is a distinctive wetland species in the Yukon and can be found breeding throughout the territory. The species breeds across the boreal forest of North America, where it is usually associated with forested wetlands and fresh open water (Matsuoka et al. 2010). In the Yukon, Sinclair et al (2003) describes the typical breeding habitat as wetland areas with dense vegetation such as grasses or shrubs and often standing dead trees, usually along the edges of ponds or lakes (Sinclair et al. 2003). In B.C., nesting habitat is usually closely associated with water and coniferous forest habitats, it includes the edges of beaver ponds, swampy lakeshores, shrubby wetlands, black spruce and tamarack bogs, muskegs, islands, meandering creeks, and river oxbows and back channels (Campbell et al. 2001). In Alaska and Canada, nests are primarily located in conifer trees, usually small black spruce, although willows are heavily used in some areas (Matsuoka et al. 2010). Nests are located in close proximity to open water: in coastal Alaska, nests were an average of 30.6 m (range: 0 – 185 m) from surface water, while in interior Alaska, nests averaged 8.2 m

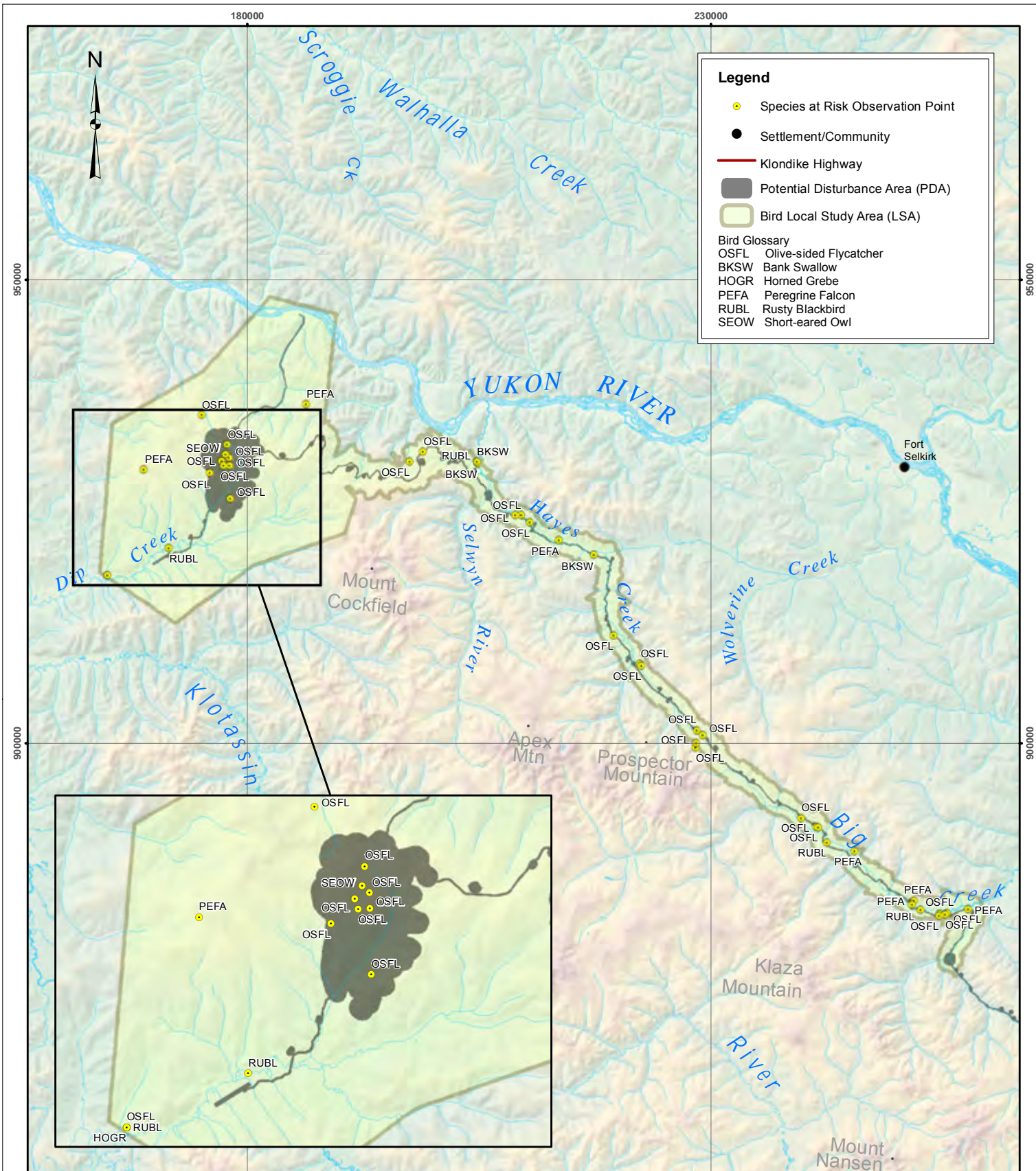




(range: 0 – 150 m) from surface water (Matsuoka et al. 2010); studies in New England found that nests were located within 75 m of standing water, and averaged 12.1 m from standing water (Powell et al. 2010).

Assessed by COSEWIC as a species of Special Concern during 2006, rusty blackbird populations have shown a severe decline that is ongoing. The known threats to this species occur on the wintering grounds and include habitat alteration and direct mortality due to blackbird control programs in the United States (COSEWIC 2006). The species is also listed as Vulnerable in the Yukon and has been identified as a priority species for conservation with evidence of regional decline within BCR 4 (Yukon Conservation Data Centre 2012; Environment Canada 2013).

Rusty blackbird was documented at five different locations within the LSA between 2010 and 2013 — all observations were associated with pond and/or wetland habitats and were located along Big Creek, Selwyn River, and Dip Creek valleys. In each observation, a single bird was seen or heard calling.



#### Notes:

1:250,000 Topographic Spatial Data, National Road Network, Ecoregions; courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

PDA provided by Knight Piesold Ltd. 2013.

Field data (bird observations) were collected by Summit, AECOM and/or EDI, 2010 – 2013.

Digital Elevation Models (30 m and 90 m) provided by Yukon Government - Geomatics Yukon; online Corporate Spatial Warehouse. [www.geomatics.yukon.ca](http://www.geomatics.yukon.ca)



#### Bird species at risk observations: 2010 to 2013

Drawn:  
MP/LG

Checked:  
MAS

Date:  
18/10/2013

Figure:  
7.1

0 5 10 15 20  
kilometres  
Map scale 1:560,000 (printed at 8.5x11)  
North American Datum 1983 CSRS Yukon Albers

**CASINO**  
COPPER AND GOLD





## 8 HABITAT MODELING

Habitat suitability models were created to quantify available habitat for select bird species within the LSA. The species selected for habitat modelling were those that are likely to be used as Valued Components (VC) for an effects assessment and for which habitat classification was possible based on the available data. These include passerine birds (as a group) and select species at risk.

Habitat models were developed using a four-class rating system as a predictor of habitat quality (High, Medium, Low, and Nil) and were based on various combinations of:

- ecological land classification (ELC) mapping conducted in the Project LSA (Appendix 11-A);
- bioclimate zone delineation done by Yukon Government – Environment Branch (Ecological and Landscape Classification Technical Working Group 2012);
- 1:50,000 Canvec waterbody layers provided by Natural Resources of Canada (NRCan);
- 1:50,000 digital elevation data obtained online through Geobase Digital Elevation Model (DEM);
- forest cover data provided by Yukon Government – Forest Management Branch (YG–FMB);
- 2011 fire history data from Yukon Geomatics (Accessed 14 September 2013); and
- imagery - high resolution imagery (0.5 m) was available for an area approximately 2 km wide along the proposed Freegold Road extension corridor, and where such imagery was not available, other types of imagery at lower resolutions were acquired through the “Add BaseMap” function in the ArcGIS workspace: *World Imagery* - Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.

**Passerine birds** — The passerine habitat model was developed using ELC mapping within the LSA with fire history data added as a modifier. Vegetation units were rated according to their ability to provide habitat for a greater density and diversity of species based on the results of the 2013 point counts (Section 6.2.2). In general, sparsely vegetated sites and alpine habitats were rated as low, subalpine habitats were rated as medium, and sites in the boreal forest zone ranged from low to high (Table 8.1). The highest value habitats for upland birds included riparian forest, riparian shrub, fens and marshes, and areas that had been burned in the last 30 years.

The passerine habitat model indicated that the majority of the LSA (82.4%) consists of medium quality habitats for passerine species such as subalpine shrub habitats and upland forest habitats (Table 8.2, Figure 8.1). Most of the higher value habitats are located in valley bottoms along the major drainages.

**Short-eared owl (SEOW)** — The model for short-eared owl was developed based on vegetation (ELC) mapping. In the Yukon, short-eared owls breed primarily in tundra habitats such as low or dwarf shrub tundra, and wet sedge meadows, but may also occur in open wetland habitats at lower elevations (Sinclair et al. 2003). Therefore, the model considered high value short-eared owl habitat to be dryas/sparse herb tundra and mid-to-high elevation dry shrub habitats in alpine and subalpine regions. All other open habitats such as coniferous treed bogs, fens and marshes were rated as medium. Moist or wet subalpine shrub





habitats were rated as low due to the dense stands of willow and dwarf birch that typically characterize these sites. Forested and disturbed sites were also rated as low or nil (Table 8.1).

The habitat model indicated that over 90% of the LSA contains low or nil value habitats for short-eared owl (Table 8.2, Figure 8.2). Only 2.3% of the LSA is rated as high value habitat and this is primarily located north and west of the proposed mine site.

***Olive-sided flycatcher (OSFL)*** — Olive-sided flycatcher are typically found in coniferous or mixed forest habitats where they show a preference for forest openings and/or edges, particularly along wetland or bog edges; they favor areas with standing dead trees and are frequently associated with burned habitats (Sinclair et al. 2003, Altman and Sallabanks 2012). Project surveys in the Casino LSA found olive-sided flycatcher in a variety of treed habitats, but they were most common in sparse coniferous forest, and in coniferous bog habitats. Based on this, the olive-sided flycatcher model was developed based on vegetation mapping with fire history data added as a modifier. The model rated sparse coniferous forest and coniferous treed bog habitat types as high value habitats (Table 8.1); it also considered all sites that have been burned since 1983 (30 year burn considered to still have standing dead stems) to be high quality habitat. A variety of other coniferous forest, mixed forest and wetland types were rated as medium quality (Table 8.1).

The olive-sided flycatcher habitat model found that the LSA contains 22.2% high quality, 38.8% medium quality, and 38.4% low quality habitat for olive-sided flycatcher (Table 8.2, Figure 8.3). The majority of the high quality habitats are located along the Freegold Road extension as compared to Casino mine and Yukon River access road areas.

***Horned grebe (HOGH)*** — Preferred nesting habitat for horned grebe is small lakes and ponds with aquatic vegetation and ‘marshy’ margins (Sinclair et al. 2003, Stedman 2000). To characterize this, the horned grebe habitat model selected for still water bodies (i.e., not creeks or rivers) 0.5 to 10 ha in size that are located within the boreal high and boreal low ecozones. Water bodies were obtained from two datasets: the 1:50,000 Canvec water body layer (NRCan) and additional water body features delineated by EDI based on available imagery. The water bodies were then queried to select for those features of appropriate size and cross-referenced with the local ecozones. In contrast to the other suitability models which were based on four ratings classes (High, Medium, Low and Nil), the horned grebe model only included two classes (Suitable and Not Suitable).

Based on the habitat modelling results, breeding habitat for horned grebe is very limited within the LSA — only 0.27 km<sup>2</sup>, less than 0.1% of the LSA, was considered suitable for nesting grebes (Table 8.2, Figure 8.4). This habitat is scattered in small pockets at mid- to low elevations throughout the Project area.

***Rusty blackbird (RUBL)*** — The model for rusty blackbird reflects their strong association with shrubby habitats at the edge of ponds or lakes and shrubby wetlands. Research on the rusty blackbird has demonstrated that nesting is usually, although not always, in close proximity to open water (Avery 2013). Based on studies in Alaska and New England (see Section 7.3), the high value habitat was considered to be located within 75 m of ponds and lakes in the LSA. As in the horned grebe model, still water bodies were obtained from the 1:50,000 Canvec water body layer (NRCan) and additional water bodies delineated by



EDI based on available imagery. A 75 m buffer was applied to the water bodies and any overlapping habitat types located within the buffer were rated as high (the actual water features were rated as nil). Additionally, all other wetland habitat types within the vegetation mapping were rated as low under the assumption that wetland habitats without open water areas would provide some nesting opportunities but were likely not preferred (Table 8.1).

The habitat model results indicated that over 99% of the LSA is considered low or nil value habitats for rusty blackbird (Table 8.2, Figure 8.5). The available high value habitat is scattered in small pockets, generally at mid- to low elevations, throughout the Project area.





**Table 8.1** Habitat ratings for specific bird species or species groups for vegetation classes from the Casino Project's ecological land classification mapping

Map code	Ecosystem name	Site description	Habitat ratings			
			Upland Bird	SEOW	OSFL	RUBL
Alpine bioclimate zone						
To	Tors	Protruding bedrock outcrops on mountain crests. Plant growth is mainly restricted to fractures and crevices where soil has accumulated.	L	L	L	N
Sd	Dryas/Sparse Herb	Occurs on plateaus and gentle slopes at high elevations. Structural development is limited by environmental conditions, and vegetation communities are mainly composed of mountain-avens, bryophytes and lichens.	L	H	L	N
Fe	Felsenmeer	Veneer of angular rock fragments/boulder fields over gently to moderately sloping ground. Vegetative cover is typically <40%, and includes dwarf shrubs, grasses, bryophytes, and lichens.	L	L	L	N
Subalpine bioclimate zone						
Sx	Mid to High Elevation Dry Shrub	Dry, open south-facing low-middle elevation slopes with vegetation dominated by low shrub species including mountain cranberry, common bearberry, and crowberry.	M	H	L	N
Sm	Subalpine Moist Shrub	Low shrub community dominated by dwarf birch, willow, bog blueberry, mountain cranberry, Labrador tea, northern Labrador tea, and crowberry.	M	L	L	N
Sw	Mid to High Elevation Wet Shrub	Black spruce-shrub communities occurring on steep, north facing slopes at high elevations. Shrub species are similar to those found in the Subalpine Moist Shrub.	M	L	L	N
St	Tall Shrub	Tall (1–1.5 m) willow, dwarf birch, water birch communities on moderate to steep slopes at high elevations.	M	L	L	N
Boreal high bioclimate zone						
Lx	Sloping Grassland	Dry, open south-facing low-middle elevation slopes with vegetation dominated by low shrubs, forbs, and graminoid species. Exposed mineral soil and organic matter accounts for >40% of ground cover.	M	L	L	N
Fbx	Dry Broadleaf Forest	Broadleaf forest ecosystem on upper-middle south or southwest-facing slopes. Trembling aspen dominates the canopy, and low shrub, forb, and grass species occur in the understory.	M	L	L	N
Fbw	Moist Broadleaf Forest	Broadleaf forest ecosystem on north-facing middle and lower slopes. Alaska birch dominates the canopy, and green alder, prickly rose, mountain cranberry, and currant/gooseberry species occur in the shrub layer.	M	L	L	N
Fc	Coniferous Forest	Black spruce forest on north-facing slopes (and occasionally white spruce forest on south-facing slopes). Shrub species include Labrador tea, mountain cranberry, and prickly rose. Step moss and fruticose lichens are abundant in the	M	L	M	N



Map code	Ecosystem name	Site description	Habitat ratings			
			Upland Bird	SEOW	OSFL	RUBL
		bryophyte layer.				
Fcs	Sparse Coniferous Forest	Sparse white spruce (sometimes black spruce) forest in middle and upper slope positions at various aspects. Shrub species include dwarf birch, Labrador tea, mountain cranberry, and willow species. Red-stemmed feathermoss and reindeer lichens are abundant in the bryophyte layer.	M	L	H	N
Fm	Mixedwood Forest	Mixedwood forest ecosystem on moderately steep slopes at various aspects. The canopy is co-dominated by white spruce and Alaska birch. Shrub species include Labrador tea, mountain cranberry, and willow species. Step moss is abundant in the bryophyte layer.	M	L	M	N
Fmr	Riparian mixedwood	No description provided in Summit draft reports.	H	L	L	N
<b>Boreal low and boreal high bioclimate zone</b>						
Sr	Riparian Shrub	Occurs within floodplains and side channels of riverine habitats where seasonal flooding is common. Tall shrub community dominated by willow species.	H	L	L	N
Fbr	Riparian Broadleaf	Well-developed balsam poplar canopy on broad, level floodplains and side channels. Shrub species include prickly rose, grey alder, high bush cranberry, and red osier dogwood. Forb species include horsetail species, tall bluebells, and northern bedstraw.	H	L	L	N
Fcr	Riparian Coniferous	Tall white spruce forest on broad floodplains and side channels. Shrub species include willow, prickly rose, grey alder, and twinflower. Horsetail species, bluejoint reedgrass, and step moss are common in the understory.	H	L	M	N
Wbc	Coniferous Treed Bog	Discontinuous black spruce canopy over shallow organic soils on level and gently sloping terrain. Labrador tea, mountain cranberry, cloudberry, sweet coltsfoot, step moss, and peat moss are common in the understory.	M	M	H	L
Bo	Open bog	No description provided in Summit draft reports.	M	M	M	L
Wf	Shrubby Fen	Shrubby fen on level and gently sloping terrain. The tree canopy layer is absent, but the shrub layer is well-developed and includes dwarf birch, mountain cranberry, northern Labrador tea, leatherleaf and some black spruce. Cloudberry, sheathed cottongrass, and peat moss are common in the understory.	H	M	M	L
Mr	Riparian Marsh	No description provided in Summit draft report.	H	M	M	M
<b>Sparsely vegetation, point features and anthropogenic sites</b>						
Gb	Gravel Bar	Coarse-textured gravels and sands deposited by fast-moving waters during flood events. Vegetation cover is sparse.	M	L	L	N
Ow	Open Water	Waterbodies (rivers, creeks, ponds, etc.).	L	N	L	N



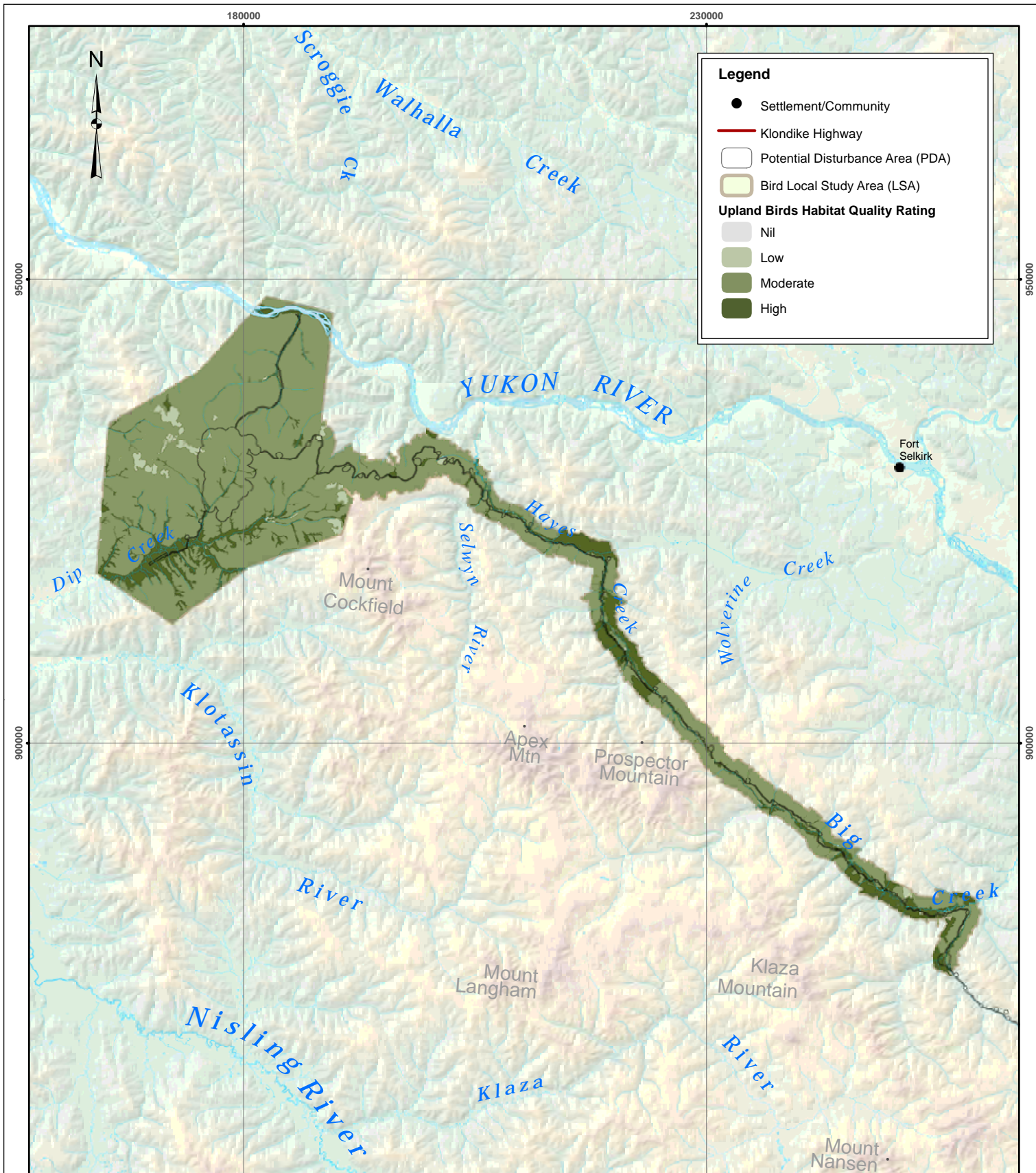
Map code	Ecosystem name	Site description	Habitat ratings			
			Upland Bird	SEOW	OSFL	RUBL
Ro	Rock Outcrop	Rock outcrop, no vegetation	L	L	L	N
TL	Thaw Lake	Ground surface depressions, commonly filled with water, created by the thawing of ice-rich permafrost and associated soil subsidence.	L	N	L	N
Pc	Pingo	A mound of earth-covered ice, in this area formed in an 'open system' where groundwater discharge (seepage) through permafrost freezes and accumulates at or close to the ground surface; all pingos within the mapping area have at least partly collapsed.	L	N	L	N
An	Anthropogenic	Early successional weedy vegetation often with bare ground. Disturbances include placer mining, road construction, seismic activity etc.	L	L	L	N

**Table 8.2** Baseline summary of habitat quantity in the Casino Project LSA

Habitat rating	Passerine		SEOW		OSFL		HOG <sup>a</sup>		RUBL	
	Km <sup>2</sup>	% of RSA <sup>b</sup>	Km <sup>2</sup>	% of RSA <sup>b</sup>	Km <sup>2</sup>	% of RSA <sup>b</sup>	Km <sup>2</sup>	% of RSA <sup>b</sup>	Km <sup>2</sup>	% of RSA <sup>b</sup>
High	136.38	15.4%	20.39	2.3%	197.16	22.2%	0.27	<0.1%	3.45	0.4%
Medium	730.29	82.4%	57.86	6.5%	343.90	38.8%			0.00	0%
Low	14.97	1.7%	803.06	90.6%	340.58	38.4%			56.59	6.4%
Nil	4.72	0.5%	4.65	0.5%	4.72	0.5%	886.02	>99.9%	826.28	93.2%

<sup>a</sup> While most of the habitat models were completed as a four-class model, horned grebe looked at only two classes: suitable and not suitable (nil).

<sup>b</sup> Based on a RSA of 886 km<sup>2</sup>



**Notes:**

1:250,000 Topographic Spatial Data, National Road Network; courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

PDA provided by Knight Piesold Ltd. 2013.

Digital Elevation Models (30 m and 90 m) provided by Yukon Government - Geomatics Yukon; online Corporate Spatial Warehouse. [www.geomatics.yukon.ca](http://www.geomatics.yukon.ca)



**Baseline habitat quality for passerine bird species in the Casino Project LSA**

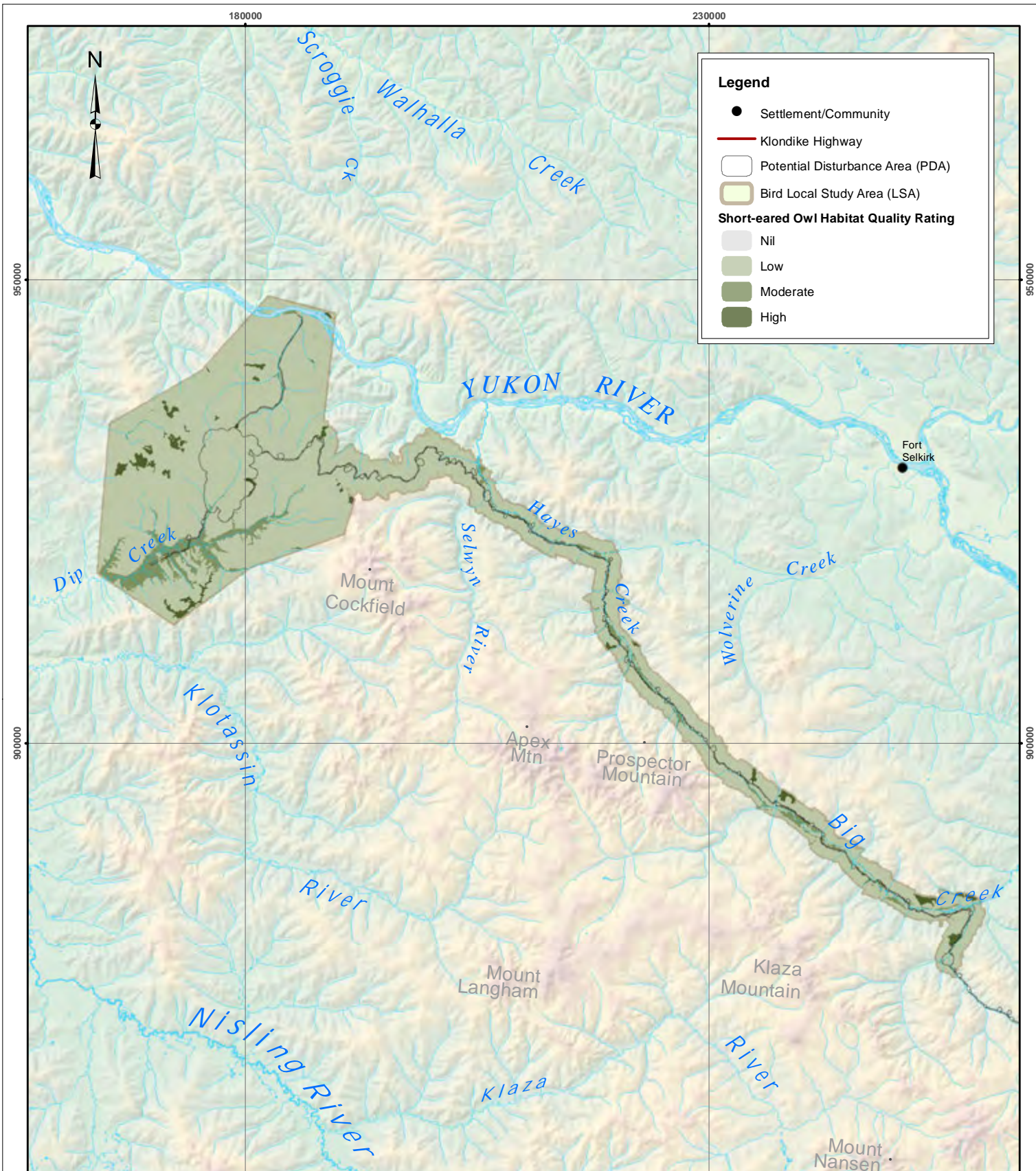
Drawn: MP/LG	Checked: MAS	Date: 18/10/2013	Figure: 8.1
-----------------	-----------------	---------------------	----------------

0 5 10 15 20  
kilometres

Map scale 1:560,000 (printed at 8.5x11)  
North American Datum 1983 CSRS Yukon Albers

**CASINO**  
COPPER AND GOLD





#### Notes:

1:250,000 Topographic Spatial Data, National Road Network; courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

PDA provided by Knight Piesold Ltd. 2013.

Digital Elevation Models (30 m and 90 m) provided by Yukon Government - Geomatics Yukon; online Corporate Spatial Warehouse. [www.geomaticsyukon.ca](http://www.geomaticsyukon.ca)



#### Baseline habitat quality for short-eared owl in the Casino Project LSA

Drawn:  
MP/LG

Checked:  
MAS

Date:  
18/10/2013

Figure:  
8.2

0 5 10 15 20  
kilometres

Map scale 1:560,000 (printed at 8.5x11)  
North American Datum 1983 CSRS Yukon Albers

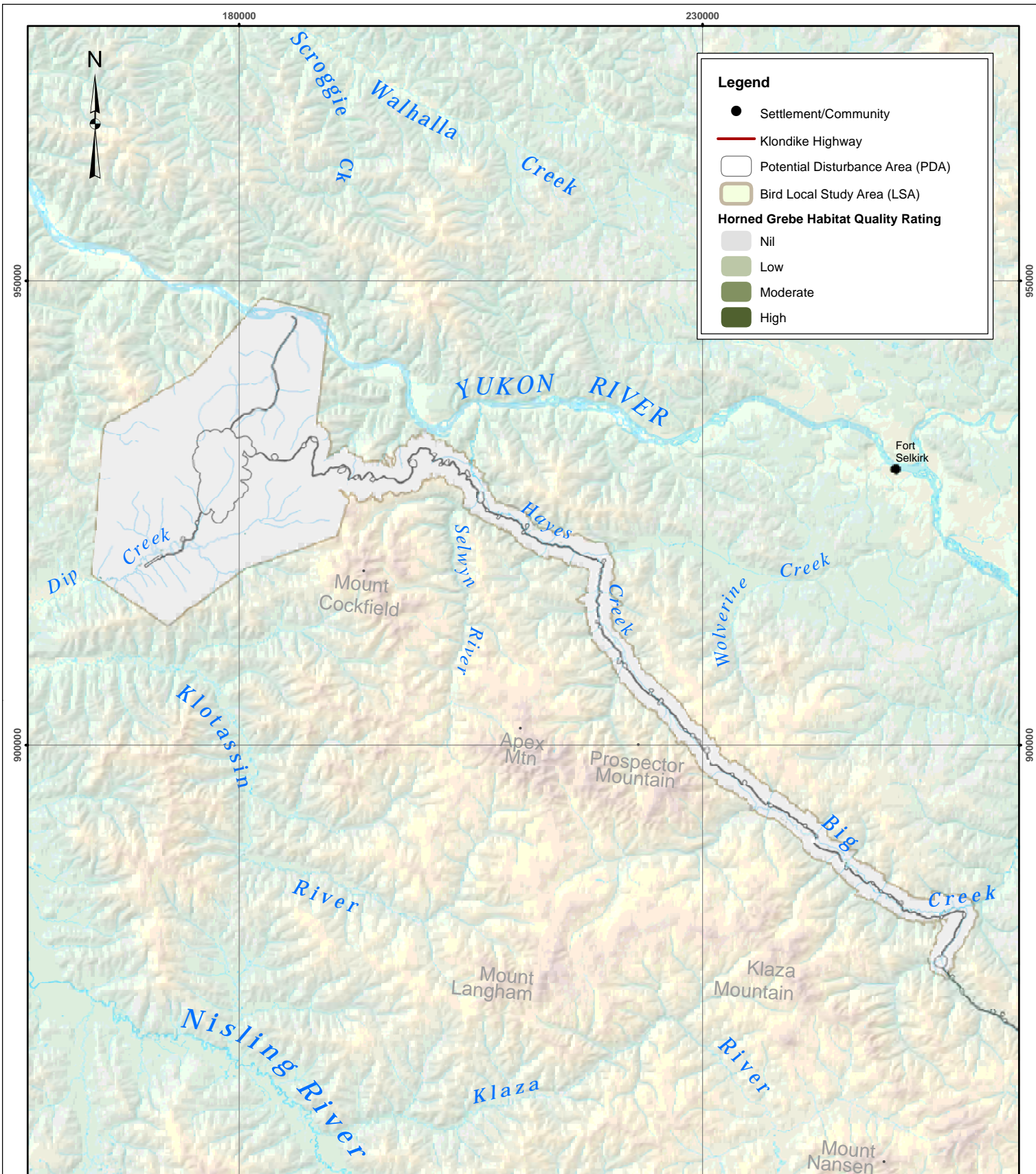
**CASINO**  
COPPER AND GOLD











**Notes:**

1:250,000 Topographic Spatial Data, National Road Network; courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

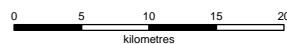
PDA provided by Knight Piesold Ltd. 2013.

Digital Elevation Models (30 m and 90 m) provided by Yukon Government - Geomatics Yukon; online Corporate Spatial Warehouse. [www.geomatics.yukon.ca](http://www.geomatics.yukon.ca)



**Baseline habitat quality for horned grebe in the Casino Project LSA**

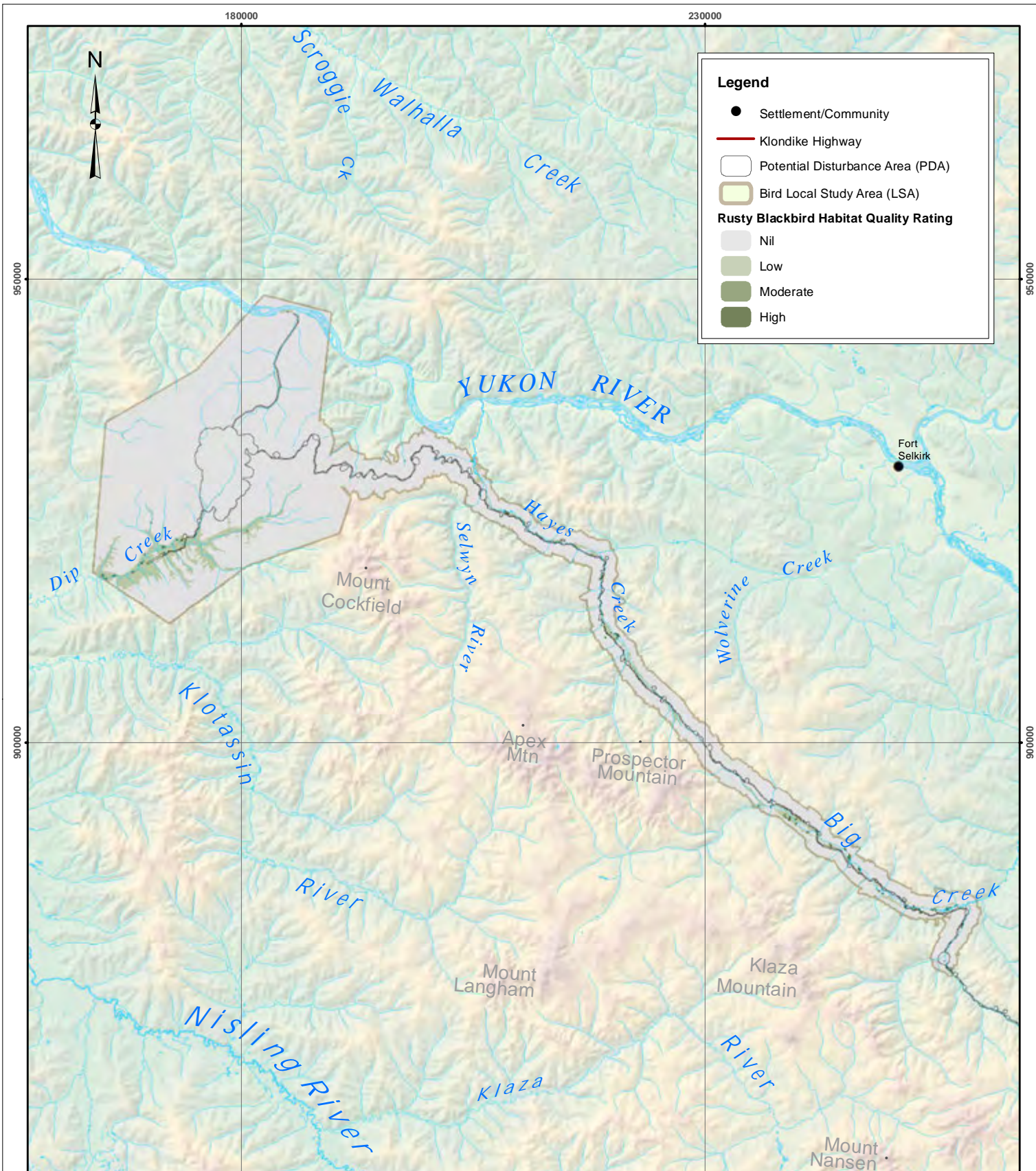
Drawn:	Checked:	Date:	Figure:
MP/LG	MAS	18/10/2013	8.4



Map scale 1:560,000 (printed at 8.5x11)  
North American Datum 1983 CSRS Yukon Albers

**CASINO**  
COPPER AND GOLD





#### Notes:

1:250,000 Topographic Spatial Data, National Road Network; courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

PDA provided by Knight Piesold Ltd. 2013.

Digital Elevation Models (30 m and 90 m) provided by Yukon Government - Geomatics Yukon; online Corporate Spatial Warehouse. [www.geomaticsyukon.ca](http://www.geomaticsyukon.ca)



#### Baseline habitat quality for rusty blackbird in the Casino Project LSA

Drawn: MP/LG	Checked: MAS	Date: 18/10/2013	Figure: 8.5
-----------------	-----------------	---------------------	----------------

0 5 10 15 20  
kilometres

Map scale 1:560,000 (printed at 8.5x11)  
North American Datum 1983 CSRS Yukon Albers

**CASINO**  
COPPER AND GOLD





## 9 SUMMARY

Within the Casino Project area, the diversity of birds is generally reflective of the avian community in this portion of the central Yukon. A total of 116 bird species have the potential to occur within the LSA including eight species which are listed as species at risk by COSEWIC, 14 species which are on the Yukon Conservation Data Centre's track list and 53 species that have been identified as priority species for conservation under the recent bird conservation strategy for Bird Conservation Region 4. To date, 82 species have been confirmed present in the LSA. The only primary bird habitat type not present within the study area is lakes or other large water bodies and as such, species associated with those habitats are generally not present.

Based on the findings of the Casino bird surveys and the presence (documented or potential) of numerous species at risk and species of conservation concern, there are several habitats of key importance to bird populations within the LSA. These include:

- Alpine tundra habitats — alpine tundra in the region provides habitat for several species at risk or of conservation concern including short-eared owl, white-tailed ptarmigan, American golden-plover, wandering tattler, whimbrel, surfbird, Smith's longspur, and gray-crowned rosy-finch. The reduction of alpine tundra due to climate change was identified as a high magnitude threat to many of these species in the recent BCR 4 conservation strategy (Environment Canada 2013).
- Tors, cliffs, and rocky outcrops — higher elevation tors, cliffs, and rocky outcrops on steep slopes are essential to cliff-nesting raptors such as peregrine falcon, golden eagle and gyrfalcon within the LSA.
- Pond and open-water wetlands — ponds and open-water wetlands such as marshes are limited throughout the LSA and support a diverse assemblage of birds. Several species at risk and species of conservation concern are exclusively associated with these habitats in the LSA including horned grebe, rusty blackbird, and American wigeon.
- Mature or old-growth riparian forests — riparian forest habitats support some of the highest numbers of birds and bird species within the LSA; previous work in the Yukon has highlighted the importance of old-growth riparian forest for various bird species of the boreal forest (e.g. cavity-nesters, Mossop 1997).



## 10 REFERENCES

### 10.1 LITERATURE CITED

- Altman, B. and R. Sallabanks. 2012. Olive-sided flycatcher (*Contopus cooperi*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/502doi:10.2173/bna.502>
- Avery, Michael L. 2013. Rusty blackbird (*Euphagus carolinus*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/200doi:10.2173/bna.200>
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cown, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall. 1990. *The birds of British Columbia: Volume 2 — Nonpasserines: diurnal birds of prey through woodpeckers*. UBC Press, Vancouver B.C. 636 pp.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G. W. Kaiser, M.C.E. McNall, and G.E.J. Smith. 1997. *The birds of British Columbia, Volume 3, Passerines: Flycatchers through vireos*. UBC Press, Vancouver B.C. 693 pp.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G. W. Kaiser, A.C. Stewart, and M.C.E. McNall. 2001. *The birds of British Columbia, Volume 4, Passerines: Wood-warblers through old world sparrows*. UBC Press, Vancouver B.C. 739 pp.
- Canadian Wildlife Service, Waterfowl Committee. 2012. *Population status of migratory game birds in Canada*. CWS Migratory Birds Regulatory Report Number 37.
- COSEWIC. 2006. *COSEWIC assessment and update status report on the rusty blackbird, Euphagus carolinus, in Canada*. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 28 pp. Available at: [www.sararegistry.gc.ca/status/status\\_e.cfm](http://www.sararegistry.gc.ca/status/status_e.cfm)
- COSEWIC. 2007a. *COSEWIC assessment and update status report on the olive-sided flycatcher, Contopus cooperi, in Canada*. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 25 pp. Available at: [www.sararegistry.gc.ca/status/status\\_e.cfm](http://www.sararegistry.gc.ca/status/status_e.cfm)
- COSEWIC. 2007b. *COSEWIC assessment and update status report on the peregrine falcon, Falco peregrinus (pealei subspecies — Falco peregrinus pealei, anatum/tundrius — Falco peregrinus anatum/tundrius), in Canada*. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 45 pp. Available at: [www.sararegistry.gc.ca/status/status\\_e.cfm](http://www.sararegistry.gc.ca/status/status_e.cfm)
- COSEWIC. 2007c. *COSEWIC assessment and update status report on the common nighthawk, Chordeiles minor, in Canada*. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 25 pp. Available at: [www.sararegistry.gc.ca/status/status\\_e.cfm](http://www.sararegistry.gc.ca/status/status_e.cfm)





- COSEWIC. 2008. *COSEWIC assessment and update status report on the short-eared owl, *Asio flammeus*, in Canada*. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 24 pp. Available at: [www.sararegistry.gc.ca/status/status\\_e.cfm](http://www.sararegistry.gc.ca/status/status_e.cfm)
- COSEWIC. 2011. *COSEWIC assessment and update status report on the barn swallow, *Hirundo rustica*, in Canada*. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 37 pp. Available at: [www.sararegistry.gc.ca/status/status\\_e.cfm](http://www.sararegistry.gc.ca/status/status_e.cfm)
- COSEWIC. 2012. *Canadian wildlife species at risk*. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Web site: [http://www.cosewic.gc.ca/eng/sct0/rpt/rpt\\_csar\\_e.cfm](http://www.cosewic.gc.ca/eng/sct0/rpt/rpt_csar_e.cfm) [accessed 27 March 2013].
- COSEWIC. 2013. Committee on the Status of Endangered Wildlife in Canada website: [http://www.cosewic.gc.ca/eng/sct5/index\\_e.cfm](http://www.cosewic.gc.ca/eng/sct5/index_e.cfm) [accessed May 2013].
- Ecological and Landscape Classification Technical Working Group. 2012. Bioclimate zones of Yukon – Version 3 interim release. Department of Environment. Report and map at 1:1,000,000 scale.
- Environment Canada, SARA (Species at Risk Act). 2012. Species at Risk public registry. Government of Canada. Website: [http://www.sararegistry.gc.ca/approach/act/default\\_e.cfm](http://www.sararegistry.gc.ca/approach/act/default_e.cfm) [accessed May 2013].
- Environment Canada. 2013. *Bird conservation strategy for Bird Conservation Region 4 in Canada: Northwestern Interior Forest*. Canadian Wildlife Service, Environment Canada. Whitehorse, Yukon. 138 pp. + append.
- Frisch, R. 1983. *Notes on birds and their habitats, Klaza – Prospector Mountain area, Dawson Range, Yukon Territory, June 2 – 10, 1982*. Unpublished report for the Canadian Wildlife Service, Whitehorse, Yukon. 33 pp. + append.
- Gratto-Trevor, C., R.I.G. Morrisons, B. Collins, J. Rausch, M. Drever and V. Johnston. *Trends in Canadian shorebirds*. Canadian Biodiversity: Ecosystem Status and Trends 2010, Technical Thematic Report No. 13. Canadian Council of Resource Managers. Ottawa, ON. Iv + 32 p.
- Kochert, M. N., K. Steenhof, C. L. McIntyre and E. H. Craig. 2002. Golden eagle (*Aquila chrysaetos*). *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/684doi:10.2173/bna.684>.
- Krebs, C.J., M. O'Donoghue, V. Loewen, T. Jung, S. Gilbert, S. Taylor, L. Larocque, R. Boonstra, S. Boutin, and A.J. Kenney. 2012. The community ecological monitoring program annual report 2012. Available online: [http://www.zoology.ubc.ca/~krebs/downloads/annual\\_report\\_2012.pdf](http://www.zoology.ubc.ca/~krebs/downloads/annual_report_2012.pdf) [accessed August 23, 2013].
- Krebs, C.J., K. Kielland, J. Bryant, M. O'Donoghue, F. Doyle, C. McIntyre, D. DiFolco, N. Berg, S. Carrier, R. Boonstra, S. Boutin, A.J. Kenney, K. Bodony, J. Putera, and T. Burke. 2013. Synchrony in the snowshoe hare cycle in northwestern North America, 1970-2012. *Canadian Journal of Zoology* 91(8): 562-572.



- Matsuoka, S.M., D. Shaw, P.H. Sinclair, J.A. Johnson, R.M. Corcoran, N.C. Dau, P.M. Meyers, and N.A. Rojek. 2010. Nesting ecology of the rusty blackbird in Alaska and Canada. *The Condor* 112(4): 810-824.
- Mcintyre, C. L. and L. G. Adams. 1999. Reproductive characteristics of migratory golden eagles in Denali National Park, Alaska. *Condor* 101:115-123.
- Mossop, D. 1997. The importance of old-growth refugia in the Yukon boreal forest to cavity-nesting owls. In: Duncan, James R.; Johnson, David H.; Nicholls, Thomas H., eds. *Biology and conservation of owls of the Northern Hemisphere: 2nd International symposium*. General Technical Report NC-190. St. Paul, MN: U.S. Dept. of Agriculture, Forest Service, North Central Forest Experiment Station. Pp 584-586.
- NABCI. 2012. *The state of Canada's birds, 2012*. North American Bird Conservation Initiative Canada. Environment Canada, Ottawa, Canada. 36 pp.
- Poole, K.G., and R.G. Bromley. 1988. Interrelationships within a raptor guild in the central Canadian Arctic. *Canadian Journal of Zoology* 66:2275–2282.
- Powell, L.L., T.P. Hodgman, W.E. Glanz, J. D. Osenton, and C.M. Fisher. 2010. Nest-site selection and nest survival of the rusty blackbird: does timber management adjacent to wetlands create ecological traps? *The Condor* 112(4): 800-809.
- Resource Inventory Committee. 1998. Inventory methods for nighthawk and poorwill; Standards for components of British Columbia's biodiversity no. 9, Version 2.0. British Columbia Ministry of Environment, Lands and Parks. Victoria, B.C. xi + 20 pp. Available at: <http://www.ilmb.gov.bc.ca/risc/pubs/tebiodiv/poorw/assets/poorw.pdf>.
- Sinclair, P.H., W.A. Nixon, C.D. Eckert, and N.L. Hughes (eds). 2003. *Birds of the Yukon Territory*. UBC Press, Vancouver B.C. 595 pp.
- Smith, C.A.S., Meikle, J.C., and Roots, C.F. (eds). 2004. *Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes*. Agriculture and Agri-Food Canada, PARC Technical Bulletin No. 04-01, Summerland, British Columbia, 313 pp.
- Stedman, S.J. 2000. Horned grebe (*Podiceps auritus*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/505doi:10.2173/bna.505>
- USGS (United States Geological Survey). 2013. North American breeding bird survey website: <https://www.pwrc.usgs.gov/bbs/> [accessed May 2013].
- Wiggins, D. A., D. W. Holt and S. M. Leasure. 2006. Short-eared owl (*Asio flammeus*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/062doi:10.2173/bna.62>



Yukon Bird Club. 2008. Checklist of Yukon birds. Prepared by the Yukon Bird Club with support of Yukon Environment and the Canadian Wildlife Service.

Yukon Conservation Data Centre. 2012. *Yukon Conservation Data Centre's Animal Track List: Updated May 2012*. Yukon Environment. Available at: <http://www.env.gov.yk.ca/animals-habitat/cdc.php> [accessed 20 August 2013].

Yukon Ecoregions Working Group. 2004. Boreal Cordillera Ecozone. In: *Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes*, C.A.S. Smith, J.C. Meikle and C.F. Roots (eds.), Agriculture and Agri-Food Canada, PARC Technical Bulletin No. 04-01, Summerland, British Columbia, p. 157-256.



**ATTACHMENT A SUMMARY OF PROJECT OBSERVATIONS  
AND REGIONAL KNOWLEDGE FOR BIRDS  
OF CONSERVATION CONCERN  
POTENTIALLY OCCURRING IN THE  
PROJECT LSA**



**Table A1 Summary of Project observations and regional knowledge for species of conservation concern potentially occurring in the Project LSA<sup>1</sup>**

Common name	Conservation status <sup>2</sup>	Confirmed within LSA	Observations within the LSA and presence within the region
Horned grebe	Listed as Special Concern under COSEWIC	Yes	Horned grebe has been documented only once during Project surveys when a single male was observed swimming on a pond in the Dip Creek valley during point count surveys on 18 June 2010.
American wigeon	BCR 4 Priority Species with evidence of regional decline	No	American wigeon is one of the most abundant ducks in the Yukon with breeding records throughout the territory (Sinclair et al 2003) but has not been documented in the LSA to date. Suitable habitat is present in pond and wetland habitats in the LSA, particularly in the Dip Creek valley.
Harlequin duck	Listed as Vulnerable in the Yukon	Yes	Harlequin duck were observed on large gravel bars of Big Creek and the Selwyn River during five separate overview flights in 2011. Breeding has not been confirmed in the LSA, but suitable habitat is present along parts of Big Creek, Hayes Creek and the Selwyn River.
Osprey	Listed as Vulnerable in the Yukon	Yes	The only observation of osprey within the LSA was a single adult along Hayes Creek on June 18, 2013 – the bird gave an alarm call when flushed from a perch along the creek, before flying off. An aerial search several kilometers upstream and downstream of the observation did not locate a nest.
American kestrel	Listed as Imperiled in the Yukon	Yes	American kestrel have been documented in the LSA twice: once in June 2011 within a coniferous forest along the proposed Freegold Road Extension, and once in August 2010 when a bird was observed flying (possibly migrating) near the current Casino camp.
Peregrine falcon	Included on SARA Schedule 1; listed as Special Concern under COSEWIC and Vulnerable in the Yukon	Yes	Peregrine falcon has been documented in the LSA annually since 2010 although not in large numbers. Nesting was confirmed in 2012 and 2013 on rocky outcrops on steep south-facing slopes.
White-tailed ptarmigan	BCR 4 Priority Species facing High magnitude threats	Yes	White-tailed ptarmigan have been documented in the LSA twice: once in 2013 when a single bird was recorded in alpine heath tundra west of the proposed mine, and once in 2010 when a single bird was recorded in high elevation shrub habitats northeast of the proposed mine. To the south of the LSA, around Apex, Prospector and Klaza Mountains, Frisch (1983) noted white-tailed ptarmigan to be uncommon within alpine heath tundra and rocky habitats.
Sharp-tailed grouse	Listed as Vulnerable in the Yukon	No	Sharp-tailed grouse are found in localized areas within the southern and central Yukon (Sinclair et al. 2003); they have not been documented in the LSA to date, but suitable habitats including open subalpine areas and open bog habitats are present.
American golden-plover	BCR 4 Priority Species facing High magnitude threats	No	American golden-plover has not been documented in the LSA. To the south of the LSA, around Apex, Prospector and Klaza Mountains, Frisch (1983) found the species to be common within hummock/tussock tundra and alpine heath tundra.
Lesser yellowlegs	BCR 4 Priority Species with evidence of regional decline	No	Lesser yellowlegs are generally common in suitable habitats throughout the central Yukon (Sinclair et al. 2003); to date, they have not been documented in the LSA, but suitable habitats are present including ponds, wetlands, and open boggy spruce forests.
Wandering tattler	Listed as Vulnerable in Yukon; BCR 4 Priority Species facing High magnitude threats	No	Wandering tattler is uncommon throughout the central Yukon and is usually found along creeks or rivers above treeline. It has not been documented in the LSA to date although suitable habitats are present in some of the higher elevation areas.
Whimbrel	Listed as Vulnerable in Yukon; BCR 4 Priority Species facing High magnitude threats	No	Whimbrel has not been confirmed within the LSA; south of the LSA, Frisch (1983) found a single pair of birds on territory in hummock/tussock tundra near Apex and Prospector Mountains.
Surfbird	BCR 4 Priority Species facing High magnitude threats	No	The 2013 surveys documented a single surfbird just outside of the LSA, on the northeast slopes of Prospector Mountain. South of the LSA, Frisch (1983) also documented surfbirds in a couple of locations in alpine heath tundra and rocky habitats near Prospector and Klaza Mountains.
Short-eared owl	Included on SARA Schedule 1; listed as Special Concern under COSEWIC and Vulnerable in the Yukon	Yes	A single short-eared owl sighting was made during Project surveys in the LSA; the sighting, in 2011, was in alpine moist shrub tundra close to the Casino camp, where the bird was observed perched on a dwarf spruce, hunting in the willow thickets. Following up on that observation, a standwatch survey was conducted in the Casino





Common name	Conservation status <sup>2</sup>	Confirmed within LSA	Observations within the LSA and presence within the region
			mine area in June 2013, but no birds were observed.
Common nighthawk	Included on SARA Schedule 1; listed as Threatened under COSEWIC and Imperiled in the Yukon	No	Common nighthawk is relatively rare in the central Yukon, and nesting has not yet been confirmed in this region (Sinclair et al. 2003). Suitable habitat, including old burns, open forests, and wetlands, is present; however, the species has not been documented in the LSA to date.
Olive-sided flycatcher	Included on SARA Schedule 1; listed as Threatened under COSEWIC and Imperiled-Vulnerable in the Yukon; BCR 4 Priority Species with evidence of regional decline	Yes	Olive-sided flycatcher was documented numerous times during Project surveys within the LSA; the 2013 point count surveys observed olive-sided flycatcher in 5% of plots below treeline with an average density of 0.05 birds/plot. Olive-sided flycatcher were found in a variety of treed habitats, but were most common in sparse coniferous forest, and in coniferous bog habitats.
Yellow-bellied flycatcher	Listed as Vulnerable in the Yukon	Yes	Yellow-bellied flycatcher was recorded twice during the 2013 Project surveys; both observations were of a singing male, one on a birch and black spruce slope, and the other in a white spruce forest at the base of an aspen slope.
Warbling vireo	Listed as Vulnerable in the Yukon	Yes	Warbling vireo has only been recorded once in the LSA in 2010 when a single bird was documented at a point count within a riparian deciduous forest on an island in the Yukon River near the Yukon River Access Road.
Bank swallow	Listed as Threatened under COSEWIC but Stable in the Yukon	Yes	Bank swallows were observed on a couple of occasions in 2011 and 2013 at low elevations along the Selwyn River and Hayes Creek. Observations generally consisted of one or two birds, but a flock of eight bank and six violet-green swallows was observed in June 2013 at a pond and sedge wetland along the Selwyn River (just outside the LSA).
Barn swallow	Listed as Threatened under COSEWIC	No	Barn swallow have not been documented in the LSA. Suitable habitat is present; however, the species is only occasionally found in this part of the Yukon (Sinclair et al. 2003), and may not be present.
Blackpoll warbler	BCR 4 Priority Species with evidence of regional decline	Yes	Blackpoll warblers were recorded six times during the 2013 Project surveys. All observations were of singing males in coniferous forest near a wetland or other riparian feature, or in high elevation habitats near the treeline with abundant shrub cover and open or sparse spruce.
Smith's longspur	Listed as Vulnerable in Yukon; BCR 4 Priority Species facing High magnitude threats	No	Smith's longspur has not been confirmed within the LSA; Frisch (1983) found the species to be locally common in hummock/tussock tundra and the shrubzone south of the LSA around the Klaza, Apex and Prospector Mountains.
White-crowned sparrow	BCR 4 Priority Species with evidence of regional decline	Yes	White-crowned sparrow is a common species throughout the LSA; the 2013 point count surveys documented white-crowned sparrow in 23% of the plots with an overall density of 0.05 birds/plot. However, densities were much higher at higher elevations – in alpine and subalpine habitats, white-crowned sparrow was the most common species detected with a density of 0.95 birds/plot. White-crowned sparrows were found in a variety of habitat types throughout the LSA, but were most common in habitats with a significant shrub component.
Rusty blackbird	Listed as Special Concern under COSEWIC and Vulnerable in Yukon; BCR 4 Priority Species with evidence of regional decline	Yes	Rusty blackbird has been documented at five different locations within the LSA — all observations were associated with pond and/or wetland habitats and were located in along Big Creek, the Selwyn River, and the Dip Creek valley.
Gray-crowned rosy finch	BCR 4 Priority Species facing High magnitude threats	No	Gray-crowned rosy finch has not been confirmed within the LSA; Frisch (1983) noted the species as infrequent south of the LSA around the Klaza, Apex and Prospector Mountains and found only in rocky habitats.

<sup>1</sup>Includes all species listed under SARA, COSEWIC, the Yukon Conservation Data Centre, and BCR4 priority species which have shown evidence of regional decline or have been assessed as facing high magnitude threats within the region.

<sup>2</sup>COSEWIC 2012, Environment Canada 2012, 2013, Yukon Conservation Data Centre 2012