APPENDIX X

Avifauna Baseline Study

CENTURY
IRON MINES CORP.

Joyce Lake Direct Shipping Iron Ore Project

Avifauna Baseline Study

121-18002-00

November 2013

GENIVAR

Joyce Lake Direct Shipping Iron Ore Project

Avifauna Baseline Study

Final Version

Martin Larose, Project Director

121-18002-00 November 2013

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Tél. : 418 589-8911 ~ Téléc. : 418 589-2339 ~ www.genivar.com

EXECUTIVE SUMMARY

Reference to be cited:

GENIVAR. 2013. Joyce Lake Direct Shipping Iron Ore Project. Avifauna Baseline Study. Report prepared for Labec Century Iron Ore. 57 p. and appendices.

Labec Century Iron Ore (Labec Century; the Proponent), a subsidiary of Century Iron Mines Corporation (TSX:FER), is proposing to develop an iron mine in western Labrador, approximately 20 kilometres northeast of the Town of Schefferville, Québec. The Joyce Lake Direct Shipping Iron Ore Project (the Project) lies on a peninsula of land in Attikamagen Lake and all physical elements of the Project lie within Labrador. The mine will produce up to two million tonnes (Mt) of product per year. The ore will be transported to the existing rail line owned by Tshiuetin Rail Transportation Inc. for transportation to the Port of Sept-Îles.

The Project will require approval from the Government of Newfoundland and Labrador and is subject to environmental assessment (EA) under the Newfoundland and Labrador *Environmental Protection Act* (NL EPA) and associated Environmental Assessment Regulations. Under the *CEAA, 2012* the Project is a Designated Project pursuant to Section 15(a) Regulations Designating Physical Activities and will require federal EA.

The bird surveys conducted in the Study Area in 2012 yielded a total of 66 species: 17 species of waterfowl and other aquatic birds, 4 species of birds of prey, 8 species of shorebirds, and 37 species of terrestrial birds.

Waterfowl density in the Study Area was comparable to published densities from spring surveys at the same latitudes, further to the west. However, species assemblages between the spring and summer surveys were different, with Red-breasted (*Mergus serrator*) and Common Mergansers (*M. merganser*) most common in spring, and American Black Duck (*Anas rubripes*) and Canada Goose (*Branta canadensis*) in summer. The most common breeding species were Surf Scoter (*Melanitta perspicillata*), American Black Duck and Lesser Scaup (*Aythya affinis*), based on the density of broods found.

Birds of prey were not numerous. Most frequently found was Osprey (*Pandion haliaetus*) (four nests), and two nests of Bald Eagle (*Haliaeetus leucocephalus*). Red-tailed Hawk (*Buteo jamaicensis*) was common, but no nests were located.

The most common songbirds in spruce-dominated forests were Dark-eyed Junco (*Junco hyemalis*), Fox Sparrow (*Passerella iliaca*), Yellow-rumped Warbler (*Setophaga coronata*) and Ruby-crowned Kinglet (*Regulus calendula*). White-crowned Sparrow (*Zonotrichia leucophrys*), American Robin (*Turdus migratorius*), Yellow-rumped Warbler and Fox Sparrow were most abundant in open upland habitat types. The species with the highest densities in wetland habitats were Savannah Sparrow (*Passerculus sandwichensis*), Lincoln's Sparrow (*Melospiza lincolnii*), American Robin and Rusty Blackbird (*Euphagus carolinus*).

Extensive peatland complexes represented the most productive habitat for shorebirds. The most common species in decreasing abundance were Greater Yellowlegs (*Tringa melanoleuca*), Least Sandpiper (*Calidris minutilla*), Wilson's Snipe (*Gallinago delicata*) and Solitary Sandpiper (*Tringa solitaria*).

Two species at risk were found in the Study Area: Rusty Blackbird and Gray-cheeked Thrush (*Catharus minimus*). The former was common in both small and extensive peatlands, while the latter was found exclusively in and adjacent to post-fire conifer regeneration.

PRODUCTION TEAM

Labec Century Iron Ore Inc.

Hubert Vallée	Senior Vice-President
Ghislain Arel	Mining Director
Ken Lam	Data Manager

GENIVAR Inc.

Martin Larose	Project Director, Biologist, B. Sc.
Annie Bérubé	Project Manager, Biologist, B. Sc.
Jean-François Poulin	Avifauna Specialist, Biologist, M. Sc.
Olivier Barden	Avifauna Specialist, Biologist, B. Sc.
Benoît Laliberté	Biologist, M. Env.
Joël Poirier	Field Surveys
Simon Duval	Field Surveys
Jacques Bouvier	Field Surveys
Mélissa Gaudreault	Cartography
Marie-Michèle Levesque	Cartography
Nancy Imbeault	Edition
Sara Anne Bilodeau	Linguistic revision

Stassinu Stantec

Mary Murdoch	Project Manager Biologist, M. Sc.
Dana Feltham	Project Coordinator Socio-Economic Analyst, M.L.I.S.
Perry Trimper	Senior Biologist

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1 INTRODUCTION

Labec Century Iron Ore (Labec Century; the Proponent), a subsidiary of Century Iron Mines Corporation (TSX:FER), is proposing to develop an iron mine in western Labrador, approximately 20 kilometres (km) northeast of the Town of Schefferville, Québec. The Joyce Lake Direct Shipping Iron Ore (DSO) Project (the Project) lies on a peninsula of land in Attikamagen Lake and all physical elements of the Project lie within Labrador (Figure 1).

The mine will produce up to two million tonnes (Mt) of product per year. The ore will be transported to the existing rail owned by Tshiuetin Rail Transportation Inc., and further onto the Québec North Shore and Labrador Railway (QNS&L) for transportation to the Port of Sept-Îles.

The Project will require approval from the Government of Newfoundland and Labrador and is subject to environmental assessment (EA) under the Newfoundland and Labrador *Environmental Protection Act* (NL EPA) and associated Environmental Assessment Regulations. Under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) the Project is a Designated Project pursuant to Section 15(a) Regulations Designating Physical Activities and will require federal EA.

1.1 Project Overview

The Joyce Lake mining prospect lies in an undeveloped area adjacent to the small Joyce Lake waterbody on a peninsula within Attikamagen Lake, in an area with a number of interconnecting large lakes. The prospect can be reached from the mainland by crossing a relatively narrow stretch of water, called Iron Arm. Currently, the prospect is accessed from Schefferville either directly by helicopter or by ground via an existing road to Iron Arm and then by helicopter to Joyce Lake.

The Project consists of mining a high grade deposit of hematite iron in western Labrador, approximately 20 km northeast of Schefferville, as shown in Figure 1. The physical works for the proposed Joyce Lake Project subject to assessment are located wholly in Labrador. The mine area lies within two map-staked licences (309 claims) covering 12,665 hectares (ha).

The physical elements of the Project include the Joyce Lake mining area, options for conveyance across Iron Arm (ice bridge, barge), a beneficiation plant on the mainland, a new haul road to connect to a new rail loop by Astray Lake, access roads, and an accommodation camp. Power for the Project will be provided by diesel generators using fuel stored mainly at the beneficiation plant, with smaller tanks at other locations where power is required. Other physical elements of the Project include stockpiles for overburden, waste rock, and ore (pre- and post-processing), water supply systems, settling ponds with water treatment, domestic waste water treatment, drainage ditches, explosives storage, a hazardous materials storage and management area, an accommodation camp, and ancillary buildings (e.g., offices, workshops, warehouse/storage areas, worker facilities, mobile equipment storage). All structures will be constructed so that they can be moved from the site and re-used elsewhere when no longer required for this Project.

The Project's estimated annual production of iron ore is provided in Table 1, and is based on current exploration information. The current estimated target production is 2 Mt/yr of ore. The first four years of operation would focus on production of DSO which has a high iron content (~60% iron), with stockpiling of lower grade ore (<60 % iron) that will be beneficiated in Phase II to bring it up to the desired commercial grade.

Table 1: Estimated Annual Production of Iron Ore in Phase I and Phase II for the Joyce Lake Project

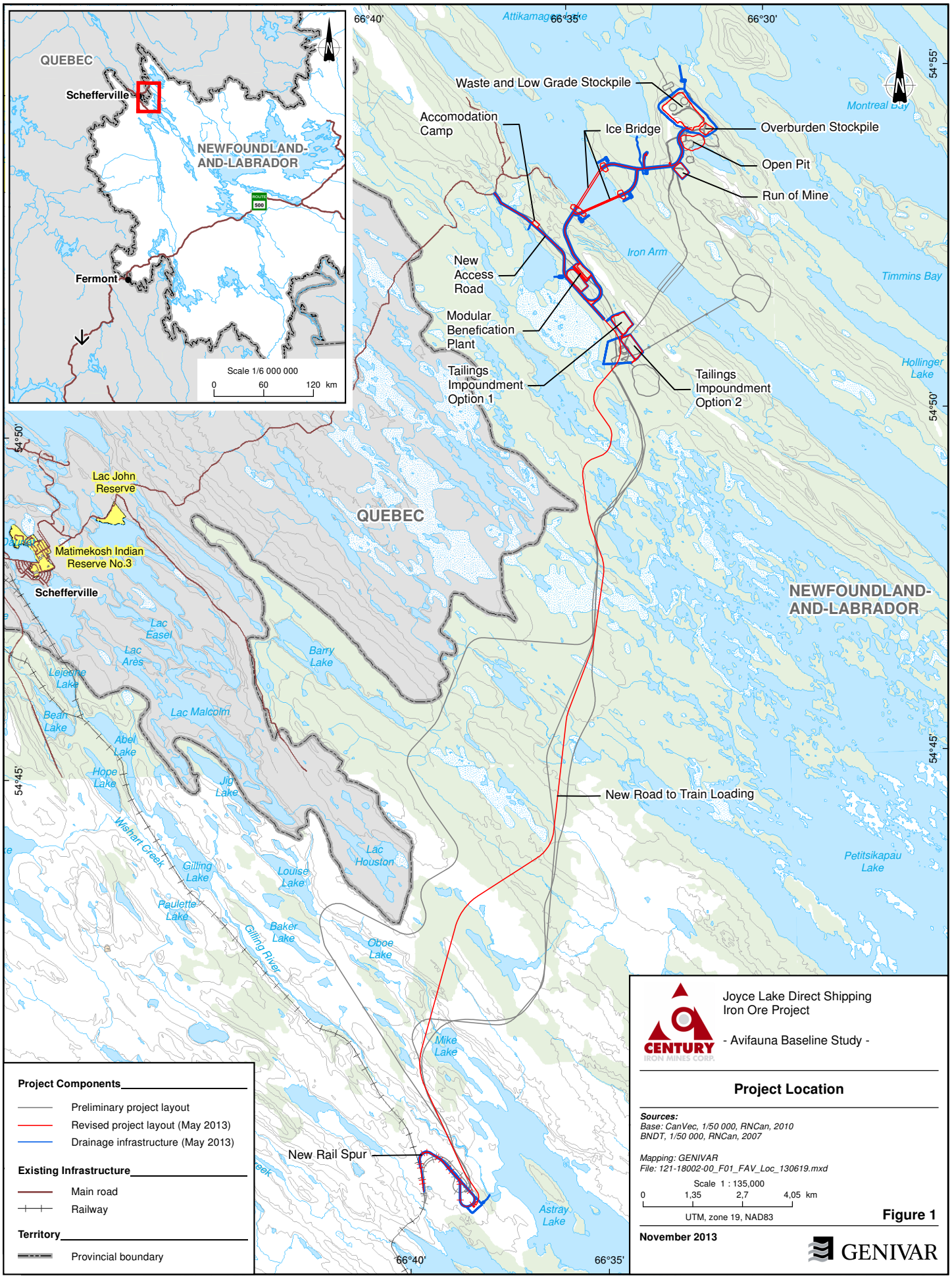
Product	Unit	Estimated Production by Year							
		2014	2015	2016	2017	2018	2019	2020	2021
Phase I Ore (DSO; 60% Fe)	tonne	-	999,000	1,987,000	1,986,000	1,987,000	TBD[1]	TBD[1]	TBD[1]
Phase II Ore (55% Fe)	tonne	-	-	-	-	-	TBD[1]	TBD[1]	TBD[1]
Waste Rock Low Grade	tonne	949,000	11,584,000	15,662,000	5,375,000	140,000	TBD[1]	TBD[1]	TBD[1]

[1] TBD: To be determined.

Phase I construction would begin upon release from EA and with receipt of the relevant permits. For Phase I, mining activities will occur throughout the year. From April to November standard mining activities will occur and ore will be stockpiled. During the winter season, the mining activities will include moving the stockpiled ore by truck from the mine site to the beneficiation plant using the ice bridge to cross Iron Arm. After beneficiation, the ore products will be hauled by truck over the new road to the new rail yard. At the present time, it is anticipated that Phase I will include four years of production (2015 to 2018), followed by three years of Phase II production. Construction of additional infrastructure for Phase II will begin during the last half of Phase I production. The total life-of-mine is anticipated to be up to seven years, but this timeframe may be adjusted as exploration proceeds.

Extraction of the resource will be by open pit and construction of this pit will require dewatering of Joyce Lake. The mining operation will consist of removing ore from the single open pit using drilling and blasting, a hydraulic excavator and haul trucks. In Phase I, mining equipment and supplies will be brought to the mine site by barge over Attikamagen Lake during the ice free season and over an ice bridge in the winter. The pre-stripping of overburden at the open pit will start during the summer, with waste rock and low grade ore being stockpiled outside the pit limits.

Beneficiation in Phase I of the Project will consist of a dry circuit with two crushing and two screening steps necessitating no water addition, allowing operation in cold weather. In Phase I, the beneficiation plant will be operated 250 days per year (during the warmer months). Only high grade ore will be processed during Phase I generating two different products: lump ore and sinter feed. During Phase I, the plant will not produce any tailings.


QUEBEC
Schefferville
NEWFOUNDLAND-
AND-LABRADOR
Fermont
Scale 1/6 000 000
0 60 120 km
66°40'
66°35'
66°30'
54°55'
54°50'
54°45'
Attikamagen Lake
Montreal Bay
Waste and Low Grade Stockpile
Accomodation Camp
Ice Bridge
Overburden Stockpile
Open Pit
Run of Mine
Iron Arm
Timmins Bay
New Access Road
Modular Benefication Plant
Tailings Impoundment Option 1
Tailings Impoundment Option 2
Hollinger Lake
Lac John Reserve
Matimekosh Indian Reserve No.3
Lac Easel
Lac Arès
Barry Lake
Lejeune Lake
Bean Lake
Lac Malcolm
Abel Lake
Hope Lake
Jig Lake
Wishart Creek
Gilling Lake
Louise Lake
Lac Houston
Paulette Lake
Baker Lake
Gilling River
Oboe Lake
Mike Lake
Astray Lake
New Road to Train Loading
New Rail Spur
Petitsikapau Lake
Project Components
Preliminary project layout
Revised project layout (May 2013)
Drainage infrastructure (May 2013)
Existing Infrastructure
Main road
Railway
Territory
Provincial boundary
Joyce Lake Direct Shipping Iron Ore Project
- Avifauna Baseline Study -
Project Location
Sources:
Base: CanVec, 1/50 000, RNCan, 2010
BNDT, 1/50 000, RNCan, 2007
Mapping: GENIVAR
File: 121-18002-00_F01_FAV_Loc_130619.mxd
Scale 1 : 135,000
0 1,35 2,7 4,05 km
UTM, zone 19, NAD83
Figure 1
November 2013
GENIVAR

For Phase II, a wet circuit will be added which will require the use of fresh water and may include an iron content upgrading process. For Phase II, the beneficiation plant will be operated approximately 200 days per year (during the warmer months). Processing details for Phase II have not yet been determined and are being studied in parallel with information obtained during exploration activities.

For both phases, the final product will be hauled by truck from the beneficiation plant to the rail yard, a distance of approximately 28 km along a new haul road. At the rail yard, the product will be loaded onto rail cars on a new 6 km rail loop that will connect to the existing Tshiuetin Rail. The product will be taken south to Sept-Îles, Québec, where it will be stockpiled on Port Authority land prior to shipping to market.

1.2 Organization of this Baseline Study

The remainder of this Avifauna Baseline Study outlines the scope, methodology, and results of the baseline program and is presented in six sections, as follows:

- Section 1: Introduction;
- Section 2: Objectives and Rationale;
- Section 3: Methods;
- Section 4: Results and Discussion;
- Section 5: Summary and Closure;
- Section 6: References.

Additional supporting information and documentation is presented in the appendices.

2 OBJECTIVES AND RATIONALE

The Avifauna Baseline Study documents bird presence and habitat use in the Study Area. Emphasis is made on migratory bird habitat likely to be directly affected by the Project, as well as bird species designated as species at risk by the federal and provincial governments. Two specific objectives were outlined:

- to determine which bird species, migratory or non-migratory are found within and in the vicinity of the Study Area;
- to provide estimates of indicated pair densities for each species in avian habitats surveyed in the Study Area.

Field protocol and methodologies used in this baseline study are based on those provided in the Guide for Impact Assessment on Birds (Environment Canada, 1997).

The surveys were specifically aimed at documenting the following groups:

- birds of prey;
- landbirds;
- shorebirds;
- waterfowl and other aquatic birds;
- species at risk and of conservation concern (Table 2).

Table 2: Species at Risk and of Conservation Concern that Could Occur in the Study Area

Species	Status[1]				Conservation Action/Priority Level[2]				
	COSEWIC	SARA	NL *ESA*	QC *LEMVQ*	ACCDC Labrador	BCR/WCR 7	Northern Forest Biome	Québec Shorebird	Continental
Canada Goose (Atlantic)						Highest			High
American Black Duck						High			High
Northern Pintail						Moderate			High
Lesser Scaup						Moderate			High
Black Scoter						Mod High			Mod High
Surf Scoter						High			Mod High
White-winged Scoter					S5N	(No data)			Mod High
Common Goldeneye						High			Mod High
Bufflehead					S1S2?				
Hooded Merganser					S2B				
Harlequin Duck	SC	SC	V	V		High			Moderate
Spruce Grouse						PR	PR		PR
American Kestrel	C3	-	-	-	S1S2B				
Merlin						PR			
Peregrine Falcon	SC	SC	V	V					
Semipalmated Plover								Medium	Low
Greater Yellowlegs								Low	Medium
Lesser Yellowlegs					S3N			Medium	Low
Solitary Sandpiper								High	Medium
Spotted Sandpiper								Medium	Medium
Least Sandpiper								Medium	Medium
Short-billed Dowitcher								Medium	Medium
Wilson's Snipe								High	Medium
Red-necked Phalarope								Medium	Medium
Short-eared Owl	SC	SC	V	LDTV					MA
Belted Kingfisher	C3	-	-	-					
American Three-toed W'pecker						PR			
Black-backed Woodpecker						PR	PR		PR
Alder Flycatcher						PR	PR		PR
Yellow-bellied Flycatcher									PR
Olive-sided Flycatcher	T	T	T	LDTV		PR	MA		MA
Red-eyed Vireo					S2B				

Table 2: Species at Risk and of Conservation Concern that Could Occur in the Study Area (continued)

Species	Status[1]				Conservation action/priority level[2]				
	COSEWIC	SARA	NL *ESA*	QC *LEMVQ*	AC CDC Labrador	BCR/WCR 7	Northern forest biome	Québec Shorebird	Continental
Northern Shrike							PR		PR
Gray Jay						PR	PR		PR
Boreal Chickadee						PR	MA		MA
Winter Wren					S2B				
Golden-crowned Kinglet					S1B?				
Ruby-crowned Kinglet						PR			
Gray-cheeked Thrush	-	-	V	-		PR			
Hermit Thrush						PR			
Bohemian Waxwing							PR		PR
Cedar Waxwing					S2B				
Northern Waterthrush						PR			
Tennessee Warbler						PR	PR		PR
Nashville Warbler					S1B?				
Orange-crowned Warbler						PR			
Yellow Warbler						PR			
Blackpoll Warbler						PR			
Palm Warbler						PR	PR		PR
Yellow-rumped Warbler						PR			
Fox Sparrow						PR			PR
Lincoln's Sparrow						PR	PR		PR
Swamp Sparrow						PR	PR		PR
White-crowned Sparrow						PR			
Rusty Blackbird	SC	SC	V	LDTV		PR	MA		MA
Pine Grosbeak						PR	PR		PR
White-winged Crossbill						PR	PR		PR

[1] Source: COSEWIC (2013) SARA: Government of Canada (2012), NL ESA: NL DOEC (2013), QC LEMVQ: MRN (2013).

[2] Labrador species of conservation concern obtained from AC CDC (2013), Waterfowl priority levels obtained from NAWMP (2004), shorebird priority levels obtained from Aubry and Cotter (2007) and Donaldson *et al.* (2000); landbird data obtained from Partners in Flight North American Landbird Conservation Plan (Rich *et al.*, 2004).

Legend: T: threatened, V: vulnerable, SC: special concern, LDTV: likely to be designated threatened or vulnerable, C3: low priority candidate species, S1B?: extremely rare breeder in Labrador -- ? denotes rank uncertainty, S2B: rare breeder, S3N: uncommon migrant (nonbreeder), S5N: abundant migrant, MA: management, PR: long-term planning and responsibility, Moderate through Highest (waterfowl): continental priority based on importance in harvest and population trend, waterfowl conservation region (WCR) 7 priority for breeding season based on geographic importance and continental priority, Low to High (shorebirds): based on population trends, relative abundance, threats during breeding and non-breeding seasons, size of breeding and non-breeding distribution, and expert opinion (for Québec).

3 METHODS

3.1 Description of the Study Area

3.1.1 Project Development Area

The Project Development Area (PDA) is the immediate area of the proposed Project infrastructure. The PDA is limited to the anticipated area of physical disturbance associated with the construction or operation of the Project. For this Project, the mine area lies within two map-staked licences (309 claims) covering 12,665 ha. The PDA includes the mining area, conveyances across Iron Arm, a beneficiation plant on the mainland, a new haul road, access roads, an accommodation camp, and a rail spur near the existing railroad (Figure 1).

3.1.2 Study Area

The Avifauna Study Area is that area within which Project-related environmental effects would be predicted or measured with a reasonable degree of accuracy and confidence. The Study Area includes the PDA and any adjacent areas where Project-related environmental effects may reasonably be expected to occur (Figure 2).

Despite a few shifts in the preliminary project layout of various infrastructures (conveyor, haul road, tailings impoundment), the Study Area was designed to encompass eventual alternative layout options, and survey locations were spread out across the Study Area.

For the purpose of the Avifauna Baseline Study, some habitats obtained from the ELC presented within the Vegetation Baseline Study were grouped together (Table 3).

3.1.2.1 Waterfowl, Common Loon and Other Aquatic Birds

Surveys for waterfowl, Common Loon (*Gavia immer*) and other aquatic birds were completed on three 25-km² inventory plots (5 x 5 km) and on a 1-km wide corridor centred on the haul road link proposed in the spring of 2012, at the time of survey planning (Figure 2). The two northernmost square plots were adjacent, centred on the mine across from Iron Arm and the plant on the mainland. The third square plot was centred on the rail spur that connects to the Tshiuetin railroad. The selection of 25 km² plots was made to be consistent with the Black Duck Joint Venture helicopter surveys methodology (Bordage *et al*., 2003). Waterfowl, Common Loon and other aquatic birds were surveyed near key Project components where impacts on these species could occur.

3.1.2.2 Birds of Prey

Raptor surveys were completed in a zone greater than that covered for waterfowl, Common Loon and other aquatic birds because raptors are known to occupy large territories throughout the breeding season. Therefore, the area considered for this

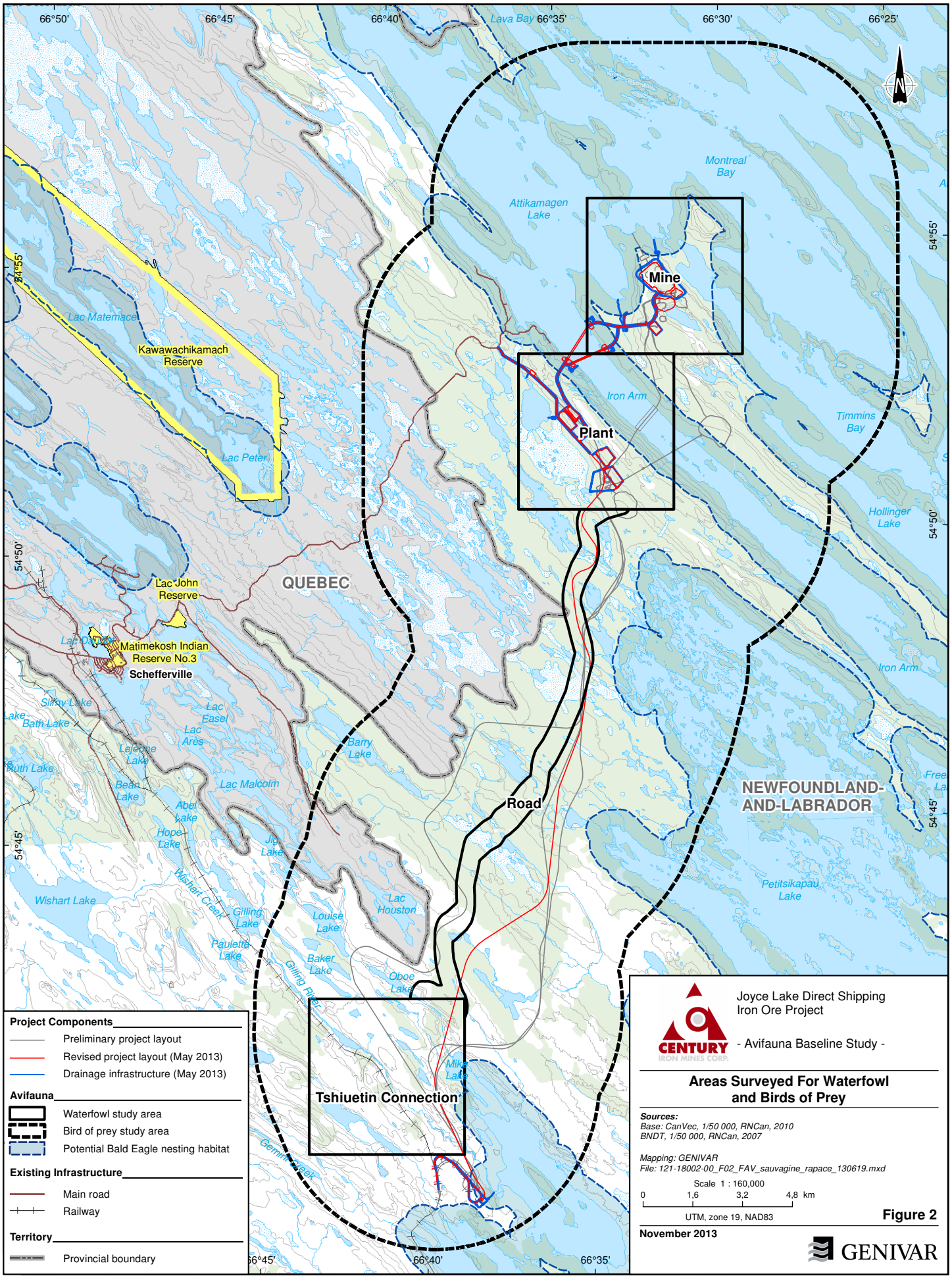
survey consists of a 5-km wide buffer added on the waterfowl survey plots (Figure 2). This enlarged area was created in order to maximise detection of associated nests from these species. These birds have large territories and may forage within the Study Area, even though nests may be several kilometres away.

Table 3: Correspondence of ELC and Avifauna Ecotypes

	ELC		Avifauna	
	Ecotype	**Area (ha)**	**Ecotype**	**Area (ha)**
Upland	Closed spruce-moss forest	1,392.5	Spruce-moss forest	6,674.4
	Open spruce-moss forest	4,312.0		
	Open spruce-lichen forest	3,694.7	Spruce-lichen forest	3,694.7
	Shrubland	699.1	Shrubland	721.4
	Exposed gravel and sand	0.4	Bare dry ground	1,022.2
	Highly weathered rock barren	36.1		
	Lichen-shrub barren	461.0		
	Moderately weathered rock barren	172.1		
	Slightly weathered rock barren	352.6		
	Post-fire conifer regeneration	1,757.9	Post-fire conifer regeneration	1,757.9
	Birch forest	1.8	Other	70.1
	Clear cut	38.6		
	Human disturbances	29.7		
	Sub-total	**12,948.5**	**Sub-total**	**13,940.7**
Wetland	Forested swamp	22.3	(Shrubland)	-
	Forested bog	188.9	(Spruce-moss forest)	-
	Forested fen	781.0		
	Shrub swamp	275.8	Shrub swamp	275.8
	Riparian fen	159.5	Small peatland	631.0
	Flat bog	16.3		
	Northern ribbed fen	390.2	Extensive peatland complex	375.8
	Horizontal fen	440.9		
	Pond	9.3	Water	1,015.5
	Temporary pond	14.1		
	Water	992.1		
	Sub-total	**3,290.4**	**Sub-total**	**2,298.2**
Total		**16,238.9**		**16,238.9**

3.1.2.3 Terrestrial Birds and Shorebirds

Surveys for terrestrial birds and shorebirds occurred in the vicinity of the proposed mine, plant installations, haul road and rail spur (Figure 3).


66°50'
66°45'
66°40'
66°35'
66°30'
66°25'
54°55'
54°50'
54°45'
Lava Bay
Montreal Bay
Attikamagen Lake
Mine
Plant
Iron Arm
Timmins Bay
Hollinger Lake
Petitsikapau Lake
Lac Matemace
Kawawachikamach Reserve
Lac Peter
QUEBEC
Lac John Reserve
Lac Daniel
Matimekosh Indian Reserve No.3
Schefferville
Slimy Lake
Bath Lake
Lac Easel
Lac Ares
Lejeune Lake
Ruth Lake
Bear Lake
Lac Malcolm
Abel Lake
Hope Lake
Jig Lake
Wishart Lake
Wishart Creek
Gilling Lake
Paulette Lake
Gilling River
Baker Lake
Louise Lake
Lac Houston
Oboe Lake
Barry Lake
Road
Tshiuetin Connection
Mike Lake
Gemini Creek
NEWFOUNDLAND-AND-LABRADOR
Project Components
Preliminary project layout
Revised project layout (May 2013)
Drainage infrastructure (May 2013)
Avifauna
Waterfowl study area
Bird of prey study area
Potential Bald Eagle nesting habitat
Existing Infrastructure
Main road
Railway
Territory
Provincial boundary
CENTURY IRON MINES CORP.
Joyce Lake Direct Shipping Iron Ore Project
- Avifauna Baseline Study -
Areas Surveyed For Waterfowl and Birds of Prey
Sources:
Base: CanVec, 1/50 000, RNCan, 2010
BNDT, 1/50 000, RNCan, 2007
Mapping: GENIVAR
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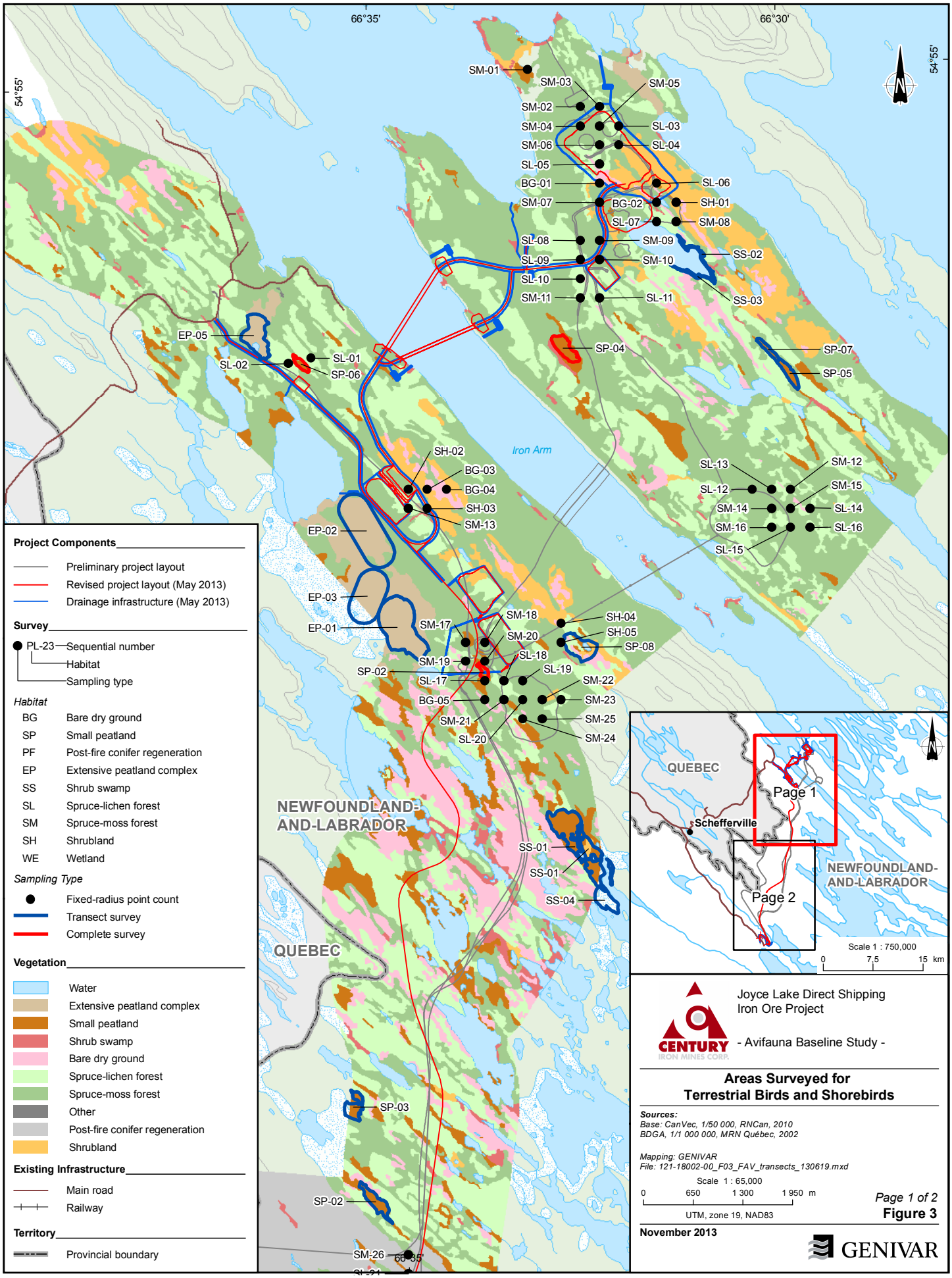
UTM, zone 19, NAD83
Figure 2
November 2013
GENIVAR


66°35'
66°30'
54°55'
Iron Arm
QUEBEC
NEWFOUNDLAND-
AND-LABRADOR
Project Components
Preliminary project layout
Revised project layout (May 2013)
Drainage infrastructure (May 2013)
Survey
PL-23 Sequential number
Habitat
Sampling type
Habitat
BG Bare dry ground
SP Small peatland
PF Post-fire conifer regeneration
EP Extensive peatland complex
SS Shrub swamp
SL Spruce-lichen forest
SM Spruce-moss forest
SH Shrubland
WE Wetland
Sampling Type
Fixed-radius point count
Transect survey
Complete survey
Vegetation
Water
Extensive peatland complex
Small peatland
Shrub swamp
Bare dry ground
Spruce-lichen forest
Spruce-moss forest
Other
Post-fire conifer regeneration
Shrubland
Existing Infrastructure
Main road
Railway
Territory
Provincial boundary
Page 1
Page 2
Schefferville
Scale 1 : 750,000
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Joyce Lake Direct Shipping
Iron Ore Project
- Avifauna Baseline Study -
Areas Surveyed for
Terrestrial Birds and Shorebirds
Sources:
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BDGA, 1/1 000 000, MRN Québec, 2002
Mapping: GENIVAR
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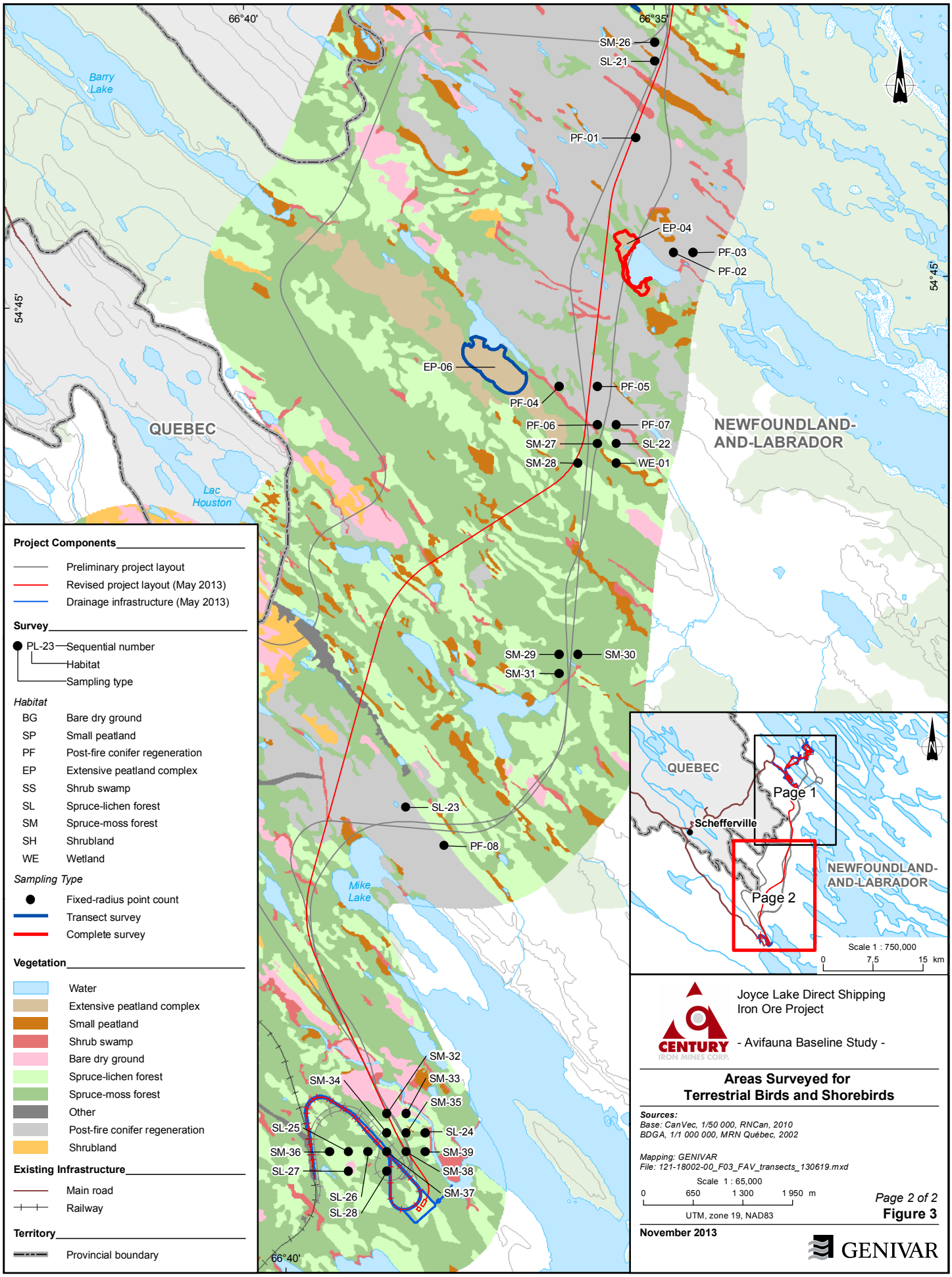
Page 1 of 2
Figure 3
November 2013
GENIVAR


66°40'
66°35'
54°45'
Barry Lake
Lac Houston
Mike Lake
QUEBEC
NEWFOUNDLAND-AND-LABRADOR
SM-26
SL-21
PF-01
EP-04
PF-03
PF-02
EP-06
PF-04
PF-05
PF-06
PF-07
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SL-22
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SM-33
SM-34
SM-35
SL-25
SL-24
SM-36
SM-39
SL-27
SM-38
SL-26
SM-37
SL-28
Project Components
Preliminary project layout
Revised project layout (May 2013)
Drainage infrastructure (May 2013)
Survey
PL-23 Sequential number
Habitat
Sampling type
Habitat
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SP Small peatland
PF Post-fire conifer regeneration
EP Extensive peatland complex
SS Shrub swamp
SL Spruce-lichen forest
SM Spruce-moss forest
SH Shrubland
WE Wetland
Sampling Type
Fixed-radius point count
Transect survey
Complete survey
Vegetation
Water
Extensive peatland complex
Small peatland
Shrub swamp
Bare dry ground
Spruce-lichen forest
Spruce-moss forest
Other
Post-fire conifer regeneration
Shrubland
Existing Infrastructure
Main road
Railway
Territory
Provincial boundary
QUEBEC
Page 1
Schefferville
Page 2
NEWFOUNDLAND-AND-LABRADOR
Scale 1 : 750,000
0 7,5 15 km
CENTURY IRON MINES CORP.
Joyce Lake Direct Shipping Iron Ore Project
- Avifauna Baseline Study -
Areas Surveyed for Terrestrial Birds and Shorebirds
Sources:
Base: CanVec, 1/50 000, RNCan, 2010
BDGA, 1/1 000 000, MRN Québec, 2002
Mapping: GENIVAR
File: 121-18002-00_F03_FAV_transects_130619.mxd
Scale 1 : 65,000
0 650 1 300 1 950 m
UTM, zone 19, NAD83
Page 2 of 2
Figure 3
November 2013
GENIVAR

3.2 Pre-Survey Planning

Prior to the field surveys, a work plan was prepared in collaboration with Stassinu Stantec team members to determine the appropriate baseline methodologies to document avifauna. A scientific research permit request was sent to the Newfoundland and Labrador Department of Environment and Conservation (NL DOEC) to undertake aerial surveys of waterfowl and raptors. A copy of the permit is provided in Appendix A.

3.3 Waterfowl, Common Loon and Other Aquatic Birds

3.3.1 Field Methods

Breeding waterfowl and other aquatic birds were inventoried using methods consistent with the Black Duck Joint Venture helicopter surveys, conducted by the Canadian Wildlife Service in the boreal forest of Québec (Bordage *et al.,* 2003). The breeding pair survey was conducted on 31 May and 3 June, 2012, a date interval during which it is estimated that approximately half of adult females were incubating and the other half remained paired, based on results obtained by Bordage *et al.* (2003) and weather in the weeks leading to the survey. The inventory was targeted to cover the period between the breeding of early (dabblers) and late (divers) breeding waterfowl.

A brood survey was conducted on 28 July 2012 in the same plots that were surveyed in the spring. The survey was targeted during the period when ducklings cannot fly long distances and remain near their natal site. The survey also permitted the identification of moulting sites. Brood age was estimated using methodology outlined in Gollop and Marshall (1954). Individual birds or groups of the same species that were isolated by a few metres from other individuals were noted with different sequential numbers.

All aquatic environments (e.g., lakes, rivers, streams, ponds and peatlands) and their shores were surveyed within each 25 km^2 plot. The helicopter flew at an altitude ranging from 15 to 50 m at a speed between 30 and 100 km/h. The field crew was comprised of the helicopter pilot, a navigator-observer in the front seat and a secondary observer seated behind the pilot (starboard). The navigator-observer was in charge of directing the helicopter movements and mapping the observations on a 1:50 000 map. The secondary observer validated bird locations by marking GPS coordinates and noting information relative to the observation (e.g., species name, number of adult or immature individuals, sex, number and age class of ducklings, presence of a nest and number of eggs, behaviour.). Individual birds or groups of the same species that were separated by several metres from other individuals were noted with a different sequential number. Photographs of bird species, nests and photos depicting various habitat types are presented in Appendix B, while conditions during the surveys are presented in Appendix C.

Potential suitable habitats for Harlequin Duck (*Histrionicus histrionicus*) (i.e. rivers with fast-moving water and cascading river sections) were surveyed within a 5 km area around the PDA. During these inventories, all bird species were noted, and

particular attention was given to other wildlife activity such as beaver dams and caribou sightings.

3.3.2 Data Analysis

Phenology Index

Phenology indices (PI) were calculated for the most abundant species to determine if the spring inventory was conducted at the right time in the breeding season. According to Bordage *et al.* (2003), the inventory should ideally be conducted after the beginning of the egg-laying period, when half of the females are incubating. The phenology index corresponds to the ratio of paired males compared to the number of unattended males (lone and flocked males). A PI = 1.0 is optimal, but a value lower than 1.0 indicates the inventory was done too late in the breeding season. A PI > 1.0 means the inventory was conducted too early. The PI was calculated for each waterfowl species potentially breeding in the study area, and was adjusted for naturally unequal sex ratios in some species, according to the data presented in Table 4.

Table 4: Sex Ratio and Correction Factor used for Waterfowl Species Phenology Index

Species	Sex ratio (male:female)	Correction Factor (CF)
American Black Duck	122:100	0.83
Lesser Scaup	150:100	0.67
Common Goldeneye	150:100	0.67
Bufflehead	150:100	0.67
Common Merganser	186:100	0.56
Red-breasted Merganser	186:100	0.56

Source: Benoit (2005).

Breeding Chronology

Breeding chronology was calculated by evaluating the onset of egg-laying, incubating and hatching periods from broods that were aged during the July survey. Through backdating, median duckling age classes (Tecsult Inc., 2007) were used to calculate the approximate date of hatching.

Number of Breeding Pairs, Broods, and Total Abundance

The evaluation of the number of indicated pairs (IP) for waterfowl and Common Loon was based on Black Duck Joint Venture criteria (Bordage *et al.,* 2003). Indicated pairs were calculated using a method of scaling observed pairs to account for unmated males and for species with unequal sex ratios (Dzubin, 1969; Bordage *et al.*, 2003). Indicated pairs, broods and total abundance were analyzed in order to obtain a mean density per 25 km² of land and per 10 km of shoreline.

3.4 Birds of Prey and Common Raven

3.4.1 Field Methods

The raptor inventory was conducted simultaneously with the waterfowl and other aquatic bird surveys (31 May, 3 June and 28 July 2012). All habitats identified in the sampling plan that were suitable for species at risk and of conservation concern were inventoried (Figure 2). The field crew was comprised of the helicopter pilot, a navigator-observer in the front (port side) and a secondary observer seated behind the pilot (starboard).

The majority of known Bald Eagle (*Haliaeetus leucocephalus*) nests are located less than 300 m from a shore (Fradette, 1998). For this study, suitable habitats were defined as comprising a 500-m wide band along the shores of a large lake (> 5 km²), reservoir, or large river. Nests of other species such as Osprey (*Pandion haliaetus*), Red-tailed Hawk (*Buteo jamaicensis*) and Great Horned Owl (*Bubo virginianus*) can be found using this methodology. In order to detect Bald Eagle nests, the helicopter flew over treetops at an altitude of 20-40 m at an approximate speed of 60-80 km/h. In order to adequately cover the 500-m buffer zone of potential habitat, two equidistant passes were performed on each shore.

Suitable nesting habitat for the Peregrine Falcon (*Falco peregrinus*) and Golden Eagle (*Aquila chrysaetos*) were visited within the study area. These two species mainly establish their nests on cliffs. All cliffs with a slope > 60 % were mapped and visited. Other cliff-nesting species can be observed with this sampling plan, such as Red-tailed Hawk, Rough-legged Hawk (*Buteo lagopus*), Great Horned Owl, Merlin *(Falco columbarius*) and Common Raven (*Corvus corax*). Cliffs were surveyed by slowly flying alongside at a lateral distance of 10 to 30 m. The number of passes was dependent on cliff height. The first pass began at the top of the cliff and the following passes progressed downwards. During these low-speed passes (approximately 5 to 10 km/h), observers scanned the cliff for any signs revealing the presence of a nest (e.g., droppings, feathers, adults flying nearby, prey remains, nitrophilous lichen).

Nesting habitats suitable for Short-eared Owl (*Asio flammeus*) were visited during the waterfowl and other aquatic bird inventory. Large open areas (> 50 ha) such as bare dry ground and peatlands were highlighted as potential nesting habitat. Short-eared Owl potential breeding habitats were entirely inventoried at low speed (10-30 km/h) and at low altitude (5-10 m).

3.4.2 Data Analysis

In addition to the helicopter-based bird of prey surveys, all other observations of birds of prey within the Study Area at any other time were also recorded.

A nesting site is considered as an area with one or more nests, including replacement or frustration nests (Ontiveros *et al*., 2008) where one pair breeds. The best indications that a nesting site is currently occupied are: the observation of a pair near or on a nest, or when breeding evidence was noted (e.g.: incubating adult), the observation of eggs and hatchlings, a newly-repaired nest or with fresh nesting

material. Nesting material is identified by fresh greenery or twigs deposited on a nest by some species (e.g.; Golden Eagle) (Steenhof and Newton, 2007). The observation of a pair without a nest is also considered to be a sign that a territory is occupied.

The number of confirmed and potential breeding pairs was determined for the bird of prey Study Area as a whole (Figure 2). Confirmed pairs were obtained from the sum of occupied nesting sites and pairs. Potential pairs were estimated from the observation of single adult from other conspecific sightings using a species-specific distance from Morneau and Benoît (2005) (Table 5).

Table 5: Distance Used to Determine Potential Birds of Prey and Common Raven Pairs

Species	Distance (km)[1]
Osprey	6
Bald Eagle	10
Red-tailed Hawk	4
Great Horned Owl	8

[1] Morneau and Benoit (2005).

3.5 Terrestrial Birds

3.5.1 Field Methods

Two complementary sampling plans were devised in order to document habitat use by terrestrial birds in the Study Area: point count stations and transect counts, as recommended in the *Guide for Impact Assessment on Birds* (Environment Canada, 1997). Point counts were used in upland habitats whereas transect counts were conducted in wetlands.

3.5.1.1 Point Count Stations

Point counts were conducted in order to determine breeding pair density for species in each upland habitat category found in the Study Area. This method entails a count of all birds observed or heard from a pre-determined point (point count station) within a defined radius for a defined duration (Ralph *et al*., 1995). Observers counted birds at each point count station for a total of 10 minutes. The distance of each bird from the observer was estimated and categorized (0-50 m, 51-75 m, 76-100 m and > 100 m). Multiple detections of the same species are considered as separate individuals if they are seen or heard simultaneously, if they are counter-singing, or if morphological differences are observed. Throughout the 10-minute period, observers documented bird behaviour in order to determine their breeding status in the Study Area. The Quebec Breeding Bird Atlas (2010) breeding evidence codes, standard for all recent atlas projects across Canada, were used to describe various types of behaviour. Play-back of Black-capped Chickadee (*Poecile atricapillus*) and Red-breasted Nuthatch (*Sitta canadensis*) mobbing calls were broadcasted for a 2-minute period after completion of the point count (i.e., after

10 minutes). Conditions observed during the inventories are presented in Appendix D.

The sampling effort was divided in order to cover the different parts of the Project. Habitats were grouped into categories based on the information available from Natural Resources Canada (Landsat 7 imagery interpretation) (Wulder and Nelson, 2003). The major upland habitat types are: spruce-moss forest (open and closed), spruce-lichen forest, post-fire conifer regeneration and bare dry ground. Those habitat categories were validated in the field.

A grid of potential equidistant point count stations (250 m) was superimposed onto the Study Area. The 250 m distance between stations was considered sufficient to avoid the overlap of point count records (see section 3.5.2.2). Major habitat types were sampled proportionally. However, less frequent habitat types (e.g., shrubland) were necessarily sampled proportionally less than habitats covering large, easy to find and access areas (e.g., spruce-lichen forests). Point count stations were spread out to ensure appropriate spatial coverage of the Study Area. Access to the point count stations was achieved via helicopter transportation. The sites surveyed were therefore limited by helicopter landing locations.

Point count surveys were conducted between 26 June and 4 July 2012. They took place from sunrise until 0900 hrs on days without rain or strong winds (Beaufort Scale > 3) to avoid weather-induced detection bias (Environment Canada, 2007).

The habitat at each point count was characterized in order to precisely define the habitat type. The general habitat type was specified (e.g., spruce-moss forest) with details on the surroundings when necessary, such as windfall, or near the edge of a riparian habitat. Stem density was estimated and categorized (percent or surface covered by trees), and tree height (in metres) was estimated. Evidence of past disturbances such as windfall and fire were noted, as well as the prevalence of snags in the point count radius. The relative cover percentage of the three following strata was estimated: trees (≥ 7 m in height), shrubs (heath family species, young trees and shrubs treated separately), and the herbaceous layer. An estimate of relative cover was also given for the dominant species in each stratum. Ground cover was characterized according to the presence of moss, sphagnum, lichen, water, organic matter, litter and rocks or bare ground. An estimation of the abundance of downed woody debris was given. Habitat data are shown in Appendix E. At least one photograph of the habitat from the centre of the point count station was taken for documentation purposes (Appendix B).

3.5.1.2 Transect Count

Transect counts were employed to detect terrestrial bird species that are sparsely distributed, seldom encountered in habitats covered by point counts, and those likely to be found in linear habitats. These surveys were conducted on the ground, mainly in wetlands (i.e., bogs, fens), and along shorelines, brushy margins of lakes and rivers (riparian habitats known as shrub swamp). The sampling of habitats was dependent on the proportion of different habitat types in the Study Area as found on field maps, validated on site, and their accessibility by helicopter. Generally, two sites were visited per day. Surveys were conducted either alone or in pairs. Small

sites were afforded complete coverage, while larger habitats were sampled through transects. Inaccessible areas were surveyed using a spotting scope and binoculars.

Wetland surveys took place late in the morning, following point counts, also from 26 June to 4 July 2012. The percentage of landbirds observed was much greater in open habitats than during forest point counts, bias induced by weather and number of hours after sunrise was considerably diminished. A linear index of abundance (LIA) was derived by conducting continuous counts along transects, the length and trajectory of which was at the discretion of the observer(s). Transects were generally conducted in extensive peatlands and linear habitats such as riparian areas lined with shrub swamp (Figure 3). This entailed walking slowly through the habitat, with numerous pauses to observe, listen for, and record birds (e.g. general Atlas style survey). For smaller wetlands such as isolated bogs, complete coverage of the well-defined habitat was achieved by walking throughout the habitat until no new bird species could be added within a reasonable time frame. The beginning and end of each transect was recorded with a GPS coordinate, and a track file of the survey was saved. The distance of each bird observed or heard relative to the observer was estimated and categorized (0-100 m, 101-200 m, > 200 m). When a nest was discovered during these surveys, geographic coordinates, photographs of the contents, and a brief description of the nest site were recorded. Weather conditions observed during inventories are presented in Appendix F.

A short description of the wetlands was completed in order to define habitat types. The relative cover of sphagnum moss, herbaceous species, heath, conifer shrubs, water and mud, the presence of mossy or grassy islets, emergent rocks and standing snags was recorded in peatland habitats. For riparian habitats, the width of the watercourse, width of the shrubby or boggy margin, main woody species, presence of beaver and of snags was noted (Appendix G). Photographs of habitat were taken from the ground and/or from the air.

3.5.2 Data Analysis

3.5.2.1 Avifauna Ecotypes

The terrestrial bird habitat types based on the ELC (Table 3) grouped some vegetation classes in order to allow some measure of sampling effort (at least five point count stations per habitat type) to adequately document and compare habitat use of birds. The habitat defined as forested swamp by the ELC was essentially a humid version of shrubland, and was merged with this category. Forested bogs and swamps were typical spruce forests resting on humid sphagnum moss typical of bogs. The area comprised by these two habitat types was transferred to the avian spruce-moss forest upland habitat category.

Peatlands, including horizontal fen, northern ribbed fen, riparian fen and flat bog in the ELC (Table 3) were often not distinguishable in the field, limiting their individual value for assessing bird habitat use. Consequently, they were lumped and then divided into two types: small peatlands and extensive peatland complexes. Five of these complexes were identified in the Study Area by virtue of their large size and distinctive lack of trees, peat composed of a mix of northern ribbed, horizontal and riparian fen (in decreasing order of area), and networks of shallow pools. All other

peatlands were merged into a single category of smaller, more isolated and often drier bogs and fens.

3.5.2.2 Point Count Stations

An indicated pair value (IP = potential nesting pairs) was calculated for all terrestrial birds detected during the point count surveys. A singing male (or drumming woodpecker), a visible pair of birds (agitated or not), or a single agitated individual are given a value of 1.0 IP. A female or silent individual was given a value of 0.5 IP. All terrestrial birds detected within a 75 m radius from the observer were considered for the analysis of pair density, with the exception of birds flying across without stopping during the point count. Density was established by calculating the number of IP's per hectare (1.7671 ha in a 75 m fixed-radius point count).

"Constancy" refers to the percentage of stations among a given habitat type in which a species was recorded without consideration to the radius throughout the 10-minute period. Constancy is calculated by dividing the number of detections of a given species within a habitat type by the total number of stations surveyed in that habitat. Birds flying through or over the station were considered for this analysis, mainly in order to account for the regular presence of cardueline finches, which tend to elude qualification criteria for density estimates. Species observed during the play-back period were only considered for breeding evidence and for the list of species observed in the Study Area.

The average number of species detected per station (species richness) and cumulative species richness was calculated for each habitat type. Overall population was also calculated. A value referring to the number of indicated pairs was designated for birds found within a 75-m radius (FRPC) and without regard to distance (PIA). Through the interpretation of high-resolution photographs, the area covered by each habitat type was determined. Therefore, the minimum, mean and maximum population of terrestrial birds per habitat type was calculated by multiplying IP/ha density by the total number of hectares occupied by each habitat.

3.5.2.3 Abundance Indices

An abundance index adapted from Blondel *et al*. (1970) was created using point count data, where the average IP abundance per habitat was considered without any regard to the distance (Point Index of Abundance; PIA). The species composition retained for analyses is identical to the set used to measure constancy. Average and cumulative species richness were also calculated from this broader analysis.

Other observations noted during transit were only used to document presence of birds otherwise not noted, to gather higher breeding evidence, and to document the presence of species at risk.

In the case of wetland transects, the number of IP was calculated by including all birds with the exception of: those seen or heard outside of the surveyed habitat, those beyond 200 m from the observer, and birds flying through without stopping. The extended range of detection by sight and sound in open habitats such as peatlands explains the longer sampling radius than in point counts. Density was

calculated by dividing the total number of IP's found in a habitat type by the total number of hectares surveyed, rather than averaging the number of IP per transect divided per each area surveyed. This last method causes anomalies stemming from sequences of zeros punctuated by a large number, leading to misguided densities. Consequently, the method used does not come with a standard deviation value associated with density calculations.

Wetland size for use in the density and abundance index calculations was determined by establishing a maximum buffer of 200 m or 100 m (the latter in the case of small or denser habitats or when the observer's ability was limited by sampling distance) around the survey transect limited to the sampled habitat, or by selecting the entire area of an isolated patch of completely surveyed habitat (Table 6). Forested habitat and larger bodies of water were subtracted from buffers in order to retain an area 100% composed of the surveyed habitat type. As with point count data, average and cumulative species richness per habitat were calculated in this analysis.

One transect was discarded from analysis due to the fact that it was conducted through a forested habitat, which was already sampled using point counts. The resulting areas presented in Table 6 reflect only those retained for the analyses.

Table 6: Survey Method and Area Obtained for all Wetland Transects

Name	Habitat	Method	Area Surveyed (ha)
SS-01	Shrub swamp	200-m buffer	26.6
SS-02	Shrub swamp	100-m buffer	1.9
SS-03	Shrub swamp	200-m buffer	1.3
SS-04	Shrub swamp	200-m buffer	5.8
SP-01	Small peatland	Complete	1.5
SP-02	Small peatland	200-m buffer	6.1
SP-03	Small peatland	200-m buffer	5.4
SP-04	Small peatland	Complete	6.3
SP-05	Small peatland	200-m buffer	3.7
SP-06	Small peatland	Complete	1.9
SP-07	Small peatland	100-m buffer	2.1
SP-08	Small peatland	200-m buffer	9.7
EP-01	Extensive peatland complex	200-m buffer	32.2
EP-02	Extensive peatland complex	200-m buffer	38.6
EP-03	Extensive peatland complex	200-m buffer	25.7
EP-04	Extensive peatland complex	Complete	10.4
EP-05	Extensive peatland complex	200-m buffer	13.3
EP-06	Extensive peatland complex	200-m buffer	31.9

3.6 Shorebirds

3.6.1 Description of the Study Area

The Study Area selected for shorebirds was the same used for the terrestrial bird surveys, detailed previously (see Section 3.1.2.3).

3.6.2 Field Methods

While shorebirds are often heard from point count stations, they are seldom associated with forested habitat. Breeding shorebird surveys were concomitant with the transect counts collected for landbirds in wetlands (Section 3.5.1.2). Such surveys were conducted exclusively in wetland habitats where shorebirds tend to nest and feed (i.e. small bogs, extensive peatland complexes, lake and river margins).

The protocol for shorebird surveys and habitat characterization was identical to that used for landbird abundance indices (Section 3.5.1.2). Binoculars were always used and a spotting scope (Kowa TSN 882, 25X magnification) was occasionally employed in vast, productive peatlands. The probability of detection of breeding shorebirds is higher than that of songbirds occupying the same habitat, due to their tendency of approaching observers and calling. For this reason, transect counts were conducted later in the morning, after point counts.

3.6.3 Data Analysis

3.6.3.1 Point Count Stations

Data analysis of shorebirds detected during point count stations was done only for the calculation of constancy (see Section 3.5.2.1).

3.6.3.2 Abundance Indices

Abundance index was the main tool used in calculating breeding shorebird abundance. Analysis was performed as described in Section 3.5.2.2.

3.7 Species at Risk and of Conservation Concern

3.7.1 Description of the Study Area

For the Peregrine Falcon and Short-eared Owl, the area considered for this survey consists of a 5-km wide buffer added on the waterfowl survey plots (Figure 2). This enlarged area was created in order to maximise detection of associated nests from these species. These birds have large territories and may forage within the Study Area, even though nests may be several kilometres away. Surveys for Gray-cheeked Thrush (*Catharus minimus*) and Rusty Blackbird (*Euphagus carolinus*) occurred in the vicinity of the proposed mine, plant installations, haul road and rail spur (Figure 3).

3.7.2 Field Methods

Based on the literature five species at risk could potentially be found in the Study Area during the breeding season: Harlequin Duck, Peregrine Falcon, Short-eared Owl, Gray-cheeked Thrush and Rusty Blackbird (BBS, 2013; eBird, 2013; QBBA, 2013; LIM, 2009; Groupe Hémisphères, 2008; NML, 2009). Specific surveys were carried out in the case of threatened birds of prey as discussed in Section 3.4.1.

Personnel carrying out fieldwork on foot were aware of potential species at risk. Rusty Blackbirds were actively sought out in riparian habitats and other wetlands, while Gray-cheeked Thrush was looked for in open spruce-lichen forests and post-fire conifer regeneration.

3.7.3 Data Analysis

Data analysis was dependent on the taxonomic category of each species, described at the end of sections on waterfowl and other aquatic birds, birds of prey, terrestrial birds and shorebirds.

3.8 Quality Assurance / Quality Control (QA/QC) Procedures

The Quality Assurance/Quality Control (QA/QC) Program includes planning, organization, communication, field work, data analysis, reporting and review of completed work. The QA/QC Program included the following measures:

- experienced professionals with a good understanding of the project and its objectives;
- pre-survey meeting to present the project and the objectives of the baseline study to the field team;
- trained and experienced technical teams of at least two persons;
- use of standard methods, with equipment in good condition and appropriate for the work to be carried out;
- preparation of specific protocols including the type of sample required, measurements required, and sampling methods;
- use of field forms;
- use of recent and standard reference documents;
- control of data tabulation;
- conservation of original data and data analysis results (hard copy and electronic); and
- revision by qualified professionals of all documents produced.

4 RESULTS AND DISCUSSION

4.1 Waterfowl, Common Loon and Other Aquatic Birds

4.1.1 Species Richness

A total of 17 species of aquatic birds, excluding shorebirds, were detected in the Study Area. Breeding was confirmed for nine of these, and an additional four are considered probable breeders (Appendix H). The only non-waterfowl species observed were Common Loon, Herring Gull (*Larus argentatus*) and Tern sp. (*Sterna* sp.).

Two species, the Northern Pintail (*Anas acuta*) and Green-winged Teal (*A. crecca*), were detected from the helicopter in the terrestrial bird survey period on 1 July, and not detected during the spring or late summer waterfowl surveys: Additionally, Canada Goose (*Branta canadensis*) was confirmed breeding, and a flock of 40 moulting adult Canada Geese was observed.

Both Common (*Sterna hirundo*) and Arctic Terns (*S. paradisaea*) are likely, though the latter is probably more frequent at these latitudes (QBBA, 2013). Other species potentially present on migration are Black Scoter (*Melanitta americana*) and Long-tailed Duck (*Clangula hyemalis*) (Lepage and Bordage, 2010).

4.1.2 Waterfowl and Common Loon

4.1.2.1 Phenology Index

As a precursor to the analysis of phenology indices, the number of individuals seen per observation was summarized (Table 7). Existing literature on the calculation of indicated pairs suggests that observations of four or more birds of the same species are usually migrants or non-breeders (Bordage *et al*., 2003). In this study, most observations were groups comprising fewer than four individuals. Observed groups of Lesser Scaup (*Aythya affinis*) may have been local breeders, given that they are known to nest relatively late. The same could be concluded of White-winged Scoter (*Melanitta fusca*), though these could be breeding further north. Observations of numerous Common Mergansers (*Mergus merganser*), Ring-necked Ducks (*Aythya collaris*) and Canada Geese were likely clusters of birds in moult (non-breeding).

The calculation of phenology indices shows a general tendency for surveys having been conducted a bit later than the preferred date intervals (PI < 1.0) (Table 8). However, small sample sizes affect the reliability of the results. It is doubtful that these surveys were too early for optimum detection of American Black Duck (*Anas rubripes*), for instance (see Section 4.1.2.2). On the other hand, it is reasonable to believe that less than half of Lesser Scaup had initiated incubation by early June.

Table 7: Waterfowl and Common Loon Group Size Observed During the Spring Aerial Survey (31 May and 3 June 2012)

Species	Group Size (Number of Observations)								
	1	2	3	4	5	6	9	10	12
Canada Goose	2	-	-	-	-	-	-	1	-
American Black Duck	2	-	-	-	1	-	-	-	-
Ring-necked Duck	-	1	-	-	1	-	-	-	-
Lesser Scaup	1	2	-	-	-	1	1	-	-
White-winged Scoter	-	1	-	1	-	-	-	-	1
Surf Scoter	-	3	-	-	-	-	-	-	-
Bufflehead	1	-	-	-	-	-	-	-	-
Common Goldeneye	-	3	-	-	-	-	-	-	-
Hooded Merganser	-	1	-	-	-	-	-	-	-
Common Merganser	4	2	-	-	1	-	-	1	-
Red-breasted Merganser	6	6	-	-	-	-	-	-	-
Merganser sp.	-	-	1	-	-	-	-	-	-
Diving duck sp.	1	-	-	-	-	-	-	-	-

Table 8: Phenology Index for the Main Waterfowl Species Observed During the Spring Aerial Survey (31 May and 3 June 2012)

Species	Correction Factor* (CF)	Lone Males (LM)	Paired Males (PM)	Phenology Index (PI = PM/LM)	Corrected Phenology Index (PI x CF)
American Black Duck[1]	0.83	1	2	2.00	-
Lesser Scaup	0.67	1	2	2.00	1.34
Common Goldeneye	0.67	2	2	1.00	0.67
Bufflehead	0.67	1	0	-	-
Common Merganser	0.56	3	2	0.67	0.37
Red-breasted Merganser	0.56	6	6	1.00	0.56

[1] For the American Black Duck, lone individuals of undetermined sex were considered in the calculation using a sex ratio of 122:100 in favour of males (lone males). Individuals of undetermined sex observed in pairs were also included in the calculation and were considered as pairs (paired males). The corrected index does not apply to this species.

* Correction Factor = adjustment for naturally unequal sex ratios (Benoit, 2005).

4.1.2.2 Breeding Chronology

A total of 12 broods of 7 species were observed during the summer aerial survey of 28 July 2012 (Table 9). In addition, two Canada Goose pairs were found on 1 July with very young 6 x 1A and 4 x 1A goslings, based on Gollop and Marshall (1954) classification. Three Mallard x American Black Duck hybrids (*Anas platyrhynchos x rubripes*) and many American Black Duck ducklings (as many as 30) were also found on this day. This type of observation is indicative of early nesting onset in large dabblers, with hatching in June rather than mid-July, as is the case with all other species (Table 10).

Table 9: Number of Broods per Age-Class Observed within the Four Plots during the Late Summer Aerial Survey (28 July 2012)

Species	Brood Age-Class[1]				
	IA	IB	IC	IIB	III
American Black Duck	-	-	-	1	2
Ring-necked Duck	-	1	-	-	-
Lesser Scaup	-	1	1	-	-
White-winged Scoter	-	1	-	-	-
Surf Scoter	-	2	-	-	-
Common Goldeneye	-	-	1	-	-
Common Loon	2	-	-	-	-
Total	**2**	**5**	**2**	**1**	**2**

[1] According to Gollop and Marshall (1954) age-classes.

Back-dating calculations are more precise than phenology indices, and are reliable in the estimation of egg-laying, incubation and hatching onset (Lepage and Bordage, 2010). Spring surveys should ideally take place between the initiation of egg-laying and the beginning of full-time incubation. Data suggest that the spring pair survey was perhaps too early for most divers, but late for the American Black Duck (Table 10). This contradicts the results of phenology indices, which suggested that the survey was perhaps late. The timing of this late summer brood survey was as designed; and occurred before young Black Duck became indistinguishable from adults and when waterfowl broods of the youngest age class 1A were no longer found.

Table 10: Mean Egg-Laying, Incubation and Hatching Onset Dates in the Study Area according to Back-Dating Calculations

Species	Number of Broods	Date[1]		
		Egg-Laying Onset	Incubation Onset	Hatching Onset
Common Loon	2	15-June	20-June	18-July
American Black Duck	3	06-May	15-May	13-June
Ring-necked Duck	1	15-June	24-June	20-July
Lesser Scaup	2	10-June	19-June	14-July
Surf Scoter	2	06-June	18-June	17-July
White-winged Scoter	1	03-June	17-June	15-July
Common Goldeneye	1	27-May	11-June	11-July

[1] Obtained from species-specific back-dating calculations using standardized breeding chronology values (Tecsult inc., 2007).

4.1.2.3 Waterfowl Abundance during the Spring Survey

The four most common species observed were Common Merganser, Lesser Scaup, White-winged Scoter and Red-breasted Merganser (*Mergus serrator*) (Table 11). More Canada Geese were observed than American Black Duck. One Bufflehead (*Bucephala albeola*) was observed during this survey, but none were encountered afterwards in the Study Area.

Table 11: Number of Individuals Observed for Each Species within the Surveyed Plots (n=4) during the Spring Inventory (31 May and 3 June 2012)

Species	Number of Birds Observed			
	Male	Female	Adults Und.[1]	Total
Canada Goose	-	-	12	12
American Black Duck	3	2	2	7
Ring-necked Duck	5	2	-	7
Lesser Scaup	14	6	-	20
White-winged Scoter	12	6	-	18
Surf Scoter	3	3	-	6
Bufflehead	1	-	-	1
Common Goldeneye	4	2	-	6
Hooded Merganser	1	1	-	2
Common Merganser	13	10	-	23
Red-breasted Merganser	12	6	-	18
Merganser sp.	3	-	-	3
Diving duck sp.	-	-	1	1
Total (divers)	**68**	**36**	**1**	**105**
Total (waterfowl)	**71**	**38**	**15**	**124**

[1] Adults und.: adults, sex undetermined.

The information provided in Table 12 presents densities derived by dividing the number of birds seen during the spring inventory (Table 11) by the area surveyed or by the shore length surveyed. The most common duck species in linear abundance were also the most common in area density. Linear abundance includes both river and lake shores, which tend to attract different species assemblages.

In terms of indicated pairs, thus probable breeders, the Red-breasted Merganser was the most common waterfowl species, with 4.0 IP/25 km^2 and 1.1 IP/10 km of shore (Table 12). Common Merganser was second (1.7 area density and 0.4 linear density), and White-winged Scoter third (1.3 area density and 0.3 linear density). The pair densities observed in this study are similar to the averages obtained during other spring waterfowl surveys at similar latitude in Québec, but further to the west (Lepage and Bordage, 2010; Guérette Montminy *et al*., 2009). The densities of Red-breasted Merganser and Common Goldeneye (*Bucephala clangula*) are slightly above average while that of Common Merganser is slightly below average. Surf Scoter (*Melanitta perspicillata*), Lesser Scaup and Ring-necked Duck densities are considered average. However, Canada Goose and American Black Duck densities were lower here than those reported in the literature cited previously, and Green-winged Teal, common in the taiga shield waterfowl conservation region, was not recorded at all. One major finding is the high density of White-winged Scoter pairs, never previously recorded in such numbers nor breeding so far to the east (B. Mactavish, personal communication, 2012).

Table 12: Mean Area (Number/25 km²) and Linear (Number/10 km of Shore) Densities for Total and Indicated Pair Abundances during the Spring Survey (31 May and 3 June 2012)

Species	Total				Indicated Pairs			
	Area		Linear		Area		Linear	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Canada Goose	4.0	6.1	1.0	1.4	0.7	0.6	0.2	0.1
American Black Duck	2.3	4.0	0.6	1.0	0.7	1.2	0.2	0.3
Ring-necked Duck	2.3	2.5	0.6	0.6	0.3	0.6	0.1	0.2
Lesser Scaup	6.7	11.5	1.6	2.7	1.0	1.7	0.2	0.4
White-winged Scoter	6.0	10.4	1.4	2.5	1.3	2.3	0.3	0.5
Surf Scoter	2.0	2.0	0.5	0.5	1.0	1.0	0.3	0.3
Common Goldeneye	2.0	2.0	0.5	0.5	1.3	1.2	0.3	0.3
Hooded Merganser	0.7	1.2	0.2	0.3	0.3	0.6	0.1	0.1
Common Merganser	7.7	10.0	1.9	2.3	1.7	1.5	0.4	0.4
Red-breasted Merganser	6.0	7.8	1.6	2.1	4.0	5.2	1.1	1.4
Merganser sp.	1.0	1.7	0.3	0.5	1.0	1.7	0.3	0.5
Diving duck sp.	0.3	0.6	0.1	0.1	-	-	-	-
Total (divers)	**34.7**	**32.1**	**8.6**	**7.3**	**12.0**	**4.4**	**3.1**	**1.1**
Total (waterfowl)	**41.0**	**42.0**	**10.1**	**9.6**	**13.3**	**4.7**	**3.4**	**1.1**

SD: standard deviation.

4.1.2.4 Waterfowl Abundance during the Summer Survey

The number of adults observed during the late summer survey on 28 July was greater than the total number of birds found in the spring (Tables 11 and 12). It appears that a number of these are moult migrants, as is almost certainly the case for many Canada Geese and Hooded Mergansers (*Lophodytes cucullatus*); two species for which no broods were observed (Table 13).

The information provided in Table 14 presents densities derived by dividing the number of birds observed during the summer survey (Table 13) by the area surveyed, depending on the type of survey: surface or linear. As was the case with the spring survey, there was a correlation between area and linear density. However, density in linear habitats relative to density per 25 km^2 was higher for broods than for adults without broods. The species with the highest breeding density was Surf Scoter, with 1.0 brood per 25 km^2 and 0.6 broods per 10 km of shoreline (Table 14). Lesser Scaup and American Black Duck had fairly equal breeding densities, with a 0.7 value for area density and 0.4 for linear density in the case of the former, and 0.8 area and 0.2 linear densities for the latter. No Red-breasted Merganser broods were found, suggesting that the high number of indicated pairs in spring may in fact have been attributed to migrants. The same could be said of the Common Merganser, and to a lesser extent White-winged Scoter. Then again, brood detection is not always easy and certainly not exhaustive, as certain females are very efficient at hiding themselves and their ducklings.

Table 13: Number of Individuals Observed for Each Species within the Surveyed Plots (n=4) during the Summer Inventory (28 July 2012)

Species	Number of Birds Observed					
	Male	Female	Adults Und.[1]	Immature	Ducklings	Total
Canada Goose	-	-	81	-	-	81
American Black Duck	-	1	45	-	8	54
Mallard	-	1	1	-	-	2
Mallard X American Black Duck hybrid	-	1	-	-	-	1
Total (dabblers)	**-**	**3**	**46**	**-**	**8**	**57**
Ring-necked Duck	-	1	11	-	7	19
Lesser Scaup	2	5	-	-	10	17
Common Goldeneye	-	1	-	-	-	1
Hooded Merganser	-	2	15	-	-	17
Common Merganser	1	-	-	-	-	1
Red-breasted Merganser	4	2	-	-	-	6
White-winged Scoter	-	5	-	1	-	6
Surf Scoter	-	2	-	-	11	13
Total (divers)	**7**	**18**	**26**	**1**	**28**	**80**
Total (waterfowl)	**7**	**21**	**153**	**1**	**36**	**218**
Common Loon	-	-	7	-	1	8
Total	**7**	**21**	**160**	**1**	**37**	**226**

[1] Adults und.: adults which sex could not be determined.

The abundance of adults without broods was quite different from the abundance of all birds seen in the spring survey. The densities of adults without broods for the four most abundant species in the spring survey (in descending order: Common Merganser, Red-breasted Merganser, Lesser Scaup and White-winged Scoter) were quite low in the summer survey, not exceeding 1.5 adults per 25 km^2 (Table 14). As mentioned earlier, Canada Goose, American Black Duck and Hooded Merganser numbers were high, likely boosted by the arrival of moulting birds over the summer.

4.1.2.5 Habitat Use

The type of habitat used by pairs in the spring survey was quite varied, with ponds and lakes varying from 10 to 100 ha in area most frequently used, while brooks and lakes 100-500 ha were rarely used (Table 15). Most Red-breasted Mergansers were observed on large lakes (> 500 ha) in spring, while Common Mergansers were the only other species to be found on this type of water body. Neither species were confirmed breeding in late summer (Table 16), suggesting that large lakes were only used by migrants.

Most waterfowl broods were observed on small surfaces of water (Table 16). Most scaup and scoter broods were found on ponds. The only duck broods found on lakes larger than 100 ha were American Black Ducks, the only dabbling species.

Table 14: Mean Area (number/25 km²) and Linear (number/10 km of shores) Densities for Broods, Adult without Broods and Total Abundance during the Summer Survey (28 July 2012)

Species	Total				Number of Broods				Adult Without Brood			
	Area		Linear		Area		Linear		Area		Linear	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Canada Goose	20.3	38.5	4.8	9.1	-	-	-	-	20.3	38.5	4.8	9.1
Mallard	0.5	1.0	0.1	0.2	-	-	-	-	0.5	1.0	0.1	0.2
American Black Duck	13.5	18.8	3.3	4.4	0.8	1.0	0.2	0.3	10.3	20.5	2.4	4.8
American Black Duck x Mallard hybrid	0.3	0.5	0.1	0.1	-	-	-	-	0.3	0.5	0.1	0.1
Total (dabblers)	14.3	20	3.5	4.7	0.8	1.0	0.2	0.3	11.0	22.0	2.6	5.2
Ring-necked Duck	4.8	5.6	1.2	1.4	0.3	0.5	0.1	0.1	2.8	5.5	0.6	1.3
Common Goldeneye	0.3	0.5	0.1	0.1	0.3	0.5	0.1	0.1	-	-	-	-
Common Merganser	0.3	0.5	0.1	0.1	-	-	-	-	0.3	0.5	0.1	0.1
Hooded Merganser	4.5	7.7	1.3	1.8	-	-	-	-	4.5	7.7	1.3	1.8
Red-breasted Merganser	1.5	3.0	0.4	0.8	-	-	-	-	1.5	3.0	0.4	0.8
White-winged Scoter	1.5	3.0	0.4	0.7	0.3	0.5	0.1	0.1	1.0	2.0	0.2	0.5
Surf Scoter	6.5	12.9	4.0	8.1	1.0	2.0	0.6	1.2	-	-	-	-
Lesser Scaup	6.2	6.8	3.1	4.6	0.7	1.0	0.4	0.6	1.5	1.9	0.5	0.6
Total (divers)	25.4	18	10.4	11.7	2.5	2.5	1.2	1.7	11.5	15.9	3.16	3.6
Total (waterfowl)	59.9	68	18.7	16.6	3.2	2.2	1.4	1.6	42.7	76.2	10.6	18
Common Loon	2.2	0.5	0.8	0.3	0.5	0.6	0.1	0.2	1.2	1.0	0.5	0.5
Total	62.2	68.0	19.5	16.7	3.7	2.1	1.5	1.5	44.0	76.7	11.1	17.7

SD: standard deviation.

Table 15: Number of Indicated Pairs per Habitat Type Observed during the Spring Survey (31 May – 3 June 2012)

Species	Brook	Pond	Lake			
			< 10 ha	10-100 ha	100-500 ha	> 500 ha
Canada Goose	-	1	1	-	-	-
American Black Duck	-	-	-	2	-	-
Ring-necked Duck	-	1	-	-	-	-
Common Goldeneye	-	2	-	2	-	-
Common Merganser	-	1	-	2	-	2
Hooded Merganser	-	-	1	-	-	-
Red-breasted Merganser	-	-	-	1	-	11
Merganser sp.	-	3	-	-	-	-
White-winged Scoter	-	-	-	4	-	-
Surf Scoter	-	1	-	1	1	-
Lesser Scaup	-	1	2	-	-	-
Bufflehead	1	-	-	-	-	-
Total (divers)	1	9	3	10	1	13
Total	1	10	4	12	1	13

Table 16: Number of Broods per Habitat Type Observed during the Summer Survey (28 July 2012)

Species	Pond	Lake			
		< 10 ha	10-100 ha	100-500 ha	> 500 ha
American Black Duck	-	-	1	1	1
Ring-necked Duck	1	-	-	-	-
Lesser Scaup	1	-	1	-	-
Surf Scoter	1	-	1	-	-
White-winged Scoter	1	-	-	-	-
Common Goldeneye	-	1	-	-	-
Total (divers)	4	1	2	-	-
Total (waterfowl)	4	1	3	1	1
Common Loon	-	-	1	-	1
Total	4	1	4	1	2

The vast majority of adults without broods were on lakes 10-100 ha in size, likely a suitable habitat for moulting (Table 17). Peatlands were rarely used by ducks. The number of mergansers on large lakes was reduced relative to the quantities of pairs seen in spring. There was no apparent difference in habitat use between scaup and scoters with and without broods.

Table 17: Number of Adults without Broods per Habitat Type Observed during the Summer Survey (28 July 2012)

Species	River	Pond	Lake		Peatland
			10-100 ha	> 500 ha	
Canada Goose	2	-	76	3	-
American Black Duck	9	-	39	-	-
Mallard	-	1	1	-	-
American Black Duck x Mallard hybrid	-	1	-	-	-
Total (dabblers)	9	2	40	-	-
Ring-necked Duck	-	11	-	-	-
Lesser Scaup	-	5	-	-	-
White-winged Scoter	-	3	-	-	1
Hooded Merganser	3	-	14	-	-
Common Merganser	-	-	-	1	-
Red-breasted Merganser	-	-	-	6	-
Total (divers)	3	19	14	7	1
Total (waterfowl)	12	21	54	7	1
Common Loon	-	-	3	1	-
Total	14	21	133	11	1

4.2 Birds of Prey and Common Raven

Three species of diurnal birds of prey were observed, Osprey, Bald Eagle and Red-tailed Hawk plus one nocturnal species (Great Horned Owl), as well as Common Raven (Table 18). Nesting sites confirming the breeding of Osprey (n=4) and Bald Eagle (n=2) were found (Figure 4). Red-tailed Hawk and Common Raven pairs were seen, but no nests were found. One Great Horned Owl was sighted. In addition, three immature Bald Eagles were observed.

Table 18: Observations of Adult Birds of Prey and Common Raven during the Breeding Period and Breeding Pair Estimation

Species	Observations	Nesting Site		Breeding Pairs		
	Adults	Unoccupied	Occupied	Confirmed	Potential	Total
Osprey	9	0	4	4	0	**4**
Bald Eagle	6	0	2	2	0	**2**
Red-tailed Hawk	4	0	0	0	4	**4**
Great Horned Owl	1	0	0	0	1	**1**
Total	**20**	**0**	**6**	**6**	**5**	**11**
Common Raven	2	0	0	0	2	**2**

All nests were found on 31 May or 3 June with the exception of one Osprey nest found on 28 July containing two young. Both Bald Eagle nests found in late spring were revisited on 28 July, and each contained a single fledgling. While many sightings of adult Osprey (n=9) and Bald Eagle (n=6) were made, these are highly visible birds with large territories, so any given bird is likely to be seen more than

once during the surveys. Due to this and the fact that they have bulky, exposed nests, the potential for undetected nests of these two species in the Study Area is thus considered low. Consequently, the total number of breeding pairs in the Study Area presented at Table 18 is considered to be accurate.

Species that are uncommon, such as Northern Hawk Owl (*Surnia ulula*) or difficult to detect such as Boreal Owl (*Aegolius funereus*) have suitable breeding habitat within the Study Area and could be present. Gyrfalcon (*Falco rusticolus*) has no suitable breeding habitat but could be found outside the breeding season.

4.3 Terrestrial Birds

A total of 85 point count stations were established across five upland habitat types, as presented in Table 19 and shown in Figure 3. One additional point count station was located in a peatland, but was not retained for density analysis. Instead, abundance indices derived from transects were used to document bird composition and abundance in wetlands (see Section 3.5.2.3). The dominant habitat types in the Study Area were spruce-moss and spruce-lichen forests.

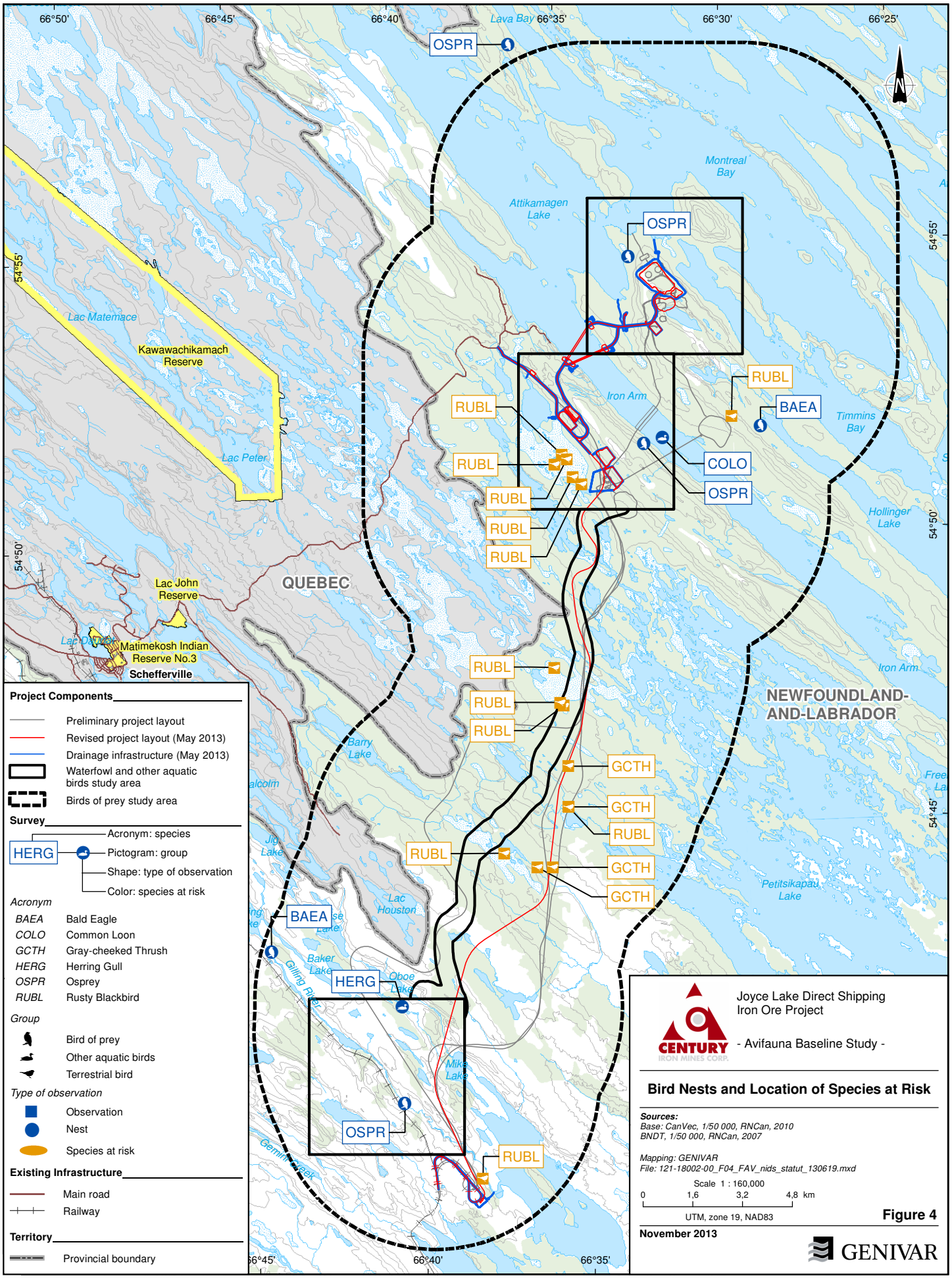
Table 19: Number of Point Count Stations per Upland Habitat Type

Habitat	Point counts		Habitat	
	Number	Proportion (%)	Area (ha)	Proportion (%)
Spruce-moss	39	45.9	6,674	47.9
Spruce-lichen	28	32.9	3,695	26.5
Post-fire conifer regeneration	8	9.4	1,758	12.6
Bare dry ground	5	5.9	1,022	7.3
Shrubland	5	5.9	721	5.2
Other	0	0	70	0.5
Total	**85**	**100**	**13,940**	**100**

4.3.1 Species Richness

A total of 37 terrestrial bird species were encountered throughout all bird surveys carried out in the Study Area, all of them migratory birds except for Spruce Grouse (*Falcipennis canadensis*) and Gray Jay (*Perisoreus canadensis*). Breeding was confirmed for eight of the 37 species, including the at-risk Rusty Blackbird, and considered probable for a further seven species. Only one species, Snow Bunting (*Plectrophenax nivalis*), was considered to be a migrant not in suitable breeding habitat (Appendix H).

Outside of the interval from May to August, little information is available on the potential occurrence of birds in the Study Area. Based on available sources, regular winter visitors likely include Willow Ptarmigan (*Lagopus lagopus*), Common (probably breeding also) and Hoary Redpolls (*Acanthis flammea, A. hornemanni*), while species breeding in nearby tundra such as Horned Lark (*Eremophila alpestris*), American Pipit (*Anthus rubescens*) and Lapland Longspur (*Calcarius lapponicus*) likely pass through on migration (LIM, 2009; Groupe Hémisphère, 2008; eBird, 2013).


66°50'
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Lava Bay
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Montreal Bay
Attikamagen Lake
Lac Matemace
Kawawachikamach Reserve
Lac Peter
Iron Arm
Timmins Bay
Hollinger Lake
RUBL
BAEA
COLO
QUEBEC
Lac John Reserve
Lac Dancer
Matimekosh Indian Reserve No.3
Schefferville
NEWFOUNDLAND-AND-LABRADOR
Barry Lake
GCTH
Petitsikapau Lake
Lac Houston
Baker Lake
Oboe Lake
HERG
Gilling River
Mike Lake
Gemini River
N
Project Components
Preliminary project layout
Revised project layout (May 2013)
Drainage infrastructure (May 2013)
Waterfowl and other aquatic birds study area
Birds of prey study area
Survey
Acronym: species
Pictogram: group
Shape: type of observation
Color: species at risk
Acronym
BAEA Bald Eagle
COLO Common Loon
GCTH Gray-cheeked Thrush
HERG Herring Gull
OSPR Osprey
RUBL Rusty Blackbird
Group
Bird of prey
Other aquatic birds
Terrestrial bird
Type of observation
Observation
Nest
Species at risk
Existing Infrastructure
Main road
Railway
Territory
Provincial boundary
CENTURY IRON MINES CORP.
Joyce Lake Direct Shipping Iron Ore Project
- Avifauna Baseline Study -
Bird Nests and Location of Species at Risk
Sources:
Base: CanVec, 1/50 000, RNCan, 2010
BNDT, 1/50 000, RNCan, 2007
Mapping: GENIVAR
File: 121-18002-00_F04_FAV_nids_statut_130619.mxd
Scale 1 : 160,000
0 1,6 3,2 4,8 km
UTM, zone 19, NAD83
Figure 4
November 2013
GENIVAR

Mean and cumulative species richness was compared between habitats. There was not much variation among habitats in mean species richness inside the 75-m FRPC, with shrubland being the highest at 4.40 species and spruce-lichen forests with the lowest at 3.43 species on average (Table 20). The latter also hosted the lowest mean diversity when looking at point index of abundance (PIA), which does not discriminate for distance, while post-fire conifer regeneration, an open habitat which allows for hearing birds at much greater distances, was at the top with 7.88.

Table 20: Species Richness per Point Count Habitat Type

Habitat	FRPC (IP/ha/10 min.)			PIA (IP/10 min.)		
	Mean	SD	Cumulative	Mean	SD	Cumulative
Spruce-moss forest	4.31	1.76	22	5.67	1.88	24
Spruce-lichen forest	3.43	1.67	16	4.75	2.08	18
Post-fire conifer regeneration	4.38	2.07	14	7.88	1.25	18
Shrubland	4.40	1.67	10	5.40	1.14	13
Bare dry ground	4.00	1.87	10	5.60	3.05	15
Total	**4.01**	**1.76**	**28**	**5.59**	**2.11**	**31**

FRPC: fixed-radius point count
PIA: point index of abundance
SD: standard deviation

Cumulative species richness logically favoured the habitats with the largest sample sizes: spruce-lichen and spruce-moss forests. Post-fire conifer regeneration was likely more rich than spruce-lichen forests, showing similar richness totals despite a difference of 20 point counts. Total richness was weak, but perhaps not unexpected for taiga plains, with 28 species in FRPC and 31 in PIA, the difference lying with three shorebird species excluded from point count density analysis. This indicates that the Study Area was sampled enough to detect almost all songbird species. This also means that a population density estimate was calculated for all songbird species recorded.

Cumulative species richness was also calculated for the four wetland habitat types surveyed through linear abundance indices (transects). They are comparable amongst themselves due to fairly similar albeit small sample sizes of the habitats.

Eight species were found in extensive peatlands, five in small peatlands and 12 in shrub swamps.

4.3.2 Population

The total estimated populations presented in Table 21 are for the entire area for which habitat was categorized in the Study Area (the extent of photo-interpretation; see Figure 3).

Table 21: Population Estimates of Terrestrial Birds per Land Habitat Type

Habitat	PIA (IP/10 min.)		FRPC (IP/ha/10 min.)		Area (ha)	Estimated Population (IP)		
	Mean	SD	Mean	SD		Minimum	Mean	Maximum
Bare dry ground	6.70	3.91	2.77	1.75	1,022	1,042	2,831	4,619
Post-fire conifer regeneration	10.13	2.40	3.04	1.78	1,758	2,215	5,344	8,474
Spruce-lichen forest	5.89	2.92	2.16	1.19	3,695	3,584	7,981	12,378
Spruce-moss forest	7.28	2.64	2.87	1.33	6,674	10,278	19,154	28,031
Shrubland	6.80	2.61	2.94	1.18	721	1,269	2,120	2,971
Total	**7.03**	**2.73**	**2.65**	**1.36**	**13,870**	**17,892**	**36,755**	**55,619**

FRPC: fixed-radius point count
PIA: point index of abundance
SD: standard deviation

Seventy hectares of other unspecified habitat types were present in the photo-interpreted section of the Study Area (Table 3). The percentage of upland habitat for which there are bird density values is 99.5%.

The estimated population of terrestrial birds per wetland habitat is less detailed, due to the fact that density was calculated by dividing the total number of indicated pairs found by the total number of hectares surveyed through wetland transects, so no standard deviation value is available. For terrestrial birds, an average density of 0.746 IP/ha was found in shrub swamp, for an extrapolated population of 206 IP in 276 ha of this habitat. In the case of small peatlands, mean density was 0.244 IP/ha. This results is an estimated population of 154 IP in 631 ha of surveyed habitat. In extensive peatland complexes, a population density of 0.171 IP/ha of landbirds was calculated, leading to an estimate of 64 IP inhabiting the total 376 ha in the Study Area.

4.3.3 Terrestrial Bird Abundance by Point Count Habitat Type

"Density" hereby refers to the values presented in the mean number of indicated pairs per hectare column (Table 21). This value is limited to 75 m, exclusively within one habitat type. The point index of abundance calculation includes birds at over 75 m of distance from the observer, often singing from different habitat types. "Constancy" refers to the percentage of stations among a given habitat type in which a species was recorded within a 75-m radius.

4.3.3.1 Spruce-Moss Forest

The ubiquitous spruce-moss forest habitat type can have a relatively dense (for the latitude) canopy of black spruce, or shows a low heath layer when more open. The Dark-eyed Junco (*Junco hyemalis*) was the most abundant species in this vast terrestrial habitat type found within the Study Area. A density of 0.62 IP/ha was established via fixed-radius point counts, with a constancy of 56% within this radius (Table 22). Ruby-crowned Kinglet (*Regulus calendula*) was the second most common with a density value of 0.40 and 59% constancy. However, this species

was half as numerous as the Junco when looking at point index of abundance values (PIA). Fox Sparrow (*Passerella iliaca*) and Yellow-rumped Warbler (*Setophaga coronata*) were the third most common with both 0.35 IP/ha and constancy just below 50%. White-winged Crossbill (*Loxia leucoptera*) was recorded on a regular basis (26% of stations), but seldom found perched within the radius, hence the low biased 0.03 IP/ha estimated density. Four species were found exclusively in this habitat type, though marginally, including the at-risk Rusty Blackbird.

4.3.3.2 Spruce-Lichen Forest

Spruce–lichen forest is consistently open in the Study Area, with exposed dry ground covered by reindeer lichen (*Cladonia spp.*). Overall density was lower than in spruce-moss forests (2.16 versus 2.87 IP/ha). Dark-eyed Junco (0.47 IP/ha, 61% constancy) was tied with Yellow-rumped Warbler (0.46 IP/ha, 68%) as the most ubiquitous species of the second most dominant habitat type (Table 22). Fox Sparrow was observed less than in spruce-moss forests, but Gray Jay was found in nearly half of stations. The low density value for this species indicates that many sightings were excluded from indicated pair calculations due to the fact that certain birds tend to follow the observer from one point count to the next. Ruby-crowned Kinglets were far less common than in spruce-moss forests (0.08 IP/ha, 14%).

4.3.3.3 Shrubland

Shrubland consists of very open spruce stands with an important mid- to low height cover of shrubs, mainly composed of dwarf birch (*Betula glandulosa*). These habitats may be the result of very old succession from fire. Overall, bird density in this unusual habitat type was similar to that found in spruce-moss forests. However, the small sample size of five resulted in a lower number of species found, and perhaps some artificially high density values (Table 22). Quite notable were the high density values for Fox Sparrow and Swainson's Thrush (*Catharus ustulatus*) (0.57 and 0.40 IP/ha respectively). Maximal IP/ha density values across all habitat types of the Study Area were achieved for the following additional species: Yellow-bellied Flycatcher (*Empidonax flaviventris*) (0.34), Gray Jay (0.20), American Three-toed Woodpecker (*Picoides dorsalis*) (0.11), Tennessee Warbler (*Oreothlypis peregrina*) (0.23) and Wilson's Warbler (*Cardellina pusilla*) (0.23). In counterpoint, Dark-eyed Junco, Yellow-rumped Warbler and American Robin (*Turdus migratorius*) were all less abundant than in the two major spruce habitat types, and Ruby-crowned Kinglet was absent.

Table 22: Density, Constancy and Abundance of Landbirds in Spruce-Dominated Forest Types

Species	Spruce-Moss Forest (n=39)					Spruce-Lichen Forest (n=28)					Shrubland (n=5)				
	Density (IP/ha)		Constancy	PIA (IP)		Density (IP/ha)		Constancy	PIA (IP)		Density (IP/ha)		Constancy	PIA (IP)	
	Mean	SD	(%)	Mean	SD	Mean	SD	(%)	Mean	SD	Mean	SD	(%)	Mean	SD
Dark-eyed Junco	0.62	0.75	56	1.58	1.65	0.47	0.47	61	1.34	0.98	0.34	0.76	20	0.80	1.30
Ruby-crowned Kinglet	0.40	0.39	59	0.83	0.75	0.08	0.20	14	0.43	0.50	-	-	-	-	-
Fox Sparrow	0.35	0.40	49	0.85	0.81	0.28	0.39	39	0.82	0.90	0.57	0.40	80	1.20	1.10
Yellow-rumped Warbler	0.35	0.44	46	0.79	0.92	0.46	0.38	68	0.93	0.66	0.23	0.51	20	0.60	0.89
Yellow-bellied Flycatcher	0.25	0.34	38	0.54	0.60	0.12	0.24	25	0.32	0.48	0.34	0.31	60	0.60	0.55
American Robin	0.23	0.30	44	0.72	0.75	0.21	0.33	32	0.55	0.94	0.11	0.25	20	1.00	1.22
Swainson's Thrush	0.20	0.37	28	0.53	0.79	0.12	0.32	14	0.43	0.69	0.40	0.47	60	0.70	0.84
Gray Jay	0.12	0.19	33	0.26	0.34	0.15	0.20	46	0.38	0.38	0.28	0.20	80	0.50	0.35
American Three-toed Woodpecker	0.07	0.19	13	0.13	0.34	0.04	0.15	7	0.07	0.26	0.11	0.25	20	0.20	0.45
White-throated Sparrow	0.04	0.15	8	0.23	0.48	0.02	0.11	4	0.11	0.31	-	-	-	0.20	0.45
Tennessee Warbler	0.04	0.15	8	0.10	0.31	-	-	4	0.07	0.38	0.23	0.31	40	0.40	0.55
Pine Grosbeak	0.04	0.19	10	0.06	0.33	0.04	0.17	7	0.07	0.30	-	-	20	-	-
Boreal Chickadee	0.04	0.12	10	0.09	0.23	0.03	0.12	7	0.05	0.21	-	-	-	-	-
White-winged Crossbill	0.03	0.13	26	0.09	0.28	-	-	14	-	-	-	-	-	-	-
Northern Waterthrush	0.03	0.13	5	0.08	0.27	0.02	0.11	4	0.04	0.19	-	-	-	-	-
White-crowned Sparrow	0.01	0.09	3	0.10	0.31	0.04	0.15	7	0.18	0.48	-	-	-	-	-
Blackpoll Warbler	0.01	0.09	3	0.03	0.16	0.02	0.11	4	0.04	0.19	0.11	0.25	20	0.20	0.45
Swamp Sparrow	0.01	0.09	3	0.05	0.22	-	-	-	-	-	-	-	-	-	-
Orange-crowned Warbler	0.01	0.09	3	0.03	0.16	-	-	-	-	-	-	-	-	-	-
Rusty Blackbird	0.01	0.05	3	0.04	0.18	-	-	-	-	-	-	-	-	-	-
Red-breasted Nuthatch	0.01	0.05	3	0.01	0.08	-	-	-	-	-	-	-	-	-	-
Pine Siskin	-	-	8	-	-	-	-	11	-	-	-	-	-	-	-
Solitary Sandpiper	-	-	5	0.03	0.16	-	-	4	-	-	-	-	40	-	-
Wilson's Snipe	-	-	3	0.03	0.16	-	-	-	-	-	-	-	-	-	-
Hermit Thrush	-	-	-	0.08	0.35	0.02	0.11	4	0.04	0.19	-	-	-	-	-
Northern Flicker	-	-	-	-	-	0.02	0.11	4	0.04	0.19	-	-	-	-	-
Wilson's Warbler	-	-	-	-	-	-	-	-	-	-	0.23	0.51	20	0.40	0.89
Total	**2.87**	**1.33**	**-**	**7.28**	**2.64**	**2.16**	**1.19**	**-**	**5.89**	**2.92**	**2.94**	**1.18**	**-**	**6.80**	**2.61**

PIA: point index of abundance
SD: standard deviation

4.3.3.4 Post-Fire Conifer Regeneration

This category includes all areas affected by fire in which the habitat usually showed some remaining snags but no dense, brushy regeneration (shrubland), nor rocky barrens with low shrubs (bare dry ground). Vast swaths of land in the Study Area were swept by fire approximately 30 years ago. The rocky substrate has likely slowed growth, insofar as to make regeneration seem younger than it actually is. Species composition in this habitat and in bare dry ground (Table 23) is quite different from that found in spruce-dominated forest habitats. Overall density was highest here with 3.04 IP/ha. White-crowned Sparrow (*Zonotrichia leucophrys*) (0.71 IP/ha, 75%) came out on top of a well-defined leading group of three species, followed by American Robin (0.57 IP/ha, 63%) and Fox Sparrow (0.50 IP/ha, 75%). The Gray-cheeked Thrush, *at risk* in Newfoundland & Labrador, was found exclusively in this habitat type. Hermit Thrush (*Catharus guttatus*), Lincoln's Sparrow (*Melospiza lincolnii*) and Alder Flycatcher (*Empidonax alnorum*) were found almost exclusively in post-fire conifer regeneration.

Table 23: Density, Constancy and Abundance of Landbirds in Open Habitat Types

Species	Post-fire Conifer Regeneration (n=8)					Bare Dry Ground (n=5)				
	Density (IP/ha)		Constancy	PIA (IP)		Density (IP/ha)		Constancy	PIA (IP)	
	Mean	SD	(%)	Mean	SD	Mean	SD	(%)	Mean	SD
White-crowned Sparrow	0.71	0.59	75	1.88	0.64	0.23	0.31	40	0.40	0.55
American Robin	0.57	0.60	63	1.63	0.92	0.23	0.51	20	0.70	0.84
Fox Sparrow	0.50	0.36	75	1.38	0.74	0.45	0.47	60	1.00	1.00
Yellow-rumped Warbler	0.21	0.29	38	0.50	0.53	0.62	0.42	80	1.10	0.74
White-throated Sparrow	0.21	0.42	25	0.88	0.64	0.40	0.74	40	0.70	1.30
Dark-eyed Junco	0.18	0.26	38	0.81	0.84	0.11	0.25	20	0.20	0.45
Gray-cheeked Thrush	0.18	0.26	38	0.31	0.46	-	-	-	-	-
Hermit Thrush	0.14	0.40	13	0.38	0.74	-	-	-	-	-
Yellow-bellied Flycatcher	0.07	0.20	13	0.38	0.52	0.23	0.31	40	0.70	0.97
Blackpoll Warbler	0.07	0.20	13	0.13	0.35	0.23	0.51	20	0.40	0.89
Ruby-crowned Kinglet	0.07	0.20	13	0.50	0.53	-	-	-	0.20	0.45
Lincoln's Sparrow	0.07	0.20	13	0.13	0.35	-	-	-	-	-
Alder Flycatcher	0.07	0.20	13	0.13	0.35	-	-	-	-	-
White-winged Crossbill	-	-	25	-	-	-	-	20	-	-
Pine Siskin	-	-	13	-	-	-	-	20	-	-
Greater Yellowlegs	-	-	13	0.13	0.35	-	-	-	-	-
Gray Jay	-	-	-	0.19	0.26	0.17	0.25	40	0.40	0.42
Swainson's Thrush	-	-	-	0.44	0.73	0.11	0.25	20	0.40	0.55
Solitary Sandpiper	-	-	-	-	-	-	-	20	0.10	0.22
Tennessee Warbler	-	-	-	0.25	0.46	-	-	-	0.20	0.45
Wilson's Snipe	-	-	-	0.13	0.35	-	-	-	0.10	0.22
Total	**3.04**	**1.78**	**-**	**10.13**	**2.40**	**2.77**	**1.75**	**-**	**6.70**	**3.91**

PIA: point index of abundance
SD: standard deviation

4.3.3.5 Bare Dry Ground

Bare dry ground is an open habitat type typically dominated by heath and lichen dotted with black spruce, hence the presence of forest species and relatively high overall density (Table 23). Yellow-rumped Warbler, Fox Sparrow and White-throated Sparrow (*Zonotrichia albicollis*) were the most abundant species in this habitat type (respectively 0.62 IP/ha and 80%, 0.45 IP/ha and 60%, 0.40 IP/ha and 40%). Peak densities across all sampled habitats were reached for the aforementioned Yellow-rumped Warbler and White-throated Sparrow, as well as for Blackpoll Warbler (*Setophaga striata*) (0.23 IP/ha, 20%). Density of White-crowned Sparrows and American Robin was considerably lower than in post-fire conifer regeneration.

4.3.4 Terrestrial Bird Abundance by Wetland Habitat Type

4.3.4.1 Extensive Peatland Complex

Distinctive by their structure, these extensive and open peatlands composed mostly of northern ribbed and horizontal fens were not productive for songbirds, with a mean density of 0.17 IP/ha (Table 24). However, the vastness of this habitat may hinder the observers' capacity to record all birds, resulting in artificially lower density values than those found in smaller, more constrained wetlands. Savannah Sparrow (*Passerculus sandwichensis*) was most abundant with 0.076 IP/ha and 100% constancy. Rusty Blackbird was second with 0.036 IP/ha and 50% constancy, and Lincoln's Sparrow third with a relatively low density of 0.020 IP/ha and 50% constancy. Cedar Waxwing (*Bombycilla cedrorum*) and Northern Shrike (*Lanius excubitor*) were each found once in this habitat, but not observed elsewhere. The Study Area is at the northern edge of the breeding range of Cedar Waxwing and near the southern edge of Northern Shrike.

Table 24: Constancy (in %) and Mean Density (in IP/ha) of Songbirds in Wetland Habitats

Species	Extensive Peatland Complex (n=6)		Small Peatland (n=8)		Shrub Swamp (n=4)	
	Constancy	Mean	Constancy	Mean	Constancy	Mean
Savannah Sparrow	100	0.076	-	-	25	0.028
Rusty Blackbird	50	0.036	25	0.054	-	-
Lincoln's Sparrow	50	0.020	25	0.054	25	0.084
Swamp Sparrow	17	0.013	-	-	25	0.028
American Robin	33	0.010	63	0.082	75	0.113
White-crowned Sparrow	17	0.007	13	0.027	75	0.155
Cedar Waxwing	17	0.007	-	-	-	-
Northern Shrike	17	0.003	-	-	-	-
Ruby-crowned Kinglet	-	-	13	0.027	-	-
Northern Waterthrush	-	-	-	-	50	0.084
Dark-eyed Junco	-	-	-	-	50	0.056
Blackpoll Warbler	-	-	-	-	50	0.056
Swainson's Thrush	-	-	-	-	25	0.056
Fox Sparrow	-	-	-	-	25	0.028
Tree Swallow	-	-	-	-	25	0.028
Yellow Warbler	-	-	-	-	25	0.028
Total	**-**	**0.171**	**-**	**0.244**	**-**	**0.746**

4.3.4.2 Small Peatland

All confined peat-based wetlands are included in this broad wetland habitat category. These are defined by their small size among a largely forested landscape and by the absence of a network of pools found in larger northern ribbed fens.

Overall density of terrestrial songbirds in this habitat was slightly more than that of extensive peatland complexes (Table 24). Compared to shrub swamp, the reduced diversity (5 species against 12) had a negative effect on density (0.244 vs. 0.746 IP/ha). American Robin was most common with 0.082 IP/ha in 5 of 8 transects, and Rusty Blackbird and Lincoln's Sparrow were second of the remaining four species with 0.054 IP/ha, and were both found in two of eight small peatlands surveyed.

4.3.4.3 Shrub Swamp

Shrub thickets often composed of willow (*Salix* sp.) and alder (*Alnus* sp.) form shrub swamp habitat found in humid areas, usually bordering watercourses.

Diversity was high (12 species for 4 transects), and overall density was the highest of all four wetland habitat types at 0.746 IP/ha (Table 24). The linear nature of these ecotone-type brushy habitats along watercourses and their intrinsic appeal to both habitat generalists and specialists combine to yield high density per hectare. However, due to the nature of the differing protocols between point counts and linear abundance indices carried out later in the day, resulting densities remain consistently lower than those calculated in fixed-radius point counts.

The most common species were White-crowned Sparrow (0.155 IP/ha, 75%) and American Robin (0.113 IP/ha, 75%), followed by Northern Waterthrush (*Parkesia noveboracensis*) and Lincoln's Sparrow with 0.084 IP/ha. Of six additional species not detected in other habitat types, only two can be considered as species actually using the habitat and not associated with adjacent forest: Tree Swallow (*Tachycineta bicolor*) and Yellow Warbler (*Setophaga petechia*).

4.4 Shorebirds

4.4.1 Species Richness

Eight species of shorebirds were found during the avian surveys. Breeding was confirmed in the case of Solitary Sandpiper, Greater Yellowlegs (*Tringa melanoleuca*), Lesser Yellowlegs (*T. flavipes*) and Least Sandpiper (*Calidris minutilla*). Short-billed Dowitcher (*Limnodromus griseus*) and Spotted Sandpiper (*Actitis macularius*) were probable breeders, while Wilson's Snipe (*Gallinago delicata*) and Red-necked Phalarope (*Phalaropus lobatus*) were considered possible breeders.

Extensive peatland complexes held the highest shorebird diversity of any habitat type, with seven of eight shorebird species recorded. Small peatlands were next with three of eight. Only two species were found in shrub swamps.

4.4.2 Population

Shorebird density was measured in wetland habitat types by dividing the total number of indicated pairs by the total number of hectares surveyed in each habitat type. A mean density of 0.084 IP/ha in shrub swamps translated to an estimated population of 23 IP in 276 ha of this habitat. In extensive peatland complexes, density was of 0.181 IP/ha over 376 ha, for an estimated population of 68 IP. In small peatlands, the density of 0.095 IP/ha translated to 60 pairs over 631 ha.

4.4.3 Shorebird Abundance by Habitat Type

Shorebirds were occasionally recorded performing flight songs or mobbing observers at point counts, but their density was not calculated in these situations. The most frequently encountered species were Solitary Sandpiper, Greater Yellowlegs and Wilson's Snipe (Tables 22 and 23). No definite link with forested habitat types can be established.

4.4.3.1 Extensive Peatland Complex

This was the most productive habitat for shorebirds. A mean of 0.18 indicated shorebird pairs per hectare were recorded (Table 25). Least Sandpiper was first, followed by Greater Yellowlegs and Short-billed Dowitcher, all above 0.03 IP/ha. This last species was not recorded regularly, with 33% constancy, but appeared to be abundant when present. Lesser Yellowlegs was recorded only when the Short-billed Dowitcher was present. The habitat preference of these two species appears to reside in the larger, more productive northern ribbed fens with numerous shallow pools. Such pools attracted Red-necked Phalarope, found in one transect. Finally, Solitary Sandpiper was found often, in four of six transects, but was not abundant.

4.4.3.2 Small Peatland

Solitary Sandpiper was slightly more abundant in small peatland types than in extensive complexes, with 0.027 IP/ha versus 0.023 (Table 25). However, there was only a single detection reported in eight transects surveyed in small bogs, where all shorebird pairs are generally detected. Wilson's Snipe was recorded twice, resulting in half of the overall 0.095 IP/ha of shorebirds.

4.4.3.3 Shrub Swamp

Shorebird density was low in shrub swamp. Spotted Sandpiper was found exclusively in this habitat, in two of four transects, resulting in a mean density of 0.056 IP/ha (Table 25). Greater Yellowlegs were recorded in one transect.

Table 25: Constancy (in %) and Mean Density (in IP/ha) of Shorebirds Encountered during Wetland Transects

Species	Extensive Peatland Complex (n=6)		Small Peatland (n=8)		Shrub Swamp (n=4)	
	Constancy	Mean	Constancy	Mean	Constancy	Mean
Least Sandpiper	67	0.039	-	-	-	-
Greater Yellowlegs	50	0.036	13	0.027	25	0.028
Short-billed Dowitcher	33	0.030	-	-	-	-
Solitary Sandpiper	67	0.023	13	0.027	-	-
Wilson's Snipe	33	0.020	25	0.041	-	-
Lesser Yellowlegs	33	0.020	-	-	-	-
Red-necked Phalarope	17	0.013	-	-	-	-
Spotted Sandpiper	-	-	-	-	50	0.056
Total	**-**	**0.181**	**-**	**0.095**	**-**	**0.084**

4.5 Species at Risk and of Conservation Concern

4.5.1 Species at Risk

4.5.1.1 Harlequin Duck

This species is designated as *vulnerable* in Newfoundland and Labrador (NL DOEC, 2013) and of *special concern* in Canada (COSEWIC, 2013; Government of Canada, 2012; see Table 2 for classification of all species at risk and of conservation concern). Harlequin Duck breeding habitat is mainly restricted to rivers with fast streams near a series of falls (Breault and Savard, 1991, Robertson and Goudie, 1999). Local knowledge makes mention of a record from the extended Howell River basin (LIM, 2009). This species was not observed during the surveys, and suitable habitats are not present in the Study Area.

4.5.1.2 Peregrine Falcon

The Peregrine Falcon is designated as *vulnerable* in Newfoundland and Labrador (NL DOEC, 2013) and of *special concern* in Canada (COSEWIC, 2013; Government of Canada, 2012). No individuals were observed, and suitable nesting cliffs were not found in the Study Area. No records exist in the Schefferville area based on consulted sources (LIM, 2009; NML, 2009; Groupe Hémisphères, 2008).

4.5.1.3 Short-eared Owl

The Short-eared Owl is designated as *vulnerable* in Newfoundland and Labrador (NL DOEC, 2013) and is a species of *special concern* in Canada (COSEWIC, 2013; Government of Canada, 2012). The breeding habitats of the Short-eared Owl are humid grasslands, pastures and arctic tundra plains. Peatlands are not extensive in the Study Area and no individuals were observed. Observations in Labrador are

mainly located on the coastline and in the Wabush sector (Schmelzer, 2005). Its presence in the Study Area is unlikely.

4.5.1.4 Olive-sided Flycatcher

The Olive-sided Flycatcher is designated as *threatened* both in Labrador (NL DOEC, 2013) and across Canada (COSEWIC, 2013). It inhabits mixed and coniferous forest edges such as burns and clearcuts, especially those adjacent to water (COSEWIC, 2007). Available literature and documentation sources indicate that the species does not inhabit regions north of the boreal softwood shield in eastern North America. There is one record for the Schefferville area in 2005 (eBird, 2013). The second closest records are from BBS route 57037, where recorded regularly (Ossok, 175 km to the southeast of the Study Area; BBS, 2013). The species was not observed and its presence in the Study Area is unlikely.

4.5.1.5 Gray-cheeked Thrush

The Gray-cheeked Thrush is designated as *vulnerable* in Labrador (NL DOEC, 2013), but has no specific status in Canada (COSEWIC, 2013). The species breeds in the northern part of the boreal forest across North America and has been observed throughout most of Labrador, but is vulnerable due to recent population decline. The species was observed at four locations during the 2012 surveys only in burnt-over areas under various stages of regeneration.

4.5.1.6 Rusty Blackbird

The Rusty Blackbird is designated as *vulnerable* in Newfoundland and Labrador (NL DOEC, 2013) and is a species of special concern in Canada (COSEWIC, 2013; Government of Canada, 2012). This species nests in wetlands. The 2012 surveys led to the observation of 12 occurrences for this species and its breeding was also confirmed. The species was mainly observed in peatlands, both small and extensive (Appendix I).

4.5.2 Species of Conservation Concern

A total of 40 species of conservation concern (excluding species with a legal *at-risk* status) were found in the Study Area (Appendix I). The various conservation status levels are presented in Table 2. A summary of relative abundance and habitat use of all species at risk and of conservation concern found in the Study Area is presented in Appendix I. Many of the species singled out by Rich *et al*. (2004) and NAWMP (2004) are common in the Study Area, due to the fact that they are typical of the taiga shield bird/waterfowl conservation region and less common in other biogeographic units. A single management-level species of concern found in the Study Area was the Boreal Chickadee (*Poecile hudsonicus*), uncommon in spruce forests (Table 2; Appendix I). Most shorebird species were common at least in prime habitat in the Study Area. All are of some degree of conservation concern in the province of Québec or at the continental scale, due to long-term population trends observed on migration and/or total estimated population size (Aubry and Cotter, 2007; Donaldson, 2000). Species with small breeding populations in Labrador are retained as species of conservation concern by ACCDC (2013). Hence, these are

mostly species at the edge of their range, more common to the south. Four such species were found in the Study Area: Bufflehead, Hooded Merganser, Red-eyed Vireo (*Vireo olivaceus*) and Cedar Waxwing. In addition, two species not thought to breed in Labrador according to ACCDC (2013) were confirmed breeding in the Study Area: White-winged Scoter and Lesser Yellowlegs.

A number of species of conservation concern were cited by one or more sources as being present in the broad vicinity of the Study Area, but were not found (Appendix I). Namely, these are: Black Scoter, American Kestrel (*Falco sparverius*), Merlin (*Falco columbarius*), Semipalmated Plover (*Charadrius semipalmatus*), Belted Kingfisher (*Ceryle alcyon*), Black-backed Woodpecker (*Picoides arcticus*), Winter Wren (*Troglodytes hiemalis*), Golden-crowned Kinglet (*Regulus satrapa*), Bohemian Waxwing (*Bombycilla garrulus*), Nashville Warbler (*Oreothlypis ruficapilla*) and Palm Warbler (*Setophaga palmarum*).

Other potential species of conservation concern were omitted from inclusion in the list presented in Table 2 by virtue of their range not exceeding the boreal softwood shield. There are mostly mixed-wood species such as Philadelphia Vireo (*Vireo philadelphicus*) and American Redstart (*Setophaga ruticilla*) and fir forest specialists such as Cape May Warbler (*Setophaga tigrina*) that are rare in Labrador, known to be present in small numbers the Happy Valley/Goose Bay region but as of yet unrecorded in the Schefferville area (LIM, 2009).

5 SUMMARY AND CLOSURE

The Study Area is characterized by a well-defined patchwork of varied bird habitats: spruce forests, bare dry ground, scrubland and peatlands. Bird species assemblage and abundance varied between these habitats.

The complete array of bird surveys conducted in the Study Area yielded a total of 66 species: 17 species of waterfowl and other aquatic birds, 4 species of birds of prey, 8 species of shorebirds and 37 species of terrestrial birds. Breeding was confirmed for 23 species of the 66 in total (Appendix H).

Waterfowl density in the Study Area was comparable to published densities from spring surveys at similar latitude, further to the west. However, the species assemblage between the spring and summer surveys differed, with Red-breasted and Common Merganser most common in spring, and American Black Duck and Canada Goose in summer. This may be due to mid-summer movement related to moulting. The most common breeding species were Surf Scoter, American Black Duck and Lesser Scaup, based on the density of broods found.

Birds of prey were not numerous. Osprey was the most frequently found, with four nests recorded, and two nests of Bald Eagle. Red-tailed Hawk was common, but no nests were located.

The most common songbirds in spruce-dominated forests were Dark-eyed Junco, Fox Sparrow, Yellow-rumped Warbler and Ruby-crowned Kinglet. In open terrestrial habitats, White-crowned Sparrow, American Robin, Yellow-rumped Warbler and Fox Sparrow were most abundant. The species with the highest densities in wetland habitats were Savannah Sparrow, Lincoln's Sparrow, American Robin and Rusty Blackbird.

In the case of shorebirds, extensive peatland complexes were the most productive habitat type. Overall, the most common shorebird species in decreasing abundance were Greater Yellowlegs, Least Sandpiper, Wilson's Snipe and Solitary Sandpiper.

Two species at risk were found in the Study Area: Rusty Blackbird and Gray-cheeked Thrush. The former was common in small peatlands and extensive peatland complexes, while the latter was found exclusively in and around post-fire conifer regeneration.

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Appendix A:
Waterfowl and Bird of Prey Aerial Surveys Scientific Research Permit

Newfoundland Labrador

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Dept of Environment & Conservation

Scientific Research Permit

(as under Section 86 of the Wildlife Regulations, Consolidated Newfoundland and Labrador Regulation 1156/96)

Project Title: *Joyce Lake DSO Project – 2012 Avifauna Survey*

Issued to:
Jean-Francois Poulin, Biologist, M.Sc.
GENIVAR INC.
31, avenue Marquette
Baie-Comeau, QC G4Z 1K4
(418) 296-8911 #261

Permit to: Undertake aerial surveys during June 2012 to determine a) the avifauna composition during the breeding season in each habitat type found in the study area; b) the density of breeding pairs for each habitat type surveyed; c) the presence and abundance of any species at risk in the study area.

Dates: June 2-7, 2012. Permit expires July 1, 2012.

Location: Within the Study Area, which includes the area of Labrador located northeast of Schefferville, QC, near Attikamagen Lake. This area is outlined in the map submitted with the permit application.

Conditions:

1) Prior to initiation of surveys, a digital copy of the shape files of all survey routes must be provided to the Wildlife Division, Senior Wildlife Biologist, Habitat Management Program, Kirsten Miller at: kirstenmiller@gov.nl.ca

2) No wildlife species, including the study species, will be harassed. The Wildlife Division advises applicants to operate under established regulations and guidelines with respect to wildlife and wildlife habitat to minimize adverse impacts (Section 106 of the *Wild Life Regulations* under the *Wild Life Act* (O.C. 96-809)).

3) The Project will be conducted using accepted wildlife research techniques and target species will be disturbed as little as possible.

4) Avifauna must not be harassed, injured or killed as the result of activities performed under this permit.

5) Upon completion of the report writing, a copy of the final reports will be remitted to the Wildlife Division, Senior Wildlife Biologist, Habitat Management Program, Kirsten

Miller at: kirstenmiller@gov.nl.ca and Senior Manager, Endangered Species and Biodiversity Program, Shelley Pardy Moores at:shelleypardy@gov.nl.ca by July 10, 2012. In addition, a list of all wildlife sightings and sign with their coordinates will be forwarded to the Wildlife Division after each aerial seasonal survey.

6) Any unusual wildlife observations or any adverse effects observed during this survey are to be reported immediately to the Wildlife Division – Corner Brook.

7) The methods and survey dates described in the application will be followed as closely as possible. Any changes to the survey design or methodology outlined in the initial permit request will require prior approval before implementation.

8) All conditions of this permit must be adhered to and data and results from previous projects submitted to the Wildlife Division prior to another permit being issued.

31 May 2012
Date:

Senior Manager – Habitat, Game and Fur

Wildlife Division
PO Box 2007
Corner Brook, NL A2H 7S1
Ph (709) 637-2383
Fax (709) 637-2004

Appendix B:
Bird Survey Photographs

Photo 1. July 28, 2012. Moulting Canada Goose (banded).

Photo 2. June 3, 2012. Bald Eagle adult at nest near Hollinger Lake.

Photo 3. July 28, 2012. Eaglet at nest near Hollinger Lake (same nest as Photo 2).

Photo 4. July 28, 2012. Eaglet at nest near Gilling River.

Photo 5. May 31, 2012. Osprey adult at nest on a telecommunication tower near the Tshiuetin Railway.

Photo 6. August 24, 2012. Aerial view of a spruce-moss stand.

Photo 7. July 3, 2012. Ground view of a spruce-moss stand.

Photo 8. June 26, 2012. Aerial view of a spruce-lichen stand.

Photo 9. June 29, 2012. Ground view of a spruce-lichen stand.

Photo 10. July 4, 2012. Aerial view of a spruce-shrub stand (above, below and left of pond).

Photo 11. June 26, 2012. Ground view of a spruce-shrub stand.

Photo 12. July 4, 2012. Aerial view of a burn.

Photo 13. July 28, 2012. Ground view of a burn.

Photo 14. June 27, 2012. Ground view of bare dry ground.

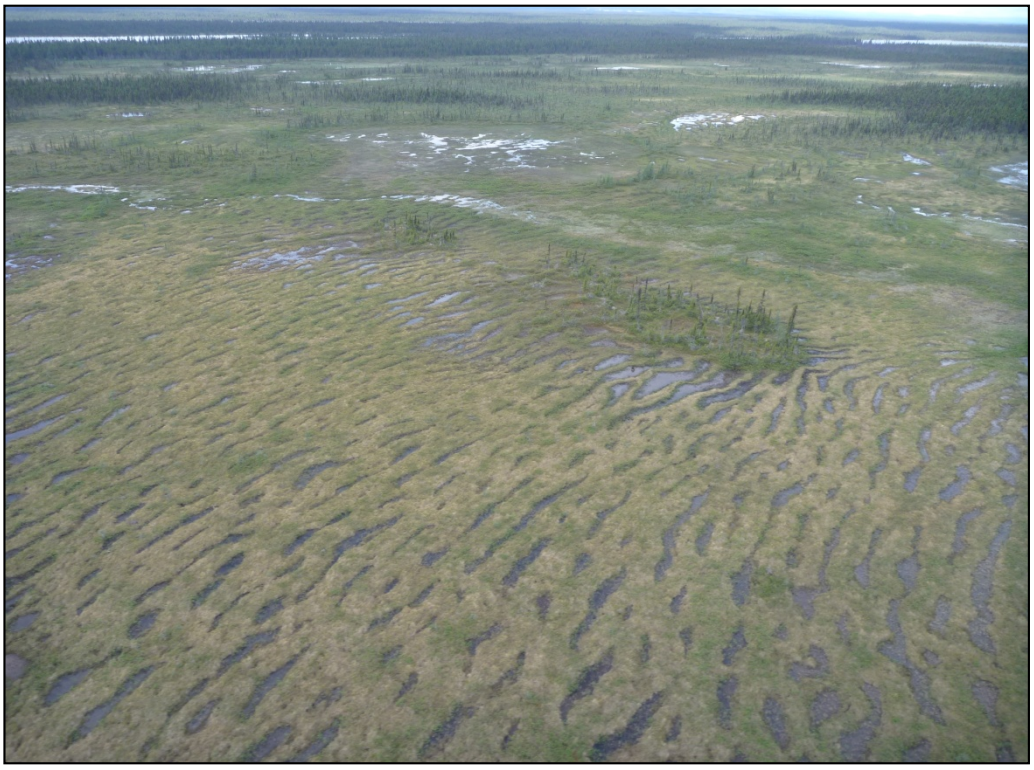

Photo 15. June 26, 2012. Aerial view of a string fen.

Photo 16. June 26, 2012. Ground view of a string fen.

Photo 17. June 27, 2012. Ground view of riparian scrubland.

Photo 18. June 27, 2012. Ground view of a riparian fen.

Appendix C: Weather Conditions Observed During the Waterfowl Breeding Pair and Brood Aerial Surveys

Appendix C: Weather Conditions Observed During the Waterfowl Breeding Pair and Brood Aerial Surveys

Date	Plot	Navigator	Observer	Temperature (°C)	Cloud Cover (%)	Precipitation	Wind Force[1]	Wind Direction	Conditions
Breeding Pair Survey									
2012-05-31	Tshiuetin Connection	Joël Poirier	Simon Duval	10	100	None	5	S	Good
2012-06-03	Road	Joël Poirier	Simon Duval	20	10	None	5	S	Good
2012-06-03	Mine	Joël Poirier	Simon Duval	20	10	None	5	S	Good
2012-06-03	Plant	Joël Poirier	Simon Duval	20	10	None	5	S	Good
Brood Survey									
2012-07-28	Tshiuetin Connection	Joël Poirier	Simon Duval	15	100	None	5	NW	Good
2012-07-28	Road	Joël Poirier	Simon Duval	15	100	None	5	NW	Good
2012-07-28	Mine	Joël Poirier	Simon Duval	17	100	None	5	NW	Good
2012-07-28	Plant	Joël Poirier	Simon Duval	17	100	Slight rain	5	NW	Fair

[1] Wind Force: according to Beaufort scale.

Appendix D: Weather Conditions Observed During Point Counts

Appendix D: Weather Conditions Observed During Point Counts

Point Count	Habitat	Latitude	Longitude	Date	Obs-erver[1]	Start Time	T°	Cloud Cover	Precip-itation	Wind Force	Listening Conditions
BG-01	Bare dry ground	54,90355	-66,53708	2012-06-30	JB	04:35	19	90	-	2	Adequate
BG-02	Bare dry ground	54,90107	-66,52553	2012-07-01	JB	05:05	16	100	-	0	Excellent
BG-03	Bare dry ground	54,86834	-66,57430	2012-06-26	BL	07:03	18	60	-	1	Excellent
BG-04	Bare dry ground	54,86826	-66,57040	2012-06-26	JB	07:38	24	5	-	1	Very good
BG-05	Bare dry ground	54,84342	-66,56411	2012-06-27	BL	04:21	n/a	90	-	0	Excellent
BU-01	Post-fire regeneration	54,76749	-66,58811	2012-07-03	JB	07:40	20	85	-	2	Excellent
BU-02	Post-fire regeneration	54,75386	-66,58115	2012-06-29	JB	07:20	21	5	-	0	Good
BU-03	Post-fire regeneration	54,75379	-66,57727	2012-06-29	JB	07:47	22	50	-	2	Adequate
BU-04	Post-fire regeneration	54,73861	-66,60536	2012-06-29	JB	06:05	18	5	-	0	Adequate
BU-05	Post-fire regeneration	54,73846	-66,59760	2012-06-29	JB	05:10	16	5	-	0	Very good
BU-06	Post-fire regeneration	54,73397	-66,59787	2012-06-29	JB	04:22	16	10	-	0	Very good
BU-07	Post-fire regeneration	54,73389	-66,59399	2012-06-29	BL	06:09	n/a	10	-	0	Excellent
BU-08	Post-fire regeneration	54,68519	-66,63178	2012-07-03	BL	05:54	n/a	100	-	1	Good
SL-01	Spruce-lichen forest	54,88422	-66,59704	2012-07-04	JB	07:05	20	100	-	0	n/a
SL-02	Spruce-lichen forest	54,88366	-66,60170	2012-07-04	BL	07:05	n/a	100	-	0	Good
SL-03	Spruce-lichen forest	54,91020	-66,53277	2012-06-30	BL	05:11	n/a	100	-	0	Good
SL-04	Spruce-lichen forest	54,90796	-66,53291	2012-06-30	BL	04:55	n/a	100	-	0	Excellent
SL-05	Spruce-lichen forest	54,90579	-66,53694	2012-06-30	BL	04:22	n/a	80	-	0	Excellent
SL-06	Spruce-lichen forest	54,90331	-66,52539	2012-07-01	JB	04:21	15	100	-	0	Very good
SL-07	Spruce-lichen forest	54,89882	-66,52567	2012-07-01	BL	04:25	n/a	95	-	0	Adequate
SL-08	Spruce-lichen forest	54,89690	-66,54138	2012-07-01	BL	06:54	n/a	100	-	0	Adequate
SL-09	Spruce-lichen forest	54,89465	-66,54152	2012-07-01	BL	05:50	n/a	100	-	0	Good
SL-10	Spruce-lichen forest	54,89241	-66,54166	2012-07-01	JB	05:50	18	90	-	1	Very good
SL-11	Spruce-lichen forest	54,89008	-66,53790	2012-07-01	JB	07:00	19	80	-	0	Very good
SL-12	Spruce-lichen forest	54,86700	-66,50814	2012-07-04	BL	05:48	n/a	100	-	0	n/a
SL-13	Spruce-lichen forest	54,86692	-66,50424	2012-07-04	BL	05:24	n/a	100	-	0	n/a
SL-14	Spruce-lichen forest	54,86452	-66,49660	2012-06-27	BL	08:39	n/a	100	Light	0	Adequate
SL-15	Spruce-lichen forest	54,86235	-66,50063	2012-06-27	JB	08:25	20	100	Light	0	Adequate
SL-16	Spruce-lichen forest	54,86227	-66,49674	2012-06-27	JB	07:50	20	100	-	0	Good
SL-17	Spruce-lichen forest	54,84566	-66,56397	2012-06-27	BL	04:00	n/a	90	-	0	Adequate
SL-18	Spruce-lichen forest	54,84558	-66,56008	2012-06-27	BL	05:43	n/a	100	-	0	Adequate
SL-19	Spruce-lichen forest	54,84551	-66,55620	2012-06-27	BL	05:23	n/a	100	-	0	Adequate
SL-20	Spruce-lichen forest	54,84326	-66,55633	2012-06-27	BL	05:02	n/a	100	-	0	Excellent
SL-21	Spruce-lichen forest	54,77639	-66,58369	2012-07-03	BL	07:45	20	70	-	0	Adequate
SL-22	Spruce-lichen forest	54,73165	-66,59412	2012-06-29	BL	05:50	n/a	10	-	0	Excellent
SL-23	Spruce-lichen forest	54,68984	-66,63927	2012-07-03	JB	05:48	17	100	-	2	Excellent
SL-24	Spruce-lichen forest	54,65160	-66,63761	2012-07-03	BL	04:59	n/a	50	-	0	Excellent
SL-25	Spruce-lichen forest	54,64965	-66,65323	2012-07-02	JB	07:02	18	100	-	0	Excellent
SL-26	Spruce-lichen forest	54,64958	-66,64936	2012-07-02	BL	06:57	20	100	-	0	Adequate
SL-27	Spruce-lichen forest	54,64741	-66,65336	2012-07-02	JB	08:00	18	100	Light	0	Good
SL-28	Spruce-lichen forest	54,64726	-66,64562	2012-07-02	BL	07:36	n/a	100	Very light	0	Adequate
SM-01	Spruce-moss forest	54,91718	-66,55097	2012-07-04	JB	07:43	20	90	-	0	n/a
SM-02	Spruce-moss forest	54,91261	-66,54043	2012-06-30	BL	06:09	n/a	90	-	0	Good
SM-03	Spruce-moss forest	54,91253	-66,53653	2012-06-30	BL	05:50	n/a	90	-	0	n/a
SM-04	Spruce-moss forest	54,91036	-66,54056	2012-06-30	BL	06:25	n/a	90	-	0	Adequate
SM-05	Spruce-moss forest	54,91028	-66,53667	2012-06-30	BL	05:29	n/a	100	-	0	Good

Point Count	Habitat	Latitude	Longitude	Date	Obs-erver	Start Time	T°	Cloud Cover	Precip-itation	Wind Force	Listening Conditions
SM-06	Spruce-moss forest	54,90804	-66,53680	2012-06-30	BL	04:38	n/a	90	-	0	Excellent
SM-07	Spruce-moss forest	54,90131	-66,53722	2012-06-30	JB	05:12	n/a	85	-	0	Adequate
SM-08	Spruce-moss forest	54,89874	-66,52177	2012-07-01	BL	04:45	n/a	95	-	0	Good
SM-09	Spruce-moss forest	54,89682	-66,53749	2012-07-01	BL	06:32	n/a	100	-	0	Adequate
SM-10	Spruce-moss forest	54,89457	-66,53763	2012-07-01	BL	06:10	n/a	100	-	0	Adequate
SM-11	Spruce-moss forest	54,89016	-66,54179	2012-07-01	JB	06:23	18	100	-	1	Very good
SM-12	Spruce-moss forest	54,86684	-66,50035	2012-07-04	BL	06:14	n/a	90	-	1	n/a
SM-13	Spruce-moss forest	54,86617	-66,57832	2012-06-26	BL	08:00	n/a	50	-	0	Adequate
SM-14	Spruce-moss forest	54,86468	-66,50438	2012-06-27	BL	07:57	n/a	100	Light	0	Adequate
SM-15	Spruce-moss forest	54,86460	-66,50049	2012-06-27	BL	07:39	n/a	100	-	0	Adequate
SM-16	Spruce-moss forest	54,86243	-66,50452	2012-06-27	BL	08:15	n/a	100	Light	0	Adequate
SM-17	Spruce-moss forest	54,85023	-66,56759	2012-06-27	JB	05:40	20	95	-	0	Adequate
SM-18	Spruce-moss forest	54,85015	-66,56370	2012-06-27	JB	04:50	18	100	-	0	Adequate
SM-19	Spruce-moss forest	54,84798	-66,56773	2012-06-27	JB	06:30	20	90	-	0	Adequate
SM-20	Spruce-moss forest	54,84791	-66,56384	2012-06-27	JB	04:06	18	100	-	0	Adequate
SM-21	Spruce-moss forest	54,84334	-66,56022	2012-06-27	BL	04:42	n/a	100	-	0	Excellent
SM-22	Spruce-moss forest	54,84318	-66,55244	2012-07-04	BL	03:55	n/a	100	-	0	Excellent
SM-23	Spruce-moss forest	54,84310	-66,54855	2012-07-04	BL	04:23	n/a	100	-	0	Good
SM-24	Spruce-moss forest	54,84101	-66,55647	2012-07-04	JB	04:25	16	100	-	0	n/a
SM-25	Spruce-moss forest	54,84094	-66,55258	2012-07-04	JB	03:55	15	100	-	0	n/a
SM-26	Spruce-moss forest	54,77863	-66,58356	2012-06-29	BL	07:09	n/a	10	-	1	Good
SM-27	Spruce-moss forest	54,73173	-66,59800	2012-06-29	BL	04:33	n/a	0	-	0	Excellent
SM-28	Spruce-moss forest	54,72956	-66,60201	2012-06-29	BL	04:59	n/a	0	-	0	Excellent
SM-29	Spruce-moss forest	54,70719	-66,60721	2012-07-03	BL	06:32	n/a	100	-	0	Adequate
SM-30	Spruce-moss forest	54,70711	-66,60334	2012-07-03	JB	06:34	18	95	Very light	0	n/a
SM-31	Spruce-moss forest	54,70494	-66,60735	2012-07-03	BL	06:51	n/a	100	-	0	Adequate
SM-32	Spruce-moss forest	54,65399	-66,64523	2012-07-03	JB	04:13	14	95	-	0	n/a
SM-33	Spruce-moss forest	54,65392	-66,64135	2012-07-03	JB	03:50	n/a	100	-	2	n/a
SM-34	Spruce-moss forest	54,65175	-66,64536	2012-07-03	JB	04:47	15	40	-	0	Excellent
SM-35	Spruce-moss forest	54,65167	-66,64148	2012-07-03	BL	03:50	15	100	-	1	Excellent
SM-36	Spruce-moss forest	54,64973	-66,65710	2012-07-02	JB	07:30	19	100	Very light	0	Excellent
SM-37	Spruce-moss forest	54,64951	-66,64549	2012-07-02	BL	07:15	20	100	-	0	Good
SM-38	Spruce-moss forest	54,64943	-66,64161	2012-07-03	BL	04:12	n/a	90	-	0	Excellent
SM-39	Spruce-moss forest	54,64935	-66,63774	2012-07-03	BL	04:35	n/a	40	-	1	n/a
SS-01	Shrubland	54,90099	-66,52164	2012-07-01	BL	05:09	n/a	100	-	1	n/a
SS-02	Shrubland	54,86842	-66,57819	2012-06-26	BL	07:39	18	50	-	0	Good
SS-03	Shrubland	54,86610	-66,57443	2012-06-26	BL	08:25	n/a	40	-	0	Adequate
SS-04	Shrubland	54,85208	-66,54801	2012-07-04	JB	05:15	17	100	-	2	n/a
SS-05	Shrubland	54,84984	-66,54814	2012-07-04	JB	05:45	19	100	-	0	n/a
WE-01	Wetland	54,72940	-66,59426	2012-06-29	BL	05:22	n/a	10	-	0	Excellent

[1] BL: Benoît Laliberté; JB: Jacques Bouvier; n/a = not available

Appendix E:
Habitat Characteristics at Point Count Stations

Appendix E: Habitat Characteristics at Point Count Stations

Point Count	Habitat	Stand Characteristics[1]				Tree Stratum			Shrub Stratum					Herbaceous Stratum		Ground Cover (%)								
		Density	Height	Snags >30cm dbh[3]	Snags 10-30cm dbh[3]	Total cover (%)	Species[2]	Cover (%)	Total cover (%)	Heath	Shrubs	Species[2]	Cover (%)	Total cover (%)	Species[2]	Moss	Sphagnum	Lichen	Litter	Bare/Rock	Organic Matter	Water	Other	Woody Debris
BG-01	Bare dry ground	E	4	0	+	5	PIMA	5	50	0	50	BEGL	50					15	5	80				
BG-02	Bare dry ground	-	-	0	0				15	0	15	PIMA	10					30		70				
												LALA	5											
BG-03	Bare dry ground	-	-	0	0				30	0	30	BEGL	30	60	UNKN					40				
BG-04	Bare dry ground			0	0				5	0	5	ALNU	2	25	EMNI			20	5	50				
												PIMA	2											
												BEGL	1											
BG-05	Bare dry ground	E	5	0	0	10	PIMA	10	10	0	10	UNKN	10					40		50		10		
BU-01	Post-fire conifer regeneration	-	-	+++	+				50	0	50	BEGL	50					100						+++
BU-02	Post-fire conifer regeneration	D	4	0	0	40	PIMA	40	40	30	10	RHGR	30			80			10	10				
												PIMA	10											
BU-03	Post-fire conifer regeneration	E	4	0	0	10	PIMA	10	20	10	10	RHGR	10				45	50		5				
												BEGL	10											
BU-04	Post-fire conifer regeneration	-	-	0	+++	5	PIMA	5	40	10	30	BEGL	30			60		20	15	5				
												RHGR	10											
BU-05	Post-fire conifer regeneration	-	-	0	+++				50	10	40	BEGL	40			70		15	10	5				
												RHGR	10											
BU-06	Post-fire conifer regeneration	-	-	0	+				20	0	20	BEGL	20	5	GRASS	40		40	10	10				++
BU-07	Post-fire conifer regeneration	-	-	0	0				30	10	20	PIMA	5	80	VACC	80			20					
												BEGL	15											
												RHGR	10											
BU-08	Post-fire conifer regeneration	-	-	0	+++				30	5	25	BEGL	25	5	UNKN	30		40			15			15
												RHGR	5											
SL-01	Spruce-lichen forest	E	4	+	++	15	PIMA	15	70	10	60	BEGL	50			50		50						++
												PIMA	10											
												RHGR	10											
SL-02	Spruce-lichen forest	E	5	0	0	10	PIMA	10	10	0	10	PIMA	5	10	COCA			75		10	15			
												LALA	5											
SL-03	Spruce-lichen forest	E	4	0	0	20	PIMA	10	40	10	30	RHGR	10	5	UNKN	40		60						
							LALA	10				BEGL	15											
												SALIX	15											
SL-04	Spruce-lichen forest	E	4	0	0	20	PIMA	20	20	5	15	RHGR	5	5	UNKN	10		90						
												BEGL	15											
SL-05	Spruce-lichen forest	E	6	0	0	5	PIMA	5	60	10	50	PIMA	10	30	VACC	30		70						
												BEGL	30											
												RHGR	10											
SL-06	Spruce-lichen forest	E	4	0	0	20	LALA	5	80	10	70	BEGL	60	10	GRASS	30	60					10		
							PIMA	15				ALNU	10											
												RHGR	10											
SL-07	Spruce-lichen forest	E	4	0	0	10	PIMA	10	10	0	10	BEGL	10	10	VACC	10			90					
SL-08	Spruce-lichen forest	E	3	2	1	25	PIMA	25	60	0	60	SALIX	15	50	COCA, EQUI	100								10
												BEGL	45											
SL-09	Spruce-lichen forest	E	5	0	0	15	PIMA	15	20	5	15	BEGL	15	5	VACC, COCA	20			80					
												RHGR	5											
SL-10	Spruce-lichen forest	D	4	0	0	35	PIMA	35	40	10	30	RHGR	10			20		80						5
												BEGL	30											
SL-11	Spruce-lichen forest	E	4	0	+	20	PIMA	20	40	10	30	RHGR	10				60	40						5
												BEGL	20											
												PIMA	10											
SL-12	Spruce-lichen forest	E	4	0	0	20	PIMA	20	20	10	10	BEGL	10	10	VACC	30		70						
												RHGR	10											

Point Count	Habitat	Stand Characteristics[1]				Tree Stratum			Shrub Stratum					Herbaceous Stratum		Ground Cover (%)								
		Density	Height	Snags >30cm dbh[3]	Snags 10-30cm dbh[3]	Total cover (%)	Species[2]	Cover (%)	Total cover (%)	Heath	Shrubs	Species[2]	Cover (%)	Total cover (%)	Species[2]	Moss	Sphagnum	Lichen	Litter	Bare/Rock	Organic Matter	Water	Other	Woody Debris
SL-13	Spruce-lichen forest	E	4	0	0	20	PIMA	20	10	0	10	BEGL	10	10	VACC	10		90						
SL-14	Spruce-lichen forest	E	5	0	0	10	PIMA	10	60	0	60	BEGL	60			30		70						
SL-15	Spruce-lichen forest	E	2	0	0	15	PIMA	15	40	20	20	BEGL	20				70	30						
												RHGR	20											
SL-16	Spruce-lichen forest	E	4	0	0	15	PIMA	15	80	20	60	RHGR	20	5	COCA	80	15		5					
												BEGL	50											
												PIMA	8											
SL-17	Spruce-lichen forest	E	5	0	0	10	PIMA	10	10	10		RHGR	10	30	UNKN		60						10	
SL-18	Spruce-lichen forest	E	5	0	0	20	PIMA	20	15	5	10	RHGR	10			20		80						
												BEGL	5											
SL-19	Spruce-lichen forest	E	5	0	+	20	PIMA	20	60	20	40	RHGR	20	90	UNKN	5						5		
												BEGL	20											
												Others	20											
SL-20	Spruce-lichen forest	E	5	1	0	20	PIMA	20	16	8	8	RHGR	8		VACC, COCA	20		80						
												BEGL	4											
												PIMA	4											
SL-21	Spruce-lichen forest	-	-	+++	+++				30	0	30	PIMA	30					80		5	15			10
SL-22	Spruce-lichen forest	E	6	0	+++	10	PIMA	10	20	10	10	LALA	5		VACC	40		60						
												PIMA	5											
												RHGR	10											
SL-23	Spruce-lichen forest	E	4	+	++	10	PIMA	10	40	0	40	PIMA	10			90		10						++
							LALA	1				BEGL	20											
												LALA	10											
SL-24	Spruce-lichen forest	E	4	0	5	20	PIMA	20	40	10	30	BEGL	30	70	GRASS, EQUI	30						5		
												RHGR	10											
SL-25	Spruce-lichen forest	D	3	0	0	40	PIMA	40	40	5	35	PIMA	20			20		80						
												BEGL	15											
SL-26	Spruce-lichen forest	E	3	0	0	10	PIMA	10										100						
SL-27	Spruce-lichen forest	E	5	0	0				20	0	20	PIMA	20					90		10				
SL-28	Spruce-lichen forest	-	-	0	0																			
SM-01	Spruce-moss forest	-	-	0	+				90	50	50	PIMA	50	20	EQUI	90						10		+
												MYGA	40											
												RHGR	10											
SM-02	Spruce-moss forest	D	4	0	0	30	PIMA	30	80	70	10	RHGR	70	90	VACC	100								
												SALIX	5											
												LALA	5											
SM-03	Spruce-moss forest	E	5	0	0	20	PIMA	20	20	0	20	BEGL	20	5	UNKN			90			10			
SM-04	Spruce-moss forest	E	4	0	0	20	PIMA	20	80	30	50	RHGR	30			100								5
												BEGL	50											
SM-05	Spruce-moss forest	D	5	0	0	40	PIMA	40	40	40	0	RHGR	40	10	RUCH	90					10			
SM-06	Spruce-moss forest	E	5	1	+	25	PIMA	25	40	10	30	RHGR	10		VACC	90			10					
												BEGL	30											
SM-07	Spruce-moss forest	D	4	0	+	10	PIMA	10	80	20	60	BEGL	45	15	VACC, COCA		90	5	5					++
												PIMA	10											
												LALA	5											
SM-08	Spruce-moss forest	E	4	0	0	10	PIMA	10	50	0	50	BEGL	50	40	VACC	95		5						
SM-09	Spruce-moss forest	E	3	0	0	20	PIMA	20	70	15	55	RHGR	15	20	COCA	100								10
												ALNU	55											
SM-10	Spruce-moss forest	E	3	6	2	20	PIMA	20	5	0	5	BEGL	5	10	VACC	100								
SM-11	Spruce-moss forest	D	4	0	0	30	PIMA	30	80	10	70	BEGL	70			50		50						
												RHGR	10											

Appendix E: Habitat Characteristics at Point Count Stations (cont'd)

Point Count	Habitat	Stand Characteristics[1]				Tree Stratum			Shrub Stratum					Herbaceous Stratum		Ground Cover (%)								
		Density	Height	Snags >30cm dbh[3]	Snags 10-30cm dbh[3]	Total cover (%)	Species[2]	Cover (%)	Total cover (%)	Heath	Shrubs	Species[2]	Cover (%)	Total cover (%)	Species[2]	Moss	Sphagnum	Lichen	Litter	Bare/Rock	Organic Matter	Water	Other	Woody Debris
SM-12	Spruce-moss forest	E	5	0	0	10	PIMA	10	90	10	80	BEGL	80	80	VACC, COCA	100								
												RHGR	10											
SM-13	Spruce-moss forest	D	4	0	0	20	PIMA	20	30	15	15	BEGL	10	20	VACC, EMNI	40		60						
												RHGR	15											
												SALIX	5											
SM-14	Spruce-moss forest	E	4	0	0	20	PIMA	20	50	25	25	RHGR	25	50	GRASS	100								
												ALNU	25											
SM-15	Spruce-moss forest	E	5	0	+	20	PIMA	20	60	10	50	BEGL	50	30	VACC	100								
												RHGR	10											
SM-16	Spruce-moss forest	E	4	0	0	10	PIMA	10	60	15	45	SALIX	25	30	VACC	100								
												BEGL	20											
												RHGR	15											
SM-17	Spruce-moss forest	C	4	0	0	40	PIMA	30	50	10	40	ALNU	40	50	CAREX		100							
							LALA	10				BEGL	5											
												PIMA	2											
SM-18	Spruce-moss forest	D	3	0	0	40	PIMA	40	30	10	20	KAAN	10	50	COCA		90	2	3			5		
												PIMA	10											
												BEGL	10											
SM-19	Spruce-moss forest	D	4	0	0	30	PIMA	28	50	15	35	SALIX	20	80	LYCO, EQUI	10	70	20						
							LALA	2				RHGR	15											
												PIMA	5											
SM-20	Spruce-moss forest	B	5	0	0	80	PIMA	75	15	5	10	RHGR	5	30	CAREX	90		5	5					
							LALA	5				PIMA	5											
												BEGL	5											
SM-21	Spruce-moss forest	E	5	0	0	10	PIMA	10	50	30	20	RHGR	30	10	RUCH		90							
												PIMA	10											
												Others	10											
SM-22	Spruce-moss forest	E	3	0	0	20	PIMA	20	40	10	30	BEGL	30	40	COCA	95		5						
												RHGR	10											
SM-23	Spruce-moss forest	E	4	0	0	15	PIMA	15	60	10	50	BEGL	50			50		50						
												RHGR	10											
SM-24	Spruce-moss forest	D	4	0	+	30	PIMA	30	60	10	50	PIMA	20	10	VACC	10	40	50						+
												BEGL	20											
												SALIX	10											
SM-25	Spruce-moss forest	D	4	+	+	30	PIMA	30	50	10	40	BEGL	30	90	CAREX	90						10		+
												RHGR	10		GRASS									
SM-26	Spruce-moss forest	E	6	0	0	5	PIMA	5	10	0	10	BEGL	10					90		10				
SM-27	Spruce-moss forest	D	4	0	0	25	PIMA	25	25	5	20	SALIX	20	50	UNKN	90						10		
												RHGR	5											
SM-28	Spruce-moss forest	D	5	0	+	25	PIMA	25	30	5	25	RHGR	5	30	VACC	90		10						
												SALIX	20											
												PIMA	5											
SM-29	Spruce-moss forest	E	3	1	5	20	PIMA	20	20	10	10	PIMA	10	40	VACC	100								5
												RHGR	10											
SM-30	Spruce-moss forest	D	4	+	++	30	PIMA	30	60	5	55	PIMA	15	10	EQUI	100								
												SALIX	10											
												ABBA	10											
SM-31	Spruce-moss forest	E	4	3	6	10	PIMA	10	20	5	15	RHGR	5	20	VACC	80		20						5
												BEGL	15											
SM-32	Spruce-moss forest	D	4	0	0	30	PIMA	30	40	10	30	PIMA	15			60			40					+
												BEGL	15											
SM-33	Spruce-moss forest	D	4	0	0	20	PIMA	20	40	10	30	BEGL	30			50		50						+

Point Count	Habitat	Stand Characteristics[1]				Tree Stratum			Shrub Stratum					Herbaceous Stratum		Ground Cover (%)								
		Density	Height	Snags >30cm dbh[3]	Snags 10-30cm dbh[3]	Total cover (%)	Species[2]	Cover (%)	Total cover (%)	Heath	Shrubs	Species[2]	Cover (%)	Total cover (%)	Species[2]	Moss	Sphagnum	Lichen	Litter	Bare/Rock	Organic Matter	Water	Other	Woody Debris
												RHGR	10											
SM-34	Spruce-moss forest	D	4	+	+	40	PIMA	40	20	0	20	PIMA	10			50		50						++
												BEGL	10											
SM-35	Spruce-moss forest	E	5	0	0	10	PIMA	10	60	5	55	BEGL	55			60		30			10			
												RHGR	5											
SM-36	Spruce-moss forest	C	4	0	0	50	PIMA	50	50	10	40	PIMA	40			50		50						+
												BEGL	10											
SM-37	Spruce-moss forest	E	5	1	3	10	PIMA	10	5	0	5	BEGL	5	5	VACC	60		40						
SM-38	Spruce-moss forest	D	4	0	0	20	PIMA	20	20	0	20	PIMA	10			100								
												BEGL	10											
SM-39	Spruce-moss forest	D	4	1	0	25	PIMA	25	20	0	20	PIMA	10			75		25						
												BEGL	10											
SS-01	Shrubland	E	5	0	0	10	PIMA	10	90	0	90	ALNU	90			20			80					
SS-02	Shrubland	D	4	0	0	20	PIMA	20	100	0	100	ALNU	100			10			90					
SS-03	Shrubland	C	4	0	0	15	PIMA	15	100	0	100	ALNU	100	10	RIBES	10			30					
SS-04	Shrubland	-	-	0	0				70	5	65	PIMA	40	5	LYCO	35		60						
												BEGL	25											
												RHGR	5											
SS-05	Shrubland	C	4	+	0	60	PIMA	60	80	5	75	BEGL	65	50	LYCO		100							
												PIMA	5		COCA									
												ALNU	5											
WE-01	Wetland	-	-	0	0				30	0	30	BEGL	30	60	GRASS							40		

[1] Density: A: 80-100 %; B: 60-80 %; C: 40-60 %; D: 20-40 %. Height: 1 : >22 m; 2 : 17-22 m; 3 : 12-17 m; 4 : 7-12 m; 5 : 4-7 m; 6 : 2-4 m.

[2] Species: ABBA: Balsam fir; ALNU: alder sp.; BEGL: dwarf birch; CAREX: *Carex sp.;* COCA: bunchberry; EMNI: black crowberry; EQUI: horsetails; GRASS: grasses; KAAN: sheep laurel; LALA: tamarack; LYCO: club-mosses; MYGA: sweet gale; PIMA: black spruce; RIBES: black currant; RHGR: Labrador tea; RUCH: cloudberry; SALIX: willow sp.; UNKN: unknown; VACC: Vaccinium sp.

[3] dbh = Diameter at breast height

Appendix F: Weather Conditions Observed During Wetland Transects (Abundance Indices)

Appendix F: Weather Conditions Observed During Wetland Transects (Abundance Indices)

Transect	Habitat	Method	Area covered (in ha)	Observers[1]	Date	Start Time	End Time	Cloud Cover	Precipitation	Wind Force	Wind Origin	Listening Conditions
SP-01	Small peatland	Complete survey	1.5	BL	2012-06-27	06:01	06:08	100	0	0	-	Good
SP-02	Small peatland	Transect - 200 m buffer	6.1	BL	2012-06-29	08:47	09:07	50	0	2	E	Good
SP-03	Small peatland	Transect - 200 m buffer	5.4	BL	2012-06-29	09:34	09:48	50	0	2	SE	Good
SP-04	Small peatland	Complete survey	6.3	BL	2012-06-30	09:00	09:10	100	0	2	S	Good
SP-05	Small peatland	Transect - 200 m buffer	3.7	BL	2012-06-30	08:14	08:32	90	0	1	S	Good
SP-06	Small peatland	Complete survey	1.9	BL	2012-07-04	07:23	07:28	100	0	1	-	Excellent
SP-07	Small peatland	Transect - 100 m buffer	2.1	JB	2012-06-30	08:20	08:40	70	0	2	S	Excellent
SP-08	Small peatland	Transect - 200 m buffer	9.7	BL	2012-07-03	16:10	16:20	60	0	0	-	Adequate
EP-01	Extensive peatland complex	Transect - 200 m buffer	32.2	BL + JB	2012-06-26	09:20	10:20	50	0	1	NW	Excellent
EP-02	Extensive peatland complex	Transect - 200 m buffer	38.6	BL + JB	2012-07-01	07:40	08:26	100	0	2	S	Good
EP-03	Extensive peatland complex	Transect - 200 m buffer	25.7	BL + JB	2012-07-01	08:36	09:03	100	0	2	S	Good
EP-04	Extensive peatland complex	Complete survey	10.4	BL + JB	2012-07-02	04:30	06:30	100	0	0	-	Good
EP-05	Extensive peatland complex	Transect - 200 m buffer	13.3	BL	2012-07-03	14:43	15:08	40	0	1	W	n/a
EP-06	Extensive peatland complex	Transect - 200 m buffer	31.9	BL	2012-07-04	13:55	14:21	90	0	0	-	Good
SS-01	Shrub swamp	Transect - 200 m buffer	26.6	BL + JB	2012-06-27	09:20	10:30	100	Light shower	1	E	Good
SS-02	Shrub swamp	Transect - 100 m buffer	1.9	JB	2012-06-30	07:28	07:53	90	0	3	S	Excellent
SS-03	Shrub swamp	Transect - 200 m buffer	1.3	BL	2012-06-30	07:24	07:44	95	0	1	-	Good
SS-04	Shrub swamp	Transect - 200 m buffer	5.8	BL	2012-07-03	15:24	15:40	-	-	-	-	n/a

[1] BL: Benoît Laliberté; JB: Jacques Bouvier

Appendix G:
Habitat Characteristics of Surveyed Wetlands

Appendix G: Habitat Characteristics of Surveyed Wetlands

Transect	Wetland Habitat Type	Ground Cover (%)					Islets	Exposed Rocks	Presence of Snags	Water Body Width	Riparian Strip	
		Water	Grasses	Sphagnum	Heath	Shrubs					Width (m)	Main Species[1]
SP-01	Small peatland	25	75	-	-	-	n/a	n/a	n/a	-	-	-
SP-02	Small peatland	30	40	-	30	-	Yes	No	No	-	-	-
SP-03	Small peatland	30	30	-	40	-	No	No	No	-	-	-
SP-04	Small peatland	20	80	-	-	-	No	No	No	-	-	-
SP-05	Small peatland	5	95	-	-	-	n/a	n/a	Yes	-	-	-
SP-06	Small peatland	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-
SP-07	Small peatland	10	40	40	-	10	No	No	Yes	-	-	-
SP-08	Small peatland	n/a	n/a	n/a	n/a	n/a	No	No	Yes	-	-	-
EP-01	Extensive peatland complex	40	40	-	20	-	n/a	n/a	n/a	-	-	-
EP-02	Extensive peatland complex	10	60	-	30	-	Yes	No	No	-	-	-
EP-03	Extensive peatland complex	10	60	-	30	-	Yes	No	No	-	-	-
EP-04	Extensive peatland complex	-	60	40	-	-	No	No	Yes	-	-	-
EP-05	Extensive peatland complex	20	60	20	-	-	No	No	No	-	-	-
EP-06	Extensive peatland complex	20	60	20	-	-	No	No	Yes	-	-	-
SS-01	Shrub swamp	-	-	-	-	-	-	-	Yes	1 to 40m	100m	SALIX, BEGL
SS-02	Shrub swamp	-	-	-	-	-	-	-	No	n/a	2 m	ALNU, SALIX
SS-03	Shrub swamp	-	-	-	-	-	-	-	No	Variable	5 m	SALIX, ALNU
SS-04	Shrub swamp	-	-	-	-	-	-	-	n/a	n/a	n/a	SALIX

[1] ALNU: alders; BEGL: dwarf birch; SALIX: willow shrubs
Note: n/a = not available

Appendix H: List of Bird Species Encountered during Surveys, with Notes on Breeding Status

Appendix H: List of Bird Species Encountered during Surveys, with Notes on Breeding Status

Group	Common Name	Scientific Name	Migratory Bird[a]	Breeding Status
Waterfowl				
	Canada Goose	*Branta canadensis*	x	CO
	American Black Duck	*Anas rubripes*	x	CO
	Mallard	*Anas platyrhynchos*	x	PO
	Northern Pintail	*Anas acuta*	x	PO
	Green-winged Teal	*Anas crecca*	x	PO
	Ring-necked Duck	*Aythya collaris*	x	CO
	Lesser Scaup	*Aythya affinis*	x	CO
	Surf Scoter	*Melanitta perspicillata*	x	CO
	White-winged Scoter	*Melanitta fusca*	x	CO
	Bufflehead	*Bucephala albeola*	x	PR
	Common Goldeneye	*Bucephala clangula*	x	CO
	Hooded Merganser	*Lophodytes cucullatus*	x	PR
	Common Merganser	*Mergus merganser*	x	PR
	Red-breasted Merganser	*Mergus serrator*	x	PR
Other aquatic birds				
	Common Loon	*Gavia immer*	x	CO
	Herring Gull	*Larus argentatus*	x	CO
	Tern sp. (Common/Arctic)	*Sterna sp. (hirundo/paradisaea)*	x	PO
Birds of prey				
	Osprey	*Pandion haliaetus*		CO
	Bald Eagle	*Haliaeetus leucocephalus*		CO
	Red-tailed Hawk	*Buteo jamaicensis*		PR
	Great Horned Owl	*Bubo virginianus*		PO
Shorebirds				
	Spotted Sandpiper	*Actitis macularius*	x	PR
	Solitary Sandpiper	*Tringa solitaria*	x	CO
	Greater Yellowlegs	*Tringa melanoleuca*	x	CO
	Lesser Yellowlegs	*Tringa flavipes*	x	CO
	Least Sandpiper	*Calidris minutilla*	x	CO
	Short-billed Dowitcher	*Limnodromus griseus*	x	PR
	Wilson's Snipe	*Gallinago delicata*	x	PO
	Red-necked Phalarope	*Phalaropus lobatus*	x	PO
Terrestrial birds				
	Spruce Grouse	*Falcipennis canadensis*		CO
	American Three-toed Woodpecker	*Picoides dorsalis*	x	PO
	Northern Flicker	*Colaptes auratus*	x	PO
	Yellow-bellied Flycatcher	*Empidonax flaviventris*	x	PO
	Alder Flycatcher	*Empidonax alnorum*	x	PO
	Northern Shrike	*Lanius excubitor*	x	PO
	Red-eyed Vireo	*Vireo olivaceus*	x	PO
	Gray Jay	*Perisoreus canadensis*		CO
	Common Raven[b]	*Corvus corax*		PR
	Tree Swallow	*Tachycineta bicolor*	x	PO
	Boreal Chickadee	*Poecile hudsonicus*	x	PO
	Red-breasted Nuthatch	*Sitta canadensis*	x	PO
	Ruby-crowned Kinglet	*Regulus calendula*	x	CO
	Gray-cheeked Thrush	*Catharus minimus*	x	PO
	Swainson's Thrush	*Catharus ustulatus*	x	CO
	Hermit Thrush	*Catharus guttatus*	x	PO
	American Robin	*Turdus migratorius*	x	CO

Group	Common Name	Scientific Name	Migratory Bird[a]	Breeding Status
	Cedar Waxwing	*Bombycilla cedrorum*	x	PO
	Snow Bunting	*Plectrophenax nivalis*	x	X
	Northern Waterthrush	*Parkesia noveboracensis*	x	PO
	Tennessee Warbler	*Oreothlypis peregrina*	x	PO
	Orange-crowned Warbler	*Oreothlypis celata*	x	PO
	Yellow Warbler	*Setophaga petechia*	x	PO
	Blackpoll Warbler	*Setophaga striata*	x	CO
	Yellow-rumped Warbler	*Setophaga coronata*	x	PR
	Wilson's Warbler	*Cardellina pusilla*	x	PR
	Savannah Sparrow	*Passerculus sandwichensis*	x	PR
	Fox Sparrow	*Passerella iliaca*	x	PR
	Lincoln's Sparrow	*Melospiza lincolnii*	x	PR
	Swamp Sparrow	*Melospiza georgiana*	x	PR
	White-throated Sparrow	*Zonotrichia albicollis*	x	PO
	White-crowned Sparrow	*Zonotrichia leucophrys*	x	PR
	Dark-eyed Junco	*Junco hyemalis*	x	CO
	Rusty Blackbird	*Euphagus carolinus*	x	CO
	Pine Grosbeak	*Pinicola enucleator*	x	PO
	White-winged Crossbill	*Loxia leucoptera*	x	PO
	Pine Siskin	*Spinus pinus*	x	PO

[a] Migratory bird under the Migratory Birds Convention Act.

[b] Treated with birds of prey due to similar nesting habits.

Legend (Breeding Status):

X: No breeding evidence found; likely on migration

PO: Breeding possible

PR: Breeding probable

CO: Breeding confirmed

Appendix I: Records of Species at Risk and of Conservation Concern and Habitat Use in the Study Area

Appendix I: Records of Species at Risk and of Conservation Concern and Habitat Use in the Study Area

Group	Common Name	Scientific Name	Legal At-Risk Status	Habitat Use in Study Area	LIM, 2009[a]	NML, 2009[b]	Groupe Hémisphères 2008[c]	BBS[d]	eBird[e]	QBBA[f]
Waterfowl										
	Canada Goose (Atlantic)	*Branta canadensis*		Uncommon in spring on small lakes; common in moult on lakes 10-100 ha	x	x	x	x	x	x
	American Black Duck	*Anas rubripes*		Uncommon breeder on large lakes; common in moult on lakes 10-100 ha	x	x	x	x	x	x
	Northern Pintail	*Anas acuta*		Rare in moult in peatlands		x		x	x	x
	Lesser Scaup	*Aythya affinis*		Common on ponds and small lakes, especially bordering peatlands			x		x	
	Black Scoter	*Melanitta americana*				x				
	Surf Scoter	*Melanitta perspicillata*		Uncommon throughout. Prefers clear, rocky lakes of various sizes.		x		x	x	x
	White-winged Scoter	*Melanitta fusca*		Common spring migrant; uncommon breeder on ponds and small lakes	x		x			x
	Common Goldeneye	*Bucephala clangula*		Uncommon on small lakes and ponds	x	x	x	x	x	x
	Bufflehead	*Bucephala albeola*		Lone male on brook in spring						x
	Hooded Merganser	*Lophodytes cucullatus*		One pair on small lake				x		x
	Harlequin Duck	*Histrionicus histrionicus*	Canada + NL		x				x	x
Birds of prey										
	American Kestrel	*Falco sparverius*							x	
	Merlin	*Falco columbarius*						x	x	x
	Peregrine Falcon	*Falco peregrinus*	Canada + NL						x	
	Short-eared Owl	*Asio flammeus*	Canada + NL							
Shorebirds										
	Semipalmated Plover	*Charadrius semipalmatus*			x	x	x	x	x	x
	Spotted Sandpiper	*Actitis macularius*		Fairly common in shrub swamp, river and lake edges	x	x	x	x	x	x
	Solitary Sandpiper	*Tringa solitaria*		Fairly common in small & extensive (mostly) peatlands	x		x	x	x	x
	Greater Yellowlegs	*Tringa melanoleuca*		Common; small & extensive (mostly) peatlands and shrub swamp	x	x		x	x	x
	Lesser Yellowlegs	*Tringa flavipes*		Locally fairly common in most extensive peatland complex						
	Least Sandpiper	*Calidris minutilla*		Common in extensive peatland complexes	x			x	x	x

Group	Common Name	Scientific Name	Legal At-Risk Status	Habitat Use in Study Area	LIM, 2009[a]	NML, 2009[b]	Groupe Hémisphères 2008[c]	BBS[d]	eBird[e]	QBBA[f]
	Short-billed Dowitcher	*Limnodromus griseus*		Locally common in most extensive peatland complex	x			x	x	x
	Wilson's Snipe	*Gallinago delicata*		Fairly common in small & extensive peatlands	x	x		x	x	x
	Red-necked Phalarope	*Phalaropus lobatus*		Locally uncommon in most extensive peatland complex				x	x	x
Terrestrial birds										
	Spruce Grouse	*Falcipennis canadensis*		Uncommon in forested habitats	x	x	x	x	x	x
	Belted Kingfisher	*Ceryle alcyon*				x		x		x
	American Three-toed Woodpecker	*Picoides dorsalis*		Uncommon in all forested habitats	x	x		x		x
	Black-backed Woodpecker	*Picoides arcticus*						x		x
	Yellow-bellied Flycatcher	*Empidonax flaviventris*		Common; various upland habitats	x	x	x	x	x	x
	Alder Flycatcher	*Empidonax alnorum*		Rare in post-fire conifer regeneration	x	x		x	x	x
	Olive-sided Flycatcher	*Contopus cooperi*	Canada + NL					x	x	
	Red-eyed Vireo	*Vireo olivaceus*		One bird in broadleaved regeneration						
	Northern Shrike	*Lanius excubitor*		One bird in extensive peatland complex				x	x	x
	Gray Jay	*Perisoreus canadensis*		Varied upland habitats, most common in shrubland	x	x	x	x	x	x
	Boreal Chickadee	*Poecile hudsonicus*		Uncommon in spruce forests	x	x	x	x	x	x
	Winter Wren	*Troglodytes hiemalis*			x					
	Golden-crowned Kinglet	*Regulus satrapa*				x	x	x		x
	Ruby-crowned Kinglet	*Regulus calendula*		Mainly in spruce-moss forest, uncommon elsewhere	x	x	x	x	x	x
	Gray-cheeked Thrush	*Catharus minimus*	NL only	Uncommon; found exclusively in post-fire conifer regeneration	x	x	x	x	x	x
	Hermit Thrush	*Catharus guttatus*		Uncommon; mainly in post-fire conifer regeneration	x	x	x	x	x	x
	Bohemian Waxwing	*Bombycilla garrulus*							x	x
	Cedar Waxwing	*Bombycilla cedrorum*		One flyover in extensive peatland complex				x		
	Northern Waterthrush	*Parkesia noveboracensis*		Uncommon; mainly in shrub swamp	x	x	x	x	x	x
	Tennessee Warbler	*Oreothlypis peregrina*		Fairly common; shrubland (mainly) and spruce-moss forest	x	x		x	x	x
	Nashville Warbler	*Oreothlypis ruficapilla*			x					x

Group	Common Name	Scientific Name	Legal At-Risk Status	Habitat Use in Study Area	LIM, 2009[a]	NML, 2009[b]	Groupe Hémisphères 2008[c]	BBS[d]	eBird[e]	QBBA[f]
	Orange-crowned Warbler	*Oreothlypis celata*		One in spruce-moss forest. Likely to be present, but not found in, shrub-dominated habitat.	x			x	x	x
	Yellow Warbler	*Setophaga petechia*		Uncommon in shrub swamp	x	x	x	x	x	x
	Blackpoll Warbler	*Setophaga striata*		Fairly common; more open habitats with low vegetation such as shrubland, bare dry ground, shrub swamp	x	x	x	x	x	x
	Palm Warbler	*Setophaga palmarum*				x		x		x
	Yellow-rumped Warbler	*Setophaga coronata*		All upland habitats, most abundant in bare dry ground and spruce-lichen forest	x	x	x	x	x	x
	Fox Sparrow	*Passerella iliaca*		Found in all upland habitats, most common in shrubland	x	x	x	x	x	x
	Lincoln's Sparrow	*Melospiza lincolnii*		Common in shrubbery in small & extensive peatlands	x	x		x	x	x
	Swamp Sparrow	*Melospiza georgiana*		Uncommon in shrub swamp and shrubbery in extensive peatlands				x		x
	White-crowned Sparrow	*Zonotrichia leucophrys*		Common in open habitats, mainly post-fire conifer regeneration, shrub swamp and bare dry ground	x	x	x	x	x	x
	Rusty Blackbird	*Euphagus carolinus*	Canada + NL	Fairly common in small & extensive peatlands and their edges	x	x	x	x	x	x
	Pine Grosbeak	*Pinicola enucleator*		Uncommon in spruce forests	x	x	x	x	x	x
	White-winged Crossbill	*Loxia leucoptera*		Spruce forests. Flyover only over open habitat types.	x	x	x	x	x	x

[a] LIM, 2009: Schefferville Iron Ore Project, includes Labrador Iron Mines' Redmond, James and Silver Yards properties to the southeast of Schefferville.

[b] NML, 2009: Based on summary of bird species encountered 1983-2006 in Howell's River Basin, Labrador, northwest of Schefferville.

[c] Groupe Hémisphères, 2008: Surveys on DSO sites property of New Millenium along QC/Labrador border northwest of Schefferville.

[d] BBS: Breeding Bird Survey routes 57041 east of Labrador City (2008-2011), 57040 Churchill Falls (2006-2011), 57039 Orma Road (1998-2012) and 57037 Ossok (1996-2011).

[e] eBird: Data limited to Bird Conservation Region 7 (Taiga Shield) in Labrador and Qc east of Caniapiscau Res. and north to Otelnuk Lake. Labrador City and Happy Valley/Goose Bay areas not included.

[f] Quebec Breeding Bird Atlas 2010-2012 (QBBA): Records of broad Schefferville area; north of Fermont, east of Caniapiscau Res., north to Otelnuk Lake.

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