Labrador – Island Transmission Link

Avifauna Component Study

Prepared for:

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EXECUTIVE SUMMARY

Nalcor Energy is proposing to develop the Labrador-Island Transmission Link (the Project), a High Voltage Direct Current (HVdc) transmission system extending from Gull Island in central Labrador to Soldiers Pond on the Island of Newfoundland's Avalon Peninsula. In preparation for and support of the environmental assessment of the Project, an *Avifauna Component Study* has been completed with the objective to gather, summarize and present information on avifauna in the area of, and which may therefore interact with the proposed Project.

The Study Area generally comprised the region surrounding the proposed and alternative HVdc transmission corridors and associated Project components. An Ecological Land Classification (ELC) was previously completed along a 15 km wide regional study area that encompassed the transmission corridors and covering a linear distance of approximately 1,100 km. Through this initiative, vegetation types and associated habitats were identified, classified and categorized on a regional scale, with a total of 15 Habitat Types and a number of non-vegetated land classes being defined and mapped. These ELC-based habitat classifications formed the basis of the avifauna habitat mapping component of this study.

This compilation is based on research completed by the Study Team and others in support of this Project, relevant avifauna surveys and studies completed by others throughout the province, as well as other existing and available literature. An extensive literature search was completed that provided a comprehensive listing of the primary sources of information on avifauna relevant to the proposed Project, from which an annotated bibliography detailing relevant studies completed in Newfoundland and Labrador since 1987 was compiled.

Recent and previous avifauna baseline studies undertaken in support of the Project include 2008 passerine surveys by Nalcor Energy (which are reported entirely within this document), as well as waterfowl surveys (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999), bird of prey (raptor) surveys (Jacques Whitford 1999a) and seabird surveys (Jacques Whitford 2000a) carried out for the transmission project in 1998. These were supplemented with data provided by the Canadian Wildlife Service (CWS) regarding spring migration along the Strait of Belle Isle (CWS unpublished data), as well as the results of previous relevant studies along the Churchill River in support of the Lower Churchill Hydroelectric Generation Project dedicated to waterfowl (LGL Limited 2008), passerines (Minaskuat Inc. 2008a) and birds of prey (Minaskuat Inc. 2008b).

Based on the findings of the literature review, regional overviews of the presence, abundance and distribution of waterfowl, passerines, birds of prey and other species are provided for the various sub-regions that comprise the Study Area: Lower Churchill River and Lake Melville region; Southeastern Labrador; the Northern Peninsula; Central and Eastern Newfoundland; and the Avalon Peninsula. In terms of spatial overlap with the Study Area, habitat use by avifauna during breeding is of greatest interest to the Project and its environmental assessment. Migration and molting areas in the Strait of Belle Isle are discussed in a separate section.

Key species of avifauna selected for more detailed review represent waterfowl, birds of prey, passerines, upland game and species listed by the Committee on the Status of *Endangered* Wildlife in Canada, under the federal *Species at Risk Act and/or the Newfoundland and Labrador Endangered Species Act.* Selection was based on their status (i.e., listed species), affinities for a particular habitat type and/or representation of a particular group (e.g., early versus late nesting species):

- Harlequin Duck (*Histrionicus histrionicus*);
- Canada Goose (*Branta Canadensis*);

- Surf Scoter (*Melanitta perspicillata*);
- Rusty Blackbird (*Euphagus carolinus*);
- Red Crossbill (*Loxia curvirostra percna*);
- Gray-cheeked Thrush (*Catharus minimus*);
- Olive-sided Flycatcher (*Contopus cooperi*);
- Blackpoll Warbler (*Dendroica striata*);
- Wetland Sparrows [Swamp Sparrow (*Melospiza georgiana*), Song Sparrow (*Melospiza melodia*),
- Lincoln's Sparrow (*Melospiza lincolnii*) and Savannah Sparrow (*Passerculus sandwichensis*)];
- Osprey (*Pandion haliaetus*);
- Bald Eagle (*Haliaeetus leucocephalus*);
- Short-eared Owl (*Asio flammeus*);
- Ruffed Grouse (*Bonasa umbellus*); and
- Common Nighthawk (*Chordeiles minor*).

In addition to these species, seven species of special conservation status in Newfoundland and Labrador were also evaluated and found to occur outside the Study Area and/or there were no recent records of their presence in the province: Barrow's Goldeneye (*Bucephala islandica*); Eskimo Curlew (*Numenius borealis*); Piping Plover (*Charadrius melodus*); Red Knot (*Calidris canutus rufa*); Chimney Swift (*Chaetura pelagica*); Ivory Gull (*Pagophila eburnea*); and Peregrine Falcon (*anatum subspecies*).

Detailed habitat quality maps were generated for eight key species/groups (i.e., where applicable), indicating the presence, amount and distribution of primary, secondary and tertiary quality habitat throughout the Study Area. For the purpose of this investigation, primary habitat was defined as habitat that provides foraging, protection, nesting and resting habitat, secondary habitat provides an abundance of one or more (or marginal amounts of all) of the critical elements and tertiary habitat provides marginal foraging, protection or resting opportunities or may only be used during transit.

Habitat quality maps were produced for the 'Southeastern Labrador', 'Northern Peninsula', 'Central and Eastern Newfoundland', and 'Avalon Peninsula' regions, based on the coverage of the ELC along the proposed and alternative HVdc transmission corridors. Maps were colour-coded to reflect habitat quality and indicate the percentage of primary, secondary and tertiary habitat available on an Ecoregion by Ecoregion basis, within each of the larger geographic regions.

A variety of waterfowl, passerine, bird of prey and upland game species are found throughout the Study Area, during various life history stages (e.g., staging, breeding, molting, migrating, winter). Along the lower Churchill River and inner Lake Melville, at least 18 species of waterfowl occur, including staging and breeding Harlequin Duck, a species of special conservation status. At least 50 species of passerines are found along the lower Churchill River/Lake Melville region that reflect the relatively high diversity and abundance of deciduous tree species found in the High Boreal Forest-Lake Melville Ecoregion compared to other areas in Labrador. Passerine species of special conservation status that occur in this geographic region are Rusty Blackbird, Gray-cheeked Thrush and Olive-sided Flycatcher. Birds of prey are similarly diverse and include at least 17 species, including Short-eared Owl, a species of special conservation status. Upland game birds that occur in this region include at least three species [Ruffed Grouse, Spruce Grouse (*Falcipennis canadensis*) and Willow Ptarmigan (*Lagopus lagopus*)].

Southeastern Labrador hosts a variety of waterfowl species, although generally at lower densities than along the Churchill River, particularly during staging, when many of the rivers in this area are ice-covered when birds first arrive in spring. Passerine diversity in this region of Labrador is similar to other areas of Labrador previously surveyed (including the lower Churchill River). Similarly, the diversity of birds of prey (during breeding or migration) in Southeastern Labrador is similar to the Lower Churchill River and Lake Melville region, with the exception of Golden Eagle (*Aquila chrysaetos*), Peregrine Falcon, Gyrfalcon (*Falco rusticolus*) and Snowy Owl (*Bubo scandiacus*) that would typically nest further north. Few sightings of upland game birds were recorded during surveys in this region; however, Willow Ptarmigan and Spruce Grouse would be expected to occur in higher numbers compared to Ruffed Grouse, based on habitat preferences of this species. While a relatively rare species in this area, three records of Rock Ptarmigan (*Lagopus muta*) have been recorded for the south coast of Labrador. Species of special conservation status that are known to or likely occur in this geographic region include Harlequin Duck, Rusty Blackbird, Gray-cheeked Thrush, Olive-sided Flycatcher and Short-eared Owl.

Along the Strait of Belle Isle, seabirds, shorebirds and other groups such as passerines and birds of prey occur at various times throughout the year. Many of these species are migrating through the area during spring and/or fall, with few actually stopping for any length of time. Over 100,000 seabirds migrate through this area during spring, comprised largely of Common Eider (*Somateria mollissima*) and alcid species [e.g., Atlantic Puffin (*Fratercula arctica*)]. Other species breed along the Strait of Belle Isle (e.g., alcids, gulls, and shorebirds) and some species are found during all periods of open water [e.g., Northern Fulmar (*Fulmarus glacialis*) and Sooty Shearwater (*Puffinus griseus*)]. Species of special conservation status that have been documented in the area during annual migrations include Harlequin Duck, Barrow's Goldeneye and Short-eared Owl.

In Newfoundland, while a variety of waterfowl, passerine, bird of prey and upland game species are found distributed through the geographic regions of the Study Area, the diversity of waterfowl species is generally lower compared to Labrador. On the Northern Peninsula, at least 11 species of waterfowl are found during staging and breeding, including the Harlequin Duck, which are largely restricted to this geographic region of the Island. As many as 47 or more passerine species have been identified and at least 13 bird of prey species regularly occur in this region, during breeding or migration. Upland game species include resident Ruffed Grouse, Spruce Grouse, Willow Ptarmigan and possibly Rock Ptarmigan in high, rocky barren habitats. Species of special conservation status that have been documented on the Northern Peninsula include Harlequin Duck, Red Crossbill, Olive-sided Flycatcher, Gray-cheeked Thrush, Rusty Blackbird and Short-eared Owl.

In the Central and Eastern Newfoundland geographic region, a relatively small variety of waterfowl species are found, with seven confirmed species observed/identified from the literature. Passerine species are comparatively high, and the Central Newfoundland Forest Ecoregion has the highest total number of species recorded in 2008, compared to all other Ecoregions investigated on the Island. Birds of prey found breeding or migrating in this region are typical of Newfoundland and are as described for the Northern Peninsula. Upland game species include resident Ruffed Grouse, Spruce Grouse and Willow Ptarmigan. Species of special conservation status that have been documented in this geographic region include Red Crossbill, Olive-sided Flycatcher, Gray-cheeked Thrush and Rusty Blackbird.

On the Avalon Peninsula, waterfowl diversity is also relatively low compared to Labrador, with at least 10 species regularly occurring in this region. However, the Avalon Peninsula provides habitat for breeding Greater Scaup and migrating Surf (*Melanitta perspicillata*) and Black (*Melanitta americana*) Scoters that are generally only found in this region of the Island. Passerine species are similar to other regions of the province, and the Avalon Forest Ecoregion in particular appears to support a slightly higher diversity and abundance than other

Ecoregions in this geographic region. Birds of prey found breeding or migrating in this region are typical of Newfoundland and are as described for the Northern Peninsula. Ruffed Grouse, Spruce Grouse and Willow Ptarmigan are residents on the Avalon Peninsula. In relation to the rest of the Island, Willow Ptarmigan are most common along the Maritime Barrens Ecoregions, near the tips of large peninsulas, and open upland sites. Upland game species include resident Ruffed Grouse, Spruce Grouse and Willow Ptarmigan. Species of special conservation status that have been documented in this geographic region include Red Crossbill, Olive-sided Flycatcher, Gray-cheeked Thrush, Rusty Blackbird and Short-eared Owl.

Habitat quality mapping for eight key species/groups identified the following additional information:

- Canada Goose (*Branta canadensis*) are most abundant in Labrador, where primary habitat for this species occupies 1,512 km^2 (23 percent) of the Labrador Study Area. Highest concentrations of primary habitat were found in the Eagle River Plateau Ecoregion, where it represents 36 percent of that 1,981.7 km^2 section.
- Rusty Blackbird prefer wetland and scrub/heathland/wetland habitats that occupy 3,330 km^2 (30 percent) of the Study Area in Newfoundland, and 1,512 km^2 (23 percent) in Labrador. Although primary habitat for Rusty Blackbird is generally between 20 and 50 percent in Ecoregions in Newfoundland (and as high as 78 percent in relatively minor Ecoregions), this species is considered uncommon on the Island compared to Labrador.
- Primary habitat for Gray-cheeked Thrush is found in all Ecoregions in the Study Area, with the highest percentages found in the Forteau Barrens (45 percent), Low Subarctic Forest (41 percent), Northern Peninsula Forest (43 percent), Central Newfoundland Forest (39 percent) and Avalon Forest (44 percent) Ecoregions. Gray-cheeked Thrush breeds throughout the Study Area, but are generally more common on the Northern Peninsula.
- Blackpoll Warbler are typically associated with conifer scrub, cutover and open conifer forest, as well as wetland and scrub/heathland/wetland habitats in some Ecoregions that are widely distributed throughout the Study Area. Primary habitat for Blackpoll Warbler occupies 2,671 to 6,001 km^2 (24 to 53 percent) of the Study Area in Newfoundland, and 2,576 km^2 (39 percent) in Labrador. This species is found throughout the Study Area, with relatively higher proportions on the Northern Peninsula and Avalon Peninsula.
- Wetland Sparrows (Swamp Sparrow, Song Sparrow, Lincoln's Sparrow and Savannah Sparrow) are found primarily in wetland and scrub/heathland/wetland habitats. Primary habitat for these species occupies 3,330 km^2 (30 percent) of the Study Area in Newfoundland, and 1,512 km^2 (23 percent) in Labrador. In 2008, 100 percent of Song Sparrow, 46 percent of Lincoln's Sparrow, 41 percent of Savannah Sparrow and 42 percent of Swamp Sparrow observations were in primary scrub/heathland/wetland habitat. An additional 21 percent of Lincoln's Sparrow, 29 percent of Savannah Sparrow and 13 percent of Swamp Sparrow were associated with primary wetland habitat.
- Short-eared Owl has been documented primarily in Labrador, but does occur on portions of the Island. Numbers are generally low, reflective of the low availability of primary habitat in the province (primary alpine vegetated, kalmia lichen/heathland and lichen heathland habitats occupy only 184 km^2 (<2 percent) of the Study Area in Newfoundland and 352 km^2 (5 percent) in Labrador).
- Ruffed Grouse, though a resident species throughout the Study Area, have a relatively limited distribution, reflective of the low levels of preferred habitat in the province in general. Primary hardwood forest habitat for this species occupies only 9 km^2 (less than 1 percent of the Study Area) in Labrador and is not found at all on the Island portion of the Study Area.
- Common Nighthawk breed in Labrador, but are extremely rare, if present, on the Island of Newfoundland. Primary habitat for this species consists of cutover, burn, open conifer and black

spruce lichen habitats. Combined, these habitats comprise 1,875 km^2 (29 percent) of the Study Area in Labrador.

The information provided in this *Avifauna Component Study* has identified key species and their habitat that occurs in the Study Area and has provided detailed information on the existing conditions and status for these species, based on original field work, a review of relevant literature and associated habitat potential mapping.

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1.0 INTRODUCTION

Nalcor Energy is proposing to develop the Labrador-Island Transmission Link (the Project), a High Voltage Direct Current (HVdc) transmission system extending from Gull Island in central Labrador to Soldiers Pond on the Island of Newfoundland's Avalon Peninsula. The environmental assessment (EA) of the Project is ongoing, with an Environmental Impact Statement (EIS) currently being completed by Nalcor Energy.

In preparation for and support of the Project's EA, this *Avifauna Component Study* was completed in order to identify, compile, summarize and present information on avifauna in the area of, and which may interact with, the proposed Project as environmental baseline information for use in the EIS.

1.1 Project Overview

The proposed Project involves the construction and operation of transmission infrastructure within and between Labrador and the Island of Newfoundland. The proposed transmission system, as currently planned, will include the following key components:

- an ac-dc converter station at Gull Island in central Labrador, on the north side of the Churchill River adjacent to the switchyard for the Lower Churchill Hydroelectric Generation Project;
- an HVdc transmission line extending from Gull Island across southeastern Labrador to the Strait of Belle Isle. The overhead transmission line will be approximately 407 km in length, with a cleared right-of-way averaging 60 m wide, and consist of single galvanized steel lattice towers;
- submarine cable crossings of the Strait of Belle Isle with associated infrastructure, including three to five cables placed under the seafloor across the Strait through various means to provide the required cable protection;
- an HVdc transmission line (similar to that described above) extending from the Strait of Belle Isle across the Island of Newfoundland to the Avalon Peninsula, for a distance of approximately 688 km;
- a dc-ac converter station at Soldiers Pond on the Island of Newfoundland's Avalon Peninsula; and
- electrodes at each end of the HVdc transmission corridor in Labrador and on the Island, with overhead lines connecting them to their respective converter stations.

Project planning and design are currently at a stage of having identified a 2 km wide corridor for the on-land portions of the proposed HVdc transmission corridor and 500 m wide corridors for the proposed Strait of Belle Isle cable crossings, as well as various alternative corridor segments in specific areas. Potential on-land corridors and study areas have also been identified for various potential (alternative) locations for the proposed electrodes, although the nature, type and location of these electrodes are the subject of ongoing analysis and engineering.

It is these proposed and potential transmission corridors and components that were the subject of Nalcor Energy's environmental baseline study program for the Project's EA. Project planning is in progress, and it is anticipated that the Project description will continue to evolve as engineering and design work continue. The EA of the Project will also identify and evaluate alternative means of carrying out the Project that are technically and economically feasible.

In conjunction and concurrent with the EA process, Nalcor Energy will be continuing with its technical and environmental analyses of the corridors, in order to identify and select a specific routing for the transmission line from within these larger corridors. The transmission line itself will have an on-land right of way that will average approximately 60 m in width. The eventual transmission routes and locations will be selected with consideration of technical, environmental and socioeconomic factors.

1.2 Nature, Purpose and Objectives of the Avifauna Study

This *Avifauna Component Study* forms one aspect of Nalcor Energy's environmental study program in relation to the proposed Project. The purpose of this and other such baseline studies has been to gather and present information on key aspects of the environment and thus, provide an appropriate understanding of the existing environmental conditions in and near the Project area for use in the EIS.

In planning and conducting this environmental study program, the nature of the Project and its potential environmental interactions were important considerations. In carrying out EAs and associated baseline studies for other types of developments - such as mines or hydroelectric projects, which are characterized by more "geographically focused" components and activities with specific "footprints" - the approach is often to conduct one or more field surveys to inventory specific aspects of the environment, typically within a single season. As a result of the nature and geographic scale of the proposed transmission link and its potential interactions with the environment, it was considered appropriate and necessary to go beyond such a "traditional" approach to environmental baseline studies for this EIS.

Specifically, rather than base the avifauna study solely on a "snap shot" understanding of avifauna presence along the transmission corridor through one or more field surveys at a single point in time, a range of methods and information sources were used to provide an appropriate and meaningful understanding of likely and potential avifauna presence, abundance and distributions in and near the Project area. The nature and appropriateness of this approach was discussed with various relevant government agencies and stakeholders as part of the planning and design of the Project's environmental study program in 2008 and 2009.

The study approach was to first identify, compile and summarize the existing and available (but previously widespread) information related to avifauna in and near the proposed Project. This included the general literature, as well as the results of avifauna studies throughout Newfoundland and Labrador by the Study Team and others over the past two decades. This information also includes, and is supplemented by, a number of dedicated avifauna surveys undertaken by Nalcor Energy and its predecessors in elation to the Project, including waterfowl, seabird and bird of prey surveys completed in 1998 and passerine survey work undertaken along the transmission corridor in 2008. The nature and results of the 1998 avifauna surveys are reported elsewhere but have been summarized in detail in this report, whereas the 2008 passerine study is reported entirely herein.

This information has been compiled and summarized in this report to first provide a "region by region" overview of avifauna across the Project area, followed by more focused and detailed summaries for various key and representative avifauna species.

The avifauna survey results and other information has also been used in conjunction with the regional Ecological Land Classification (ELC) mapping work completed for the Project, to assess and map habitat suitability – and thus, the likely and potential use of the Project area - for select avifauna species along and adjacent to the

proposed and alterative transmission corridors. Detailed habitat mapping is provided for these avifauna species in this report.

To summarize, the objective of this *Avifauna Component Study* is to identify, gather, analyze, summarize and present information on avifauna species in the area of, and which may be affected by, the proposed Project, for use in the EIS. In doing so the study involved:

- the identification, review and presentation of the results of recent and previous avifauna studies conducted in relation to the Project, as well as other relevant avifauna surveys and the literature that provide information on and insight into avifauna in and near the Project area;
- based on the above information, the development of regional overviews describing the known and likely presence, abundance and spatial distribution of avifauna across the geographic extent of the proposed transmission line, followed by detailed discussion and analyses for a number of select and representative avifauna species; and
- using the above information, and based on the regional ELC completed for the Project, the development and presentation of habitat suitability mapping for various avifauna species across the transmission corridor and surrounding area.

The species of avifauna included in this study represent several important groups of birds, including waterfowl, birds of prey, passerines and upland game birds that breed in the Study Area. Species designated at risk by the Committee on the Status of *Endangered* Wildlife in Canada (COSEWIC), or listed under the federal *Species at Risk Act* (*SARA*) and/or the *Newfoundland and Labrador Endangered Species Act* (*NLESA*) were also specifically considered.

2.0 APPROACH AND METHODS

The following sections provide an overview of the Study Area, methodology and Study Team for this *Avifauna Component Study*.

2.1 Regional Context and Study Area

The proposed Project involves the construction and operation of an HVdc transmission system within and between Labrador and the Island of Newfoundland. Given the nature of the Project and its potential interactions with the environment, as well as the rather extensive geographic scale involved, the *Avifauna Component Study* takes a "regional approach" in identifying and describing the likely presence, abundance and spatial and temporal distribution of avifauna along and adjacent to the proposed and alternative transmission corridors and associated Project components (Figure 2-1).

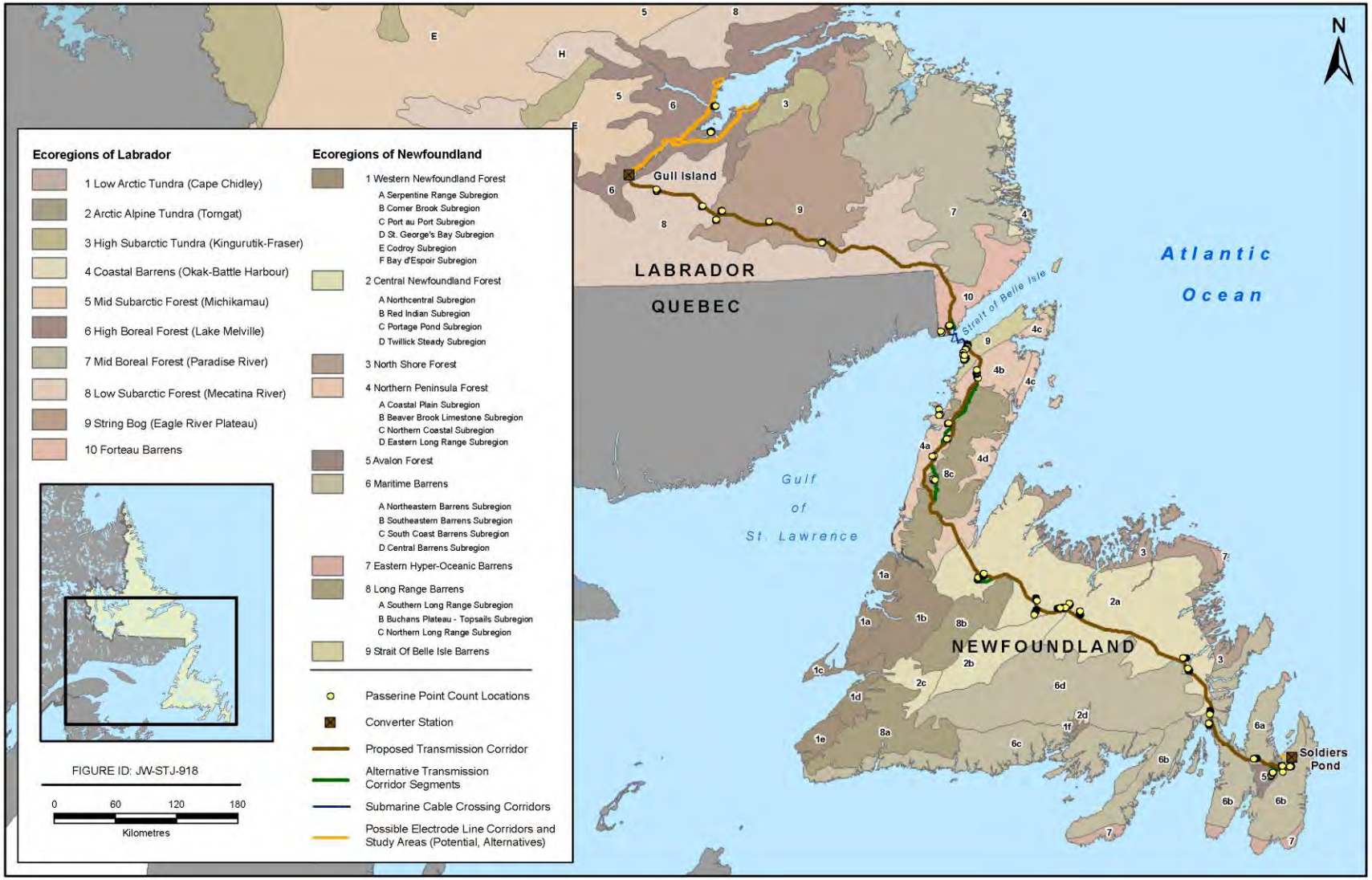
For the HVdc transmission corridor itself, the study focuses primarily on a regional Study Area, generally comprising an approximately 15 km wide area that encompasses the proposed and alternative transmission corridors from Gull Island to Soldiers Pond. This corresponds to the Study Area used in the regional ELC carried out as part of the Project environmental study program, which has also formed the basis for the avifauna habitat suitability mapping component of this Component Study. For other Project components, such as the potential electrode lines, the study focuses on the general areas involved (such as the lower Churchill River valley and Lake Melville). The analysis and discussion is in many cases influenced by the nature of the existing and available information sources, including the areas covered by the previous avifauna surveys cited.

The proposed transmission line will, as described previously, be approximately 1,100 km in length, and include a number of associated components. As such, it will extend across a considerable portion of Newfoundland and Labrador and thus, through a range of natural environments.

The national ecological framework for Canada is a nested hierarchy that describes regional ecological units at multiple scales, in which larger ecological units encompass successively smaller ones. At the top of the hierarchy, Ecozones are defined on the basis of generalized characteristics and global and continental climate. There are 15 Ecozones (Natural Resources Canada 2007) delineated for Canada, with the Project crossing two of these: the Boreal Shield Ecozone and the Taiga Shield Ecozone.

1) Boreal Shield Ecozone: The Island of Newfoundland and the Churchill River valley and southeast coast of Labrador form the eastern extent of this region. A massive rolling plain of ancient bedrock blanketed with gravel, sand and other glacial deposits, its topography is comprised of broadly rolling uplands that form poorly-drained depressions covered by lakes, ponds and wetlands. The climate of the Boreal Shield is generally continental, with long, cold winters, short, warm summers and abundant precipitation. Cool temperatures and a short growing season along with acidic soils challenge plant life in the Ecozone, although most of the area is forested (primarily coniferous species, intermixed with hardwoods), which is mixed with bogs, marshes and other wetlands. Lichens and shrubs are common on areas of exposed bedrock.

Figure 2-1 The Labrador -Island Transmission Link and Associated Ecoregions and Subregions in Newfoundland and Labrador



2) Taiga Shield Ecozone: The interior of southeastern Labrador is within this Ecozone, which consists of the taiga forest and the Canadian Shield, a primarily coniferous forest area located south of the tundra. The terrain is broadly rolling, and the landscape is composed of many lakes and wetlands. The subarctic climate is characterized by short, cool summers and long, cold winters, and precipitation is low to moderate. The open, stunted forests are dominated by species such as black spruce and are mixed with numerous bogs and other wetlands, scattered hardwood stands, and rock outcrops dominated by lichens and low shrubs.

These two Ecozones are further divided into a number of Ecoregions. Ecoregions are smaller land units within Ecozones that have distinctive, recurring patterns of vegetation and soil that are determined and controlled by local climate and geology (Damman 1983; Meades 1990; Marshall and Schutt 1999; PNAD 2008). Ecoregions also differ from each other in their combinations of plant communities, landscapes, geology and other features (Marshall and Schutt 1999; PNAD 2008). There are 19 Ecoregions within the province, nine in Newfoundland (Damman 1983) and 10 in Labrador (Meades 1990). The proposed transmission corridor will pass through 10 of these Ecoregions (Figure 2-1). A description of the Ecoregions and relevant subregions crossed by the transmission corridor and ELC study is presented in Table 2-1. Note, an additional Ecoregion (Mid Boreal Forest-Paradise Ecoregion) is included since it marginally intersects with the 15 km wide study area of the ELC, but is not intersected by the 2 km wide transmission corridor.

Table 2-1 Ecoregions and Subregions of Newfoundland and Labrador Crossed by the Transmission Corridor and ELC Study Area

Ecoregions and Subregions
LABRADOR
High Boreal Forest-Lake Melville Ecoregion (Boreal Shield Ecozone) - encompasses the Churchill River valley and the coastal plain surrounding Lake Melville. River terraces are composed of coarse-textured, alluvial soils and uplands have shallow, well-drained soils. This region has the most favorable climate in Labrador. Summers are cool and winters cold. The forests are closed-canopied and highly productive. Richer slopes are dominated by balsam fir, white birch and trembling aspen. Black spruce is present in most stands, but only dominates in upland areas and lichen woodlands, which occupy river terraces. Ribbed fens occur in upland depressions; plateau bogs occur on coastal plains.
Mid Boreal Forest-Paradise River Ecoregion (Boreal Shield Ecozone) – encompasses coastal areas of Southeastern Labrador, from the area surrounding Sandwich Bay and south where it meets the Forteau Barrens Ecoregion. Undulating bedrock with many rock outcrops and fairly productive, closed-crown forests characterize this Ecoregion. The climate is considered boreal and is moister and cooler than the Lake Melville area. Summers are cool to warm and winters are short and cold. Black spruce and balsam fir are dominant tree species; hardwoods are also commonly encountered. Raised bogs are characteristic of valleys in the area.
Low Subarctic Forest-Mecatina River Ecoregion (Taiga Shield Ecozone) - the main portion of this Ecoregion is located in southern Labrador, with two separate areas to the north of Lake Melville and the Red Wine Mountains. Broad river valleys and rolling hills covered by shallow till, drumlins and eskers are characteristic of the region. Summers are cool and winters are long. Somewhat open black spruce forests are the dominant vegetation. String bog-ribbed fen complexes cover extensive areas throughout the region.
String Bog - Eagle River Plateau Ecoregion (Taiga Shield Ecozone) - includes the Eagle River Plateau that comprises most of this Ecoregion. This upland plateau is composed of extensive string bogs with numerous open pools surrounded by fen vegetation. Bog hummocks are dominated by scrub spruce, Labrador tea and feathermoss. The peatland expanses are occasionally interrupted by only a few conspicuous eskers, which support open, lichen woodland. Alder thickets are common along river banks.
Forteau Barrens Ecoregion (Boreal Shield Ecozone) - located at the southeastern tip of Labrador, adjacent to the Strait of

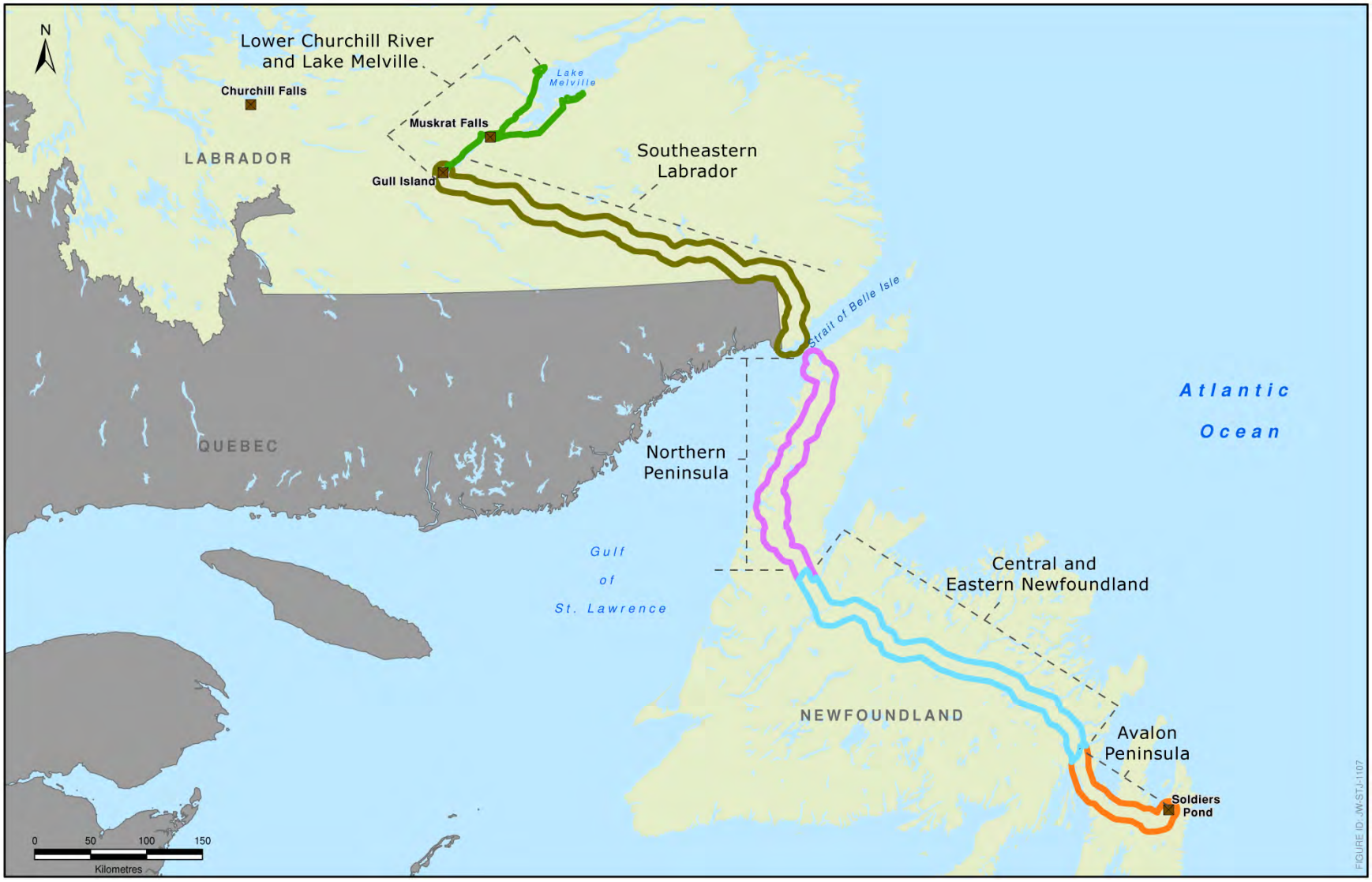
Ecoregions and Subregions
Belle Isle. Low hills are covered with scrub spruce, crowberry barren and slope bogs. Strong winds and frequent storms occur because of the proximity to the Strait of Belle Isle. Tree growth is limited by a combination of wind, wet soils and a history of repeated burns. Black spruce and larch can reach 10 to 12 m only along rivers, where soils are better drained.
ISLAND OF NEWFOUNDLAND
Strait of Belle Isle Barrens Ecoregion – dominated by almost treeless tundra vegetation. White spruce and balsam fir occurs as krummholz, interspersed with Arctic-alpine plants even near sea level. The soils are generally very shallow and outcrops of calcareous bedrock are common throughout. Large stone polygons created by freeze-thaw cycles are common on shallow-exposed mineral soil. Rare and *Endangered* species of calciphillic plants are numerous in these rock barrens.
Northern Peninsula Forest Ecoregion - differs from most other forested parts of the Island by the shortness of the vegetation season. The frost-free period is similar to other areas and somewhat longer than central Newfoundland. Soils are comparable to those of western Newfoundland, with limestone underlying most of the region. Acidic rock is more common on the eastern side of the peninsula. Balsam fir is the dominant tree in the forest stands, except at high elevations on the eastern side of the peninsula, where it is replaced by black spruce. Limestone barrens are common along the west coast, with dwarf shrub and crowberry barrens on the east coast. Plateau bogs cover extensive areas of the coastal lowlands. • *Coastal Plain Subregion* - includes the western side of the Northern Peninsula to the lower slopes of the Long Range Mountains. Most of the coastal plain is dominated by bogs and scrub forest. The area around Hawkes Bay and the foothills of the mountains are important exceptions to this generalization. • *Beaver Brook Limestone Subregion* - occupies the central lowlands north of the Highlands of St. John on the Northern Peninsula. This sheltered outlier maintains the most productive forests in the Ecoregion. Limestone, shale and sandstone bedrock types occur in this area. The till is formed from sandstone on the western side of the peninsula, east and south of Ten Mile Pond. The landscape is undulating to hilly in the extreme west. The Dryopteris-Balsam Fir and Clintonia-Balsam Fir types are most common on moderate to deep tills. The Pleurozium-Balsam Fir and Black Spruce-Feathermoss on bedrock are dominant on shallow tills. Soil textures in these types are generally sandy loam to loamy sand. • *Eastern Long Range Subregion* - includes the productive but inaccessible forest on the eastern slopes of the Long Range Mountains up to 450 m in elevation. The forests tend to be somewhat open balsam fir-black spruce mixtures. The treeline decreases towards the northern end of the subregion.
Long Range Barrens Ecoregion - a discontinuous region of highlands (Southern Long Range, Buchans Plateau -Topsails and Northern Long Range) from the southwest coast to the northern part of the Long Range Mountains. Most of the Ecoregion is characterized by rock barrens, with dwarf shrub heaths, shallow ribbed fens and areas of low, wind -stunted trees. • *Northern Long Range Subregion* - encompasses the mountainous area above the tree line on the Long Range Mountains. Trees occur only as krummholz (i.e., stunted forest), which is usually dominated by eastern larch and black spruce; however, sheltered valleys may contain small patches of forest. The vegetation is primarily alpine barren, dominated by Arctic-alpine plants, or crowberry barren. Shallow ribbed fens and slope bogs often cover extensive areas.
Central Newfoundland Forest Ecoregion - has the most continental climate of any part of insular Newfoundland. It has the highest summer and lowest winter temperatures. Because of warm summers and high evapo-transpiration rate, soils in the northern part of this Ecoregion exhibit actual soil-moisture deficiency. The Hylocomium-Balsam Fir forest type is characteristic of this area. Forest fires have played a more important role in this Ecoregion's natural history than in other regions. Thus, much of the Balsam Fir-Feathermoss forest types have been converted to black spruce, and some of the richer site types are dominated by white birch and aspen. In areas that have been burned repeatedly, dwarf shrub (Kalmia) barrens have replaced forest stands. Raised bogs are the characteristic wetland type. • *Northcentral Subregion* - has higher summer maximum temperatures, lower rainfall and higher fire frequency than anywhere else in Newfoundland. The subregion extends from Clarenville in the east to Deer Lake in the west and for

Ecoregions and Subregions
the most part has a rolling topography below 200 m. Pure black spruce forests and aspen stands dominate this area because of the prevalence of fire. The high summer temperatures are also thought to stimulate aspen root suckering and contribute to the local success of aspen (Damman 1983). Relatively low moisture, coarse soils and the prevalence of black spruce cover types make this subregion particularly susceptible to regeneration fa ilure. Furthermore, where tree regeneration is lacking, succession to dwarf shrub heath dominated by Kalmia angustifolia occurs on the nutrient-poor coarse textured till that is prevalent through much of this area. The rolling to undulating topography is characterized by shallow, medium-quality till, with a soil texture range from sandy loam to loam. Midslopes are dominated by the Hylocomium-Balsam Fir type, or Black Spruce-Feathermoss type on seepage gleysols after fire. There are also local areas covered by poor sandy till over glacio-fluvial deposits and outwash deposits along some of the major river systems, such as the Terra Nova, Exploits and Indian Rivers. Succession of productive black spruce forest types to ericaceous heath dominated by Kalmia angustifolia is most prevalent in these land types.
Maritime Barrens Ecoregion - extends from the east to the west coast of Newfoundland along the south-central portion of the Island. This Ecoregion has the coldest summers, with frequent fog and strong winds. Winters are relatively mild, with intermittent snow cover, particularly near the coastline. The landscape pattern usually consists of stunted balsam fir broken by extensive open Kalmia barrens, which developed because of indiscriminate burning by European settlers. Good forest growth is restricted to the long slopes of a few protected valleys. Slope and basin bogs are the most common wetland type. • Northeastern Barrens Subregion - this subregion has lower fog frequency and somewhat warmer summers compared to other parts of the Ecoregion. Arctic-alpine species are absent from the heath vegetation and yellow birch is absent from the forest. The landscape is extensively forested with local heath vegetation, particularly along the coast. The tills are generally a shallow, rolling ground moraine with sandy loam to loam texture. The Hylocomium-Balsam Fir type occupies midslopes, and it is usually associated with gleyed podzols or gleysols. • Southeastern Barrens Subregion - has landscape dominated by heathlands, with the forest occurring in small acreages that escaped fire. The dominant heath shrub on uplands is Empetrum nigrum, with Kalmia angustifolia forming a dense cover only in protected valleys. The topography is generally undulating with shallow, heavily compacted till and numerous large erratics. The Clintonia-Balsam Fir type is most common where the forest is still present. Good forest growth only occurs in a few large, protected valleys where the Dryopteris-Balsam Fir type dominates the slopes. Good specimens of yellow birch are also found in these stands. • Central Barrens Subregion - occurs south of the Central Newfoundland Ecoregion and north of the South Coast Barrens Subregion. Residual forests that have not been destroyed by fire have moderate forest capab ility. The dwarf shrub heaths are robust and Rhododendron canadense is a conspicuous component, suggesting deep snow cover. Arctic-alpine species are poorly represented and yellow birch is absent from the forest.
Avalon Forest Ecoregion - represents a sheltered outlier within the more open and exposed Maritime Barrens Ecoregion. Pure stands of balsam fir with a high mixture of white and yellow birch dominate this region. The Avalon Forest Ecoregion has been spared the ravages of fire that decimated the forests in the surrounding landscape, converting them to open heathland. The very moist climate and ribbed morainal topography give this small (500 km^2) Ecoregion its uniqueness. Raised bogs occur between moraines. The excessive frequency of fog is clearly evidenced by the abundance of pendant, arboreal lichens hanging from the branches of balsam fir.
Sources: Meades (1990) for Labrador Ecoregions and Damman (1983) for Newfoundland Ecoregions.

Given the geographic scale of the Project and the resulting scope of this Component Study, the analysis and discussion that follows is generally structured according to the following geographic regions (Figure 2-2):

- Lower Churchill River and Lake Melville: The general area encompassing the Project components and activities at and near Gull Island, as well as the potential electrode corridors to Lake Melville identified in the Project's EA Registration (January 2009). The dominant Ecoregion in this area is the High Boreal Forest-Lake Melville Ecoregion.

Figure 2-2 Geographic Regions of the Study Area



- *Southeastern Labrador*: The area encompassing the HVdc transmission corridor from Gull Island to the Strait of Belle Isle. Ecoregions in this portion of the Study Area are represented primarily by the Forteau Barrens (15 percent), the Low Subarctic Forest (48 percent) and the Eagle River Plateau (32 percent). The High and Mid Boreal Forest Ecoregions are also present, but make up a relatively small portion (5 percent) of the Study Area.
- *Strait of Belle Isle*: Shoreline and marine areas between the coasts of Southeastern Labrador and the northwestern portion of the Island of Newfoundland's Northern Peninsula, specifically, the general area encompassing the on-land transmission lines and submarine cable crossings of the Strait of Belle Isle. The Forteau Barrens and Strait of Belle Isle Barrens Ecoregions are adjacent to this geographic region. Given the uniqueness of this area, in terms of the aquatic nature of the environment as well as the variety of avifauna species that would occur here during migration, breeding and staging, the Strait of Belle Isle region is discussed in a separate section.
- *Northern Peninsula:* The area encompassing the HVdc transmission corridor from the Strait of Belle Isle southwards to the Deer Lake area. Relevant Ecoregions along the Northern Peninsula include the Northern Peninsula Forest (50 percent), the Long Range Barrens (44 percent) and the Strait of Belle Isle Barrens (6 percent).
- *Central and Eastern Newfoundland*: The area encompassing the HVdc transmission corridor between approximately Deer Lake and Clarenville. The dominant Ecoregion in this area is the Central Newfoundland Forest (92 percent), with small amounts of the Long Range Barrens (2 percent) and Maritime Barrens (6 percent) Ecoregions.
- *Avalon Peninsula*: The area encompassing the HVdc transmission corridor and associated Project components from Clarenville to Soldiers Pond and Conception Bay. The Avalon Peninsula region consists of the Avalon Forest (13 percent) and Maritime Barrens (87 percent) Ecoregions.

Where applicable and appropriate, such as where specific information was not available or meaningful for a particular region, existing knowledge of avifauna is discussed more generally within a larger geography (i.e., Labrador, Island of Newfoundland, or the province as a whole).

The Atlantic Flyway, one of four major routes followed by migratory birds, includes regions of Labrador and the Island of Newfoundland. The Atlantic Flyway represents a broad front along which a large number of birds predictably fly between northern (summer) and southern (winter) grounds (Welty 1982). Although birds may migrate along traditional corridors that overlap portions of the Study Area, exact routes for any given year cannot be determined with accuracy. Instead, information on habitat preferences and movement patterns of select species/groups are discussed generally in the report and in the context of the geographic regions described above.

2.2 Methods

This *Avifauna Component Study* is based on research completed by the Study Team and others in support of this Project, as well as other relevant and available original avifauna research completed throughout Newfoundland and Labrador in recent years. Where relevant, information from elsewhere (e.g., incidental sightings) has been used to supplement the understanding of existing knowledge for avifauna in the Study Area.

Initial meetings with Nalcor Energy representatives and various provincial and federal government departments and stakeholders served to focus the scope of the study by identifying key species or groups and compiling

potential information sources including (but not limited to) relevant documents and data prepared for this Project and the Lower Churchill Hydroelectric Generation Project, as well as existing scientific literature.

Species of avifauna included in this Component Study represent several important groups of birds, including waterfowl, birds of prey, passerines, upland game birds, and species listed by COSEWIC, *SARA* and/or *NLESA*.

2.2.1 Literature Review

Existing and available information on wildlife species and groups of species collected through library and internet searches and meetings with government departments and other organizations was compiled. This resulted in the development of an annotated bibliography listing and describing relevant avifauna studies completed in Newfoundland and Labrador during the past approximately 20 years (Appendix A). Sources included published and unpublished reports, peer-reviewed journal articles, government documents, research theses, books, field guides and other articles.

This information was categorized and summarized according to:

- author, date and title;
- relevance to one or more of the categories of avifauna species/groups (waterfowl, passerines, birds of prey, upland game birds); and
- a summary of the information included within, with emphasis on one or more of the following topics: population status; habitat association; local range or distribution; and limiting factors. Information and knowledge regarding potential Project interactions with and effects on these species was also identified and compiled for use in the EIS.

2.2.2 Recent and Previous Avifauna Surveys for the Transmission Link

Previous avifauna surveys carried out in relation to the Project include 2008 passerine surveys (which are reported entirely within this document), 1998 waterfowl surveys (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999), 1998 birds of prey surveys (Jacques Whitford 1999a), and 1998 seabird surveys in the Strait of Belle Isle (Jacques Whitford 2000a).

Relevant results from these earlier investigations, and others in the province (e.g., Thomas 2008, Trimper et al. 2008, Simon et al. 2002), have been incorporated into this report, in order to bring all of the relevant avifauna survey information conducted in relation to the Project "under a single cover" to facilitate the effective and efficient review and use of this information as part of the EA process.

Waterfowl Surveys (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999)

Baseline waterfowl surveys in 1998 (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999) involved a series of aerial river surveys, aerial surveys along the transmission corridor, aerial block surveys, and ground surveys within the lower Churchill River watershed and proposed transmission corridor from Gull Island to Soldiers Pond. Dedicated surveys for Harlequin Duck (*Histrionicus histrionicus*) were also conducted within the Study Area.

Following protocols used during previous studies and by other researchers in the province (e.g., Todd 1963; Goudie and Whitman 1987; Bateman and Hicks 1995), surveys were conducted during May, June and July of

1998, encompassing staging, breeding and brood/molting periods, respectively, Aerial waterfowl/Harlequin Duck surveys included all three of these time periods. Surveys began within one hour after sunrise and ended a minimum of one hour before sunset, during favorable weather conditions (i.e., low wind, no precipitation). Four observers (including pilot) were present for all surveys. A Bell 206 Long Ranger was used and maximum speeds of 50 km/h (for Harlequin Duck surveys) and 80 to 112 km/h (for general waterfowl surveys) were maintained, with maximum altitudes of 45 m. All sightings were recorded on 1:50,000 or 1:250,000 topographical maps, including the location [using a Global Positioning System (GPS)] of birds and information on weather, visibility and other wildlife observed.

The 1998 transmission avifauna Study Area in comparison with the 2 km wide transmission corridor currently under investigation is illustrated in Figure 2-3. Although some minor deviations exist between the 1998 survey area and the current Study Area, the Ecoregions represented by both studies are similar and thus data from these previous studies are relevant to this *Avifauna Component Study*.

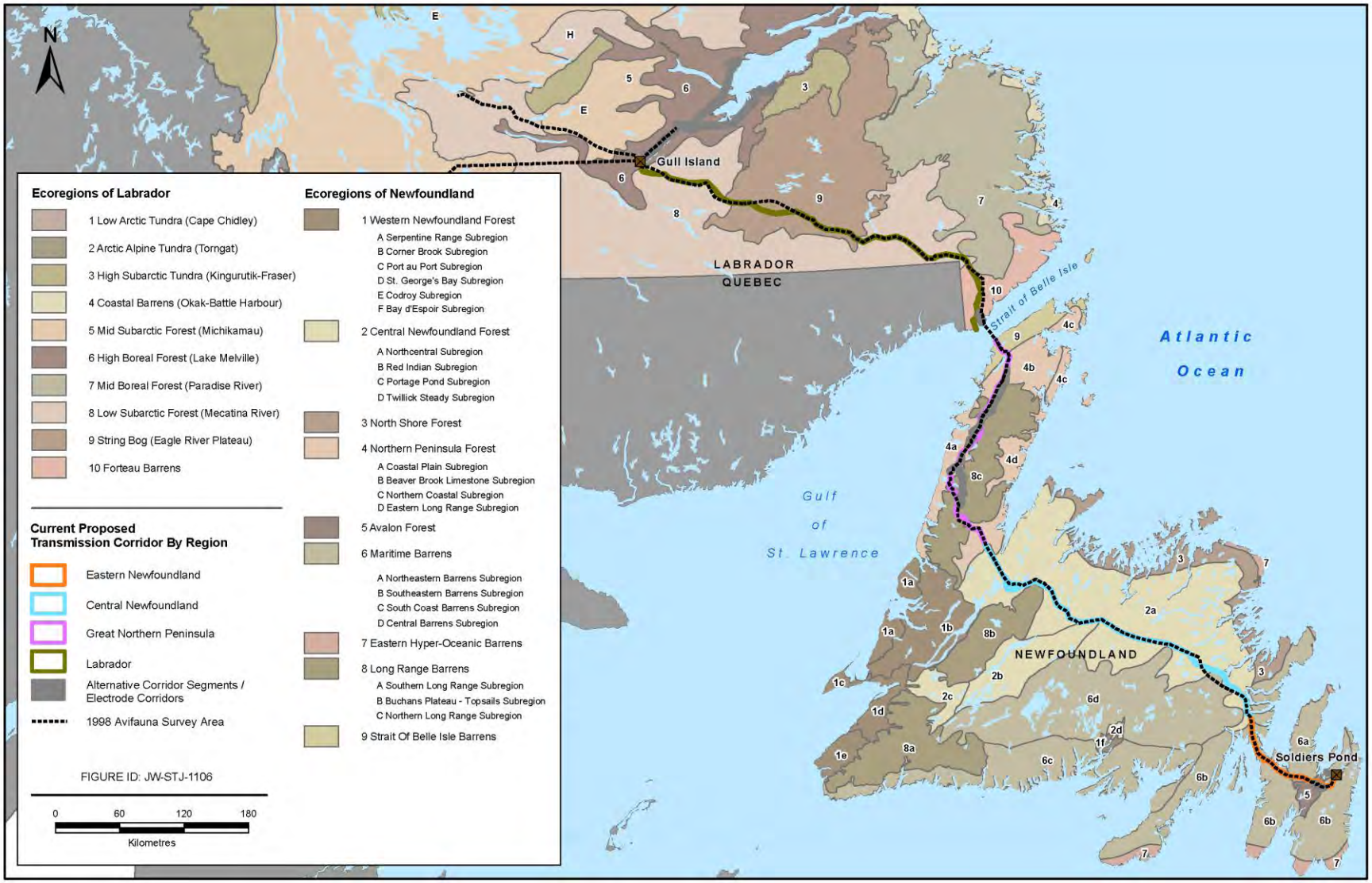
Ground surveys were completed in late July 1998 only, at three locations where Harlequin Duck broods were previously recorded, in June 1998: Beaver Brook; Fig River; and Minipi River. Two (or more) biologists led the surveys and covered approximately 4 km along each river (2 km upstream and 2 km downstream of high density locations). The entire river section was scanned for the presence of Harlequin Duck and other waterfowl (using binoculars), with emphasis on sections of preferred Harlequin Duck habitat.

Block surveys for breeding/staging waterfowl were flown in June 1998 and included four 100 km^2 plots previously flown by the Canadian Wildlife Service (CWS) in 1972, 1980 and 1992 (Gillespie and Wetmore 1974; Goudie and Whitman 1987; Lidster 1992). All watercourses and waterbodies within each plot were flown (altitude <50 m) and all waterfowl and birds of prey recorded on 1:50,000 topographical maps, including the location of birds and information on weather, visibility and other wildlife observed.

In terms of spatial overlap with the current Study Area, only the aerial surveys overlap the Study Area (i.e., Gull Island to Soldiers Pond and the lower Churchill River, though note that information related specifically to the latter could not be distinguished from the upper Churchill River). Ground and block surveys were restricted to areas north or south of the Churchill River and did not overlap the current Study Area. The proximity of these blocks and similarity of like habitat types allowed for the inclusion of these data for this extrapolation across the landscape. Aerial surveys followed the route previously described by the Lower Churchill Development Corporation (1980) and provided information particularly on spring staging and breeding waterfowl. Aerial surveys found relatively few waterfowl during spring staging surveys in May; however, breeding waterfowl were relatively abundant (compared to elsewhere in the Study Area) during surveys in June of that same year.

The relevant results of AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) have been fully included and incorporated into this current *Avifauna Component Study*, where possible. The initial waterfowl report itself (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999) has been submitted as part of the EA process for the Lower Churchill Hydroelectric Generation Project and is thus available publicly. It has therefore not been entirely reproduced or resubmitted as part of the Project's EA.

Figure 2-3 Avifauna Study Area (1998 Surveys}



Birds of Prey (Raptor) Surveys (Jacques Whitford 1999a)

The 1999 birds of prey surveys focused on Osprey (Pandion haliaetus) and Bald Eagle (Haliaeetus leucocephalus) and encompassed the north and south shoreline of the Churchill River, the shoreline of Atikonak Lake and Lac Joseph and the east and northwest shore of Lac Brule (Jacques Whitford 1999a). Known birds of prey nest sites along the Churchill River were also surveyed, as well as the proposed transmission corridors from Muskrat Falls to Gull Island, Labrador, Gull Island to Churchill Falls and Gull Island to Soldiers Pond on Newfoundland's Avalon Peninsula (Figure 2-3).

Techniques for aerial surveys were previously developed by Jacques Whitford, in association with the Newfoundland and Labrador Wildlife Division (Jacques Whitford 1998b). Four observers (including the pilot) were present during surveys.

Nest activity surveys (i.e., initial searches for active nests in the Study Area) occurred in June and early July 1998, and followed major rivers, lakes and associated wetlands along a line 500 to 1,000 m inland from the shoreline of major rivers or large water bodies, or along the centre of smaller rivers and inlets/outlets of lakes. In forest regions, heights of 50 to 100 m above ground level (agl) were maintained, with focus on higher points of land and trees adjacent to smaller tributaries. Along the transmission line, survey methods were similar, and examined potential Osprey and Bald Eagle habitat within the 1,000 m wide transmission line corridor. The helicopter flew along the approximate centre line of the transmission line, following 1:50,000 topographic mapping of the proposed corridor. Cliff habitat was also searched during suitable weather conditions (i.e., good visibility, light winds, high cloud ceilings). Cliff habitat was searched at speeds of 50 to 100 km/h at distances of 50 m from the cliff face. All observations were plotted on 1:50,000 or 1:250,000 topographic maps and confirmed using a GPS. Information on the availability of alternate nest sites outside the area of disturbance as well as incidental wildlife sightings was recorded.

Consistent with Van Daele and Van Daele (1982), a nest was considered occupied if one or more adults were observed in the vicinity (but no eggs/young in the nest) and a nest was considered active if eggs or young were observed or suspected (i.e., defended) in the nest.

In mid-August 1998, identified active nests were revisited to determine nest productivity. The number of chicks present and their condition (i.e., alive or dead) was observed and recorded for each nest site. A nest was only considered successful if one or more young were observed. Active/occupied nests were considered as failed if the structure collapsed, eggs failed to hatch, or no nestlings were alive during this survey.

In terms of the proposed Project, this survey did not find any active Bald Eagle nests in the Study Area from Gull Island to Soldiers Pond. However, five active Osprey nests were identified, with four successful in rearing chicks to fledging in that year.

The relevant results of this previous birds of prey survey work have been fully included and incorporated into this current *Avifauna Component Study*. The initial birds of prey report itself (Jacques Whitford 1999a) has been submitted as part of the EA process for the Lower Churchill Hydroelectric Generation Project, and is thus available publicly. It has therefore not been entirely reproduced or resubmitted as part of the Project's EA.

Seabird Surveys in the Strait of Belle Isle (Jacques Whitford 2000a)

This marine mammal and seabird survey was designed to estimate the relative abundance of marine mammals and seabirds in the Strait and surrounding area during the ice-free season. This involved aerial and boat-based

surveys that were conducted approximately every three weeks between July and December of 1998. The aerial survey covered the entire Strait of Belle Isle and the northeast Gulf of St. Lawrence (approximately 5,400 km^2) and the boat-based survey covered the proposed cable crossing corridor (approximately 725 km^2).

A dedicated observer conducted seabird surveys during four of the boat-based mammal surveys between August and October. The seabird observer was positioned on top of the wheel house, 5 m from the waterline, and scanned an area 180 degrees (from starboard to port) covering a distance of approximately 50 m from the boat. Each transect was divided into 10-minute intervals, during which the surface of the water was scanned constantly while traveling on the transect using a combination of binoculars and the naked eye. All birds observed within the 50 m radius during each 10-minute interval were identified and documented by a second team member (recorder). Given that survey effort was different between survey periods, the number of species seen/hour was calculated to allow for comparison across survey periods.

A total of 29 seabird species were observed during surveys. The total number of species seen for each of the surveys was consistent; however, species composition and abundance varied between surveys. Combining surveys, there were 10 species that comprised the five most abundant species during each survey: Sooty Shearwater (*Puffinus griseus*), Atlantic Puffin (*Fratercula arctica*), Herring Gull (*Larus argentatus*), Black-legged Kittiwake (*Rissa tridactyla*), Greater Black-backed Gull (*Larus marinus*), Northern Fulmar (*Fulmarus glacialis*), Northern Gannet (*Morus bassanus*), Dovekie (*Alle alle*), Common Eider (*Somateria mollissima*) and Razorbill (*Alca torda*). Species that breed in the area in relatively large numbers were most abundant in the August survey and included Greater Black-backed Gulls, Herring Gulls, Atlantic Puffin and Common Murre (*Uria aalge*).

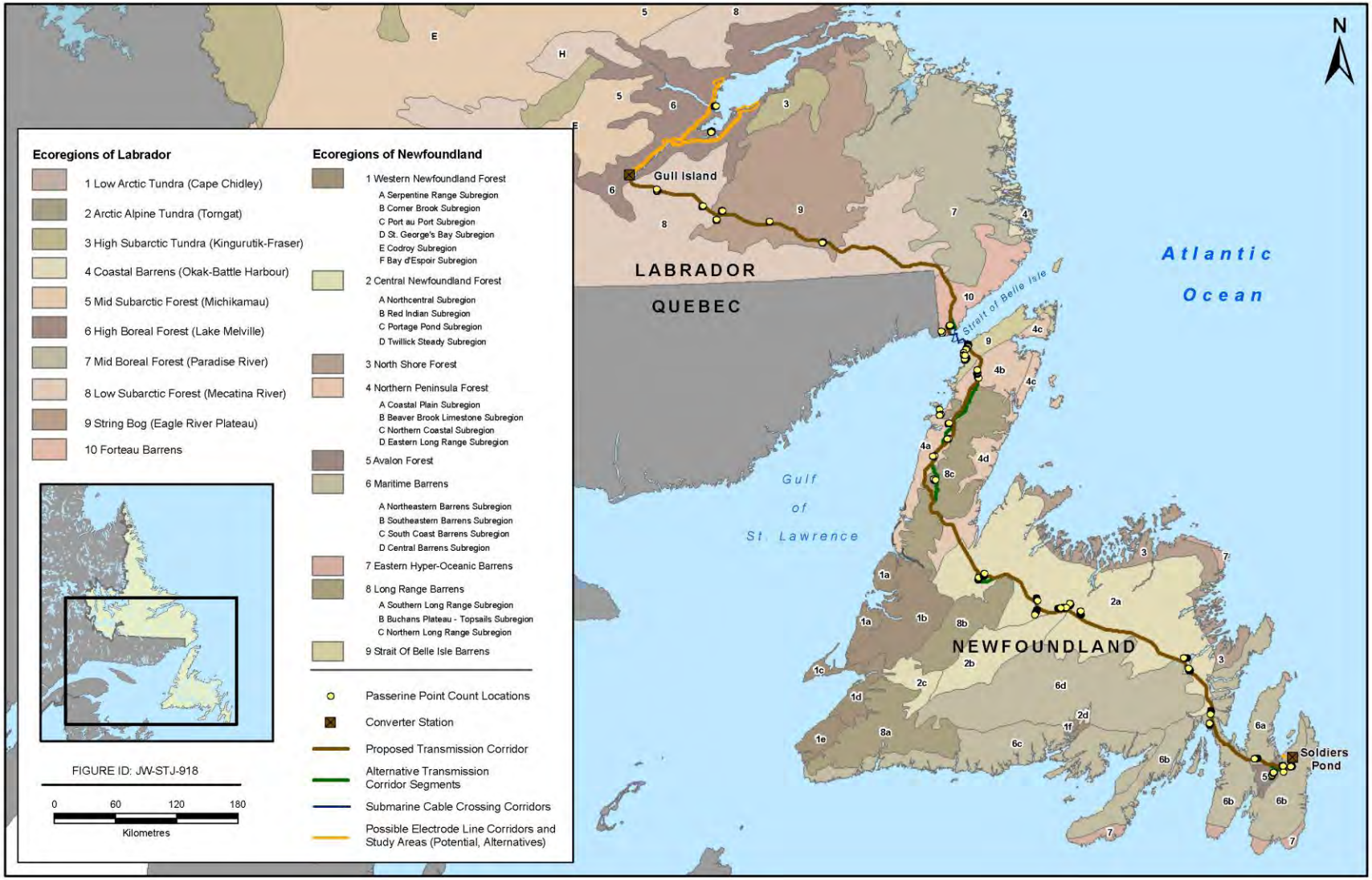
This Component Study summarizes and incorporates the results of the 1998 seabird surveys in the Strait of Belle Isle. Additional and detailed information related to these seabird surveys has also been submitted separately as a "Marine Mammals and Seabirds in the Strait of Belle Isle" Component Study as part of the Project's EA process (Jacques Whitford 2000a).

Passerine Surveys

A 2008 avifauna survey conducted as part of the Project's EA focused on passerines along the Study Area from Gull Island to Soldiers Pond. The primary objectives of the survey were: to describe the relative distribution and abundance of breeding passerines in relation to the various Ecoregions crossed by the proposed transmission corridor; and to assess species-habitat relationships to determine the main habitat features related to species distribution and abundance in the Study Area. As indicated, the 2008 passerine survey information has been fully included and incorporated into the current *Avifauna Component Study*.

The 2008 passerine survey included over 300 sampling locations across nine Ecoregions in the province (Figure 2-4). These sampling locations were selected without the benefit of the completed Ecosystem Land Classification (ELC) to stratify effort. Due to the logistics of accessing sites in remote locations, it was not practical in terms of time and cost to access many randomly placed points. Effort was focused on placing more point counts in this relatively short time period (approximately three weeks) in June/July in which to conduct these surveys. Given the need to complete surveys within a span of at most 4.5 hours, minimizing travel time between survey points is important.

Figure 2-4 Locations of Passerine Surveys along the labrador Island Transmission link and Associated Ecoregions and Subregions in Newfoundland and Labrador



Following protocols used during previous studies in the province (e.g., Schwab et al. 2001; Simon et al. 2000, 2002; Minaskuat Inc. 2008a), passerine surveys were undertaken during the peak of the breeding season, from 19 June to 2 July 2008, starting at approximately 0440h and ending by 0900h daily, due to the decreasing frequency of song as morning progresses. Since the peak of song for most species extends for only the first few hours of daylight, it is important to restrict surveys to early morning. Ralph *et al.* (1993) noted that song frequency remains fairly steady over the first 3-4 hours after sunrise, and that counts should generally be completed by 1000 at the latest. While the number of species and individuals detected per point count generally declined over the approximate five-hour daily survey period (Table 2-2), only 10 percent fewer species and 24 percent fewer individuals were recorded during the last two hours, compared to the first three hours after sunrise. An assessment of these survey parameters over the course of the field program indicated that neither mean species richness nor abundance appeared to change in relation to date during the survey (Table 2-3).

Table 2-2 Frequency of Bird Observations by Hour

Survey Time	Number of Points	Mean Species	Mean Individuals
0401h to 0500h	2	6.0	
0501h to 0600h	68	9.6	
0601h to 0700h	98	8.7	
0701h to 0800h	91	8.3	
0801h to 0900h	6	7.9	
Summary			
0401h to 0700h	168	9.1	14.5
0701h to 0900h	153	8.1	11.3

Table 2-3 Daily Summary of Passerine Surveys Indicating Influence of Date on Passerine Activity

Date (2008)	Number of Transects	Total Number of Point Counts	Number of Birds	Mean Number of Species	Mean Number of Birds
19 June	2	20	193	7.9	23.9
20 June	4	45	649	8.4	77.3
21 June	2	20	181	7.8	23.2
22 June	2	8	148	9.8	15.1
23 June	4	40	592	10.3	57.5
24 June	2	22	262	9.2	28.5
25 June	2	20	253	8.5	29.8
26 June	4	35	285	6.5	43.8
27 June	2	24	294	9.5	30.9
28 June	4	35	439	8.5	51.6
29 June	2	17	242	7.9	30.6
30 June	2	18	267	7.9	33.8
2 July	2	18	356	10.6	33.6
Total	**34***	**321**	**4161**	**8.7**	**36.9**
*One transect was surveyed over two days, thus is mentioned twice.					

Climatic conditions can greatly influence the level of bird activity/song, and may also affect the ability of observers to detect birds. Surveys should be delayed or suspended if temperature is below 0° Celsius, wind is above Beaufort 3 (>20 km/h), visibility (due to fog) is less than 50 m, or precipitation is any heavier than light,

intermittent drizzle (CWS 2007). Precipitation (Table 2-4) and wind (Table 2-5) conditions did appear to somewhat influence the activity of birds and/or the ability of observers to detect them (e.g., individuals per point and species per point were 53 and 44.5 percent greater, respectively, when wind conditions were Beaufort 2 or less compared to Beaufort 3 or more); however, the majority of point counts were conducted in the absence of precipitation (85 percent) and heavy winds (88 percent). Surveys were cancelled in situations with sustained high winds and/or steady precipitation.

Table 2-4 Effect of Precipitation on Bird Detection

	Number of Transects	Number of Point Counts	Number of Individuals	Number of Individuals per Point Count
Light Rain	1	1	5	5.0
Light Drizzle	4	15	154	10.3
Fog	7	35	431	12.3
No Precipitation	30	288	3,704	12.9

Table 2-5 Effect of Wind on Bird Detection

Wind (Beaufort Scale)	Number of Point Counts	Number of Individuals	Number of Individuals per Point Count	Number of Species per Point Count
0	150	1,978	13.2	8.5
1	91	1,271	14.0	8.8
2	56	668	11.9	8.0
3	26	226	8.7	5.9
4	16	136	8.5	5.8
Summary				
0 to 2	297	3,971	13.2	8.5
3+	42	362	8.6	5.9

As the ELC (Section 2.2.3) for the Project had not been completed prior to the start of the field program, survey locations were identified from topographic maps (and/or aerial photos) and targeted the Ecoregions that overlap the corridor. Initially, 5 km diameter circles were selected, that featured two habitat types common to the local Ecoregion. Within each circle, transects were identified in each of the two habitat types but often included a third less-common habitat (e.g., riparian areas). While target areas were predetermined, specific point count locations along transects were identified in the field based on habitat availability and safety considerations. When weather precluded the ability to access preselected sites (on three occasions), alternate transects were chosen within the same Ecoregion and as close to the proposed corridor as was possible to reach by road (within approximately 15 km).

Four two-person avifauna teams, consisting of a lead ornithologist experienced with point count surveys in boreal forest habitats and a technician, were mobilized either by vehicle (two teams covering Central and Eastern Newfoundland and the Avalon Peninsula) or by helicopter (two teams covering the Northern Peninsula and Southeastern Labrador). Each team surveyed as many point counts as possible on a given day (usually six to ten per transect). Generally four transects were completed on each day; however, constraints due to helicopter safety guidelines associated with low-visibility conditions meant that, on occasion, teams worked along the same transect to ensure completion within one visit.

Point counts were established at least 300 m apart, as determined in the field using a handheld GPS unit, and at least 50 m away from habitat edges. Upon arriving at each point basic data recorded location were project name and number, biologist, date/time, UTM coordinates, waypoint label, weather (temperature, wind, precipitation, and cloud cover), and noise level. Two consecutive five-minute counts were conducted by a single observer with a scan in all directions, using binoculars as appropriate.

(Bibby et al. 2000). All birds identified by sight or sound were recorded as being within 50 m, between 50 and 100 m, or greater than 100 m away from the observer. In cases where several individuals sang concurrently, a conservative estimate of numbers was made. Of the passerines detected in this field program, 75 percent were recorded during the first five-minute period and near equal percentages of birds were recorded at the three distance categories, with 29 percent of individuals recorded within 50 m of the observer, 37 percent between 50 and 100 m, and 34 percent further than 100 m away.

Birds flushed upon arrival were counted if not subsequently recorded during the survey, and flyovers were recorded as such. Incidental observations made during travel between point count locations were recorded separately [e.g., presence of moose (*Alces alces*) caribou (*Rangifer tarandus*), black bear (*Ursus canadensis*) scat and/or trails and prints, avian species not recorded during point counts].

All point count locations were recorded, marked and labelled with the point count number and date for future reference. At each point count, the ornithologist recorded habitat characteristics within a 50 m radius, including dominant plant species, forest age and structure, existing/historical disturbance, and proximity to water bodies, transmission lines, or roads. This general overview of habitat features allowed for correlation with the ELC habitat classifications when this information became available.

Data were compiled into a spreadsheet indexed by waypoint, Ecoregion and bird species. Flyovers were accounted for in the total number of individuals and species but removed for all further analysis, since habitat associations were unclear. Data were screened to verify rarities and clarify ambiguous records. In several instances, dense vegetation or heavy cloud cover compromised the reliability of the handheld GPS units, resulting in some points being within 300 m of others. In most cases, there was no overlap in birds between the point counts involved and all data were retained. Where one or two birds were shared between points, these were eliminated from the second point, but all other data were retained. All unidentified bird observations were removed from the data set.

Avifauna species were summarized by ELC habitat type within each Ecoregion. Corvids (i.e., crows and jays) and all non-passerines were excluded from the analysis. Corvids and jays breed earlier or later in the year, and therefore are unlikely to be defending territories at the time of the forest bird survey. Estimating density based on observations of these species would be prone to error, as juveniles might be counted (biasing the estimate upward), adults may be quieter than when breeding (biasing the estimate upward), and all ages might be wandering over larger areas than during the breeding season (possibly biasing interpretation of habitat associations)(Stantec 2012). Species with fewer than 10 individuals counted throughout the entire avifauna survey were also omitted from habitat analysis, as too few individuals were present to confirm habitat associations (i.e., fewer observations were made than available habitat classifications). Mean species richness and abundance per Ecoregion were calculated by dividing total individuals by the number of points surveyed. For the overall analysis of abundance and species richness, records from all distances from the point count centre were included. Importance indices were created for each habitat type by dividing the frequency of

occurrence of each species by the total number of birds recorded in each habitat type. Data collected at two sites surveyed opportunistically along the proposed electrode corridors were excluded from summaries and analyses regarding the transmission corridor from Gull Island to Soldiers Pond; results from these point counts are discussed separately where appropriate. The survey involved the standard point count approach that was used to characterize land bird association with various habitats. It was not possible to implement specialized techniques to detect other species over the scale of this project. However, note that sensitive habitats and/or species supported by these habitats have been considered in the assessment.

Additional effort was used to document breeding shorebirds and potential breeding and staging habitat on the Labrador and Newfoundland shores of the Strait of Belle Isle. This involved a 15-minute scan of the shoreline at the St. Barbe Ferry Terminal and a one-hour scan of the shoreline in Anchor Point, on the Newfoundland shore on 27 June 2008. Also on the 27 June 2008, surveys of the Labrador shore consisted of an assessment of habitat and recording incidental sightings of shorebirds along the shoreline at L'Anse Amour and the public beach in L'Anse-au-Clair. Data from these surveys have been used to supplement the information contained in this Component Study, primarily of a general nature (i.e., as incidental sightings).

Project Ecological Land Classification: Wildlife Observations

As part of the ELC for the proposed transmission corridor (described in Section 2.2.3), wildlife species, including avifauna, were recorded by a wildlife biologist during field surveys in July and August 2008, in several plots in Labrador (67 plots) and on the Island of Newfoundland (337 plots). Species and their habitat were evaluated at these plots. Evidence of the presence of some avifauna species (e.g., scat, nests) was also recorded. Potential habitat for these species was classified, where appropriate, according to primary, secondary or tertiary habitat potential (described in Section 2.2.4). As these data were not presented in Minaskuat Inc. (2009a), information from these surveys, where relevant, has been fully incorporated in this Component Study.

Other Information Sources

The CWS provided data from 1996 surveys along the Strait of Belle Isle (Point Amour) for incorporation in this report (CWS unpublished data). While waterfowl were the primary focus of the field program, incidental sightings of passerines, birds of prey, shorebirds and seabirds were also documented.

Additional data sources included results of previous studies along the Churchill River in support of the Lower Churchill Hydroelectric Generation Project dedicated to waterfowl (LGL Limited 2008), passerines (Minaskuat Inc. 2008a) and birds of prey (Minaskuat Inc. 2008b), as well as baseline studies in support of other Environmental Assessments in the province (e.g., DND 1994 ; DWST 1998).

In addition to these data sources, various other published and unpublished reports related to avifauna in the province were accessed and incorporated into this report.

2.2.3 Ecological Land Classification Habitat Mapping

As part of the Project's EA, a regional ELC has also been completed for a 15 km wide study area that encompasses the proposed and alternative HVdc transmission corridors from Gull Island in central Labrador to Soldiers Pond on Newfoundland's Avalon Peninsula, covering a linear distance of approximately 1,100 km. The ELC is summarized below, but has also has been reported and submitted as a separate Component Study for the Project's EA.

The purpose of the ELC was to identify, categorize and evaluate vegetation types and associated habitats on a regional scale within the Study Area. Satellite imagery (Landsat 7 and Spot 5), forestry vector data (for the Island of Newfoundland), air photos, elevation and field survey data served as the foundation for the ELC study. A field survey program was subsequently designed to support a systematic remote-sensing-based mapping program. Based on the hierarchical framework for ELC in Canada described by Marshall and Schutt (1999), the ELC incorporated a standard and well-validated methodology for describing ecological units, allowing comparisons of ELCs undertaken in other jurisdictions, including others in Newfoundland and Labrador (Minaskuat Inc. 2009a).

The field survey program was carried out in June and July of 2008, to describe the vegetation communities/habitat types within the Study Area and to verify ground information necessary for the remote-sensing mapping algorithms. Field teams consisted of a vegetation ecologist, wildlife ecologist and field technologist. Initial reconnaissance surveys along with existing spatial imagery were used to identify areas that best represented the dominant habitat type within each Ecoregion in the Study Area. Plots were selected in the field in areas within a homogenous cover and composition of vegetation, and were spaced as evenly as possible to ensure optimal distribution of ground-verified sites within the Study Area. A total of 404 plots were surveyed throughout the Study Area in Newfoundland and Labrador.

At each survey plot, a vegetation inventory was conducted for the tree, shrub and ground layers within an area of approximately 400 m2. Plant species presence and abundance (expressed as a percentage of ground area covered by the species) were then used to group the surveyed vegetation communities into habitat types. A total of 15 Habitat Types and a number of non-vegetated land classes were defined (Table 2-6). Existing satellite images and aerial photographs of the Study Area were incorporated, along with the location of all surveyed sites, into a computer-based geographic information system (GIS) and used to delineate identified habitat types that were subsequently produced at scale of 1:50,000. ELC habitat classifications formed the basis for the habitat mapping exercise for select avifauna species or species groups included in this *Avifauna Component Study*.

Table 2-6 ELC Habitat Types within the Study Area, Newfoundland and Labrador

ELC Habitat Type	Description	Distribution
Alpine Vegetated	Coniferous forest species widely spaced; large variety of shrub and ground cover.	Exclusive to the Newfoundland portion of the Study Area
Black Spruce and Lichen Forest	Picea mariana dominates – these trees are widely spaced; little variety found in shrub or ground layers; Cladina sp. dominates ground cover.	Exclusive to the Labrador portion of the Study Area
Burn	No forest cover; early invader shrub species present; little to no ground cover.	Found in the Labrador and Newfoundland portions of the Study Area
Conifer Forest	Coniferous species dominate but some deciduous present; large variety of shrub and ground cover. Stunted coniferous trees; variety of shrub and	Found in the Labrador and Newfoundland portions of the Study Area
Conifer Scrub	Stunted coniferous trees; variety of shrub and ground cover.	Found in the Labrador and Newfoundland portions of the Study Area
Cutover	A variety of coniferous and hardwood species, shrub and ground cover.	Exclusive to Newfoundland portion of the Study Area
Exposed Bedrock	Bedrock exposed; Cladina sp., Trichophorum cespitosum, Empetrum nigrum, and Vaccinium sp. make up the little ground vegetation present.	Exclusive to Labrador portion of the Study Area
Hardwood Forest	Betula species dominate but some coniferous species	Exclusive to Labrador portion of the Study

	found; variety of species found in shrub layer and ground cover.	Area
Kalmia Lichen/Heathland	Picea mariana is dominant tree species, a large variety of shrub and ground cover.	Exclusive to Newfoundland portion of the Study Area
Lichen Heathland	No trees present; a large variety of shrub and ground cover.	Exclusive to Labrador portion of the Study Area
Mixedwood Forest	Both coniferous and deciduous tree species, Kalmia angustifolia as dominant shrub; a large variety of ground cover.	Found in the Labrador and Newfoundland portions of the Study Area
Open Conifer Forest	Two dominant coniferous species, widely spaced; variety of shrubs; lichens and mosses dominate ground cover.	Found in the Labrador and Newfoundland portions of the Study Area
Rocky Barrens	No forest cover, shrub layer comprised primarily of Vaccinium species; lichen and other ground cover.	Exclusive to Newfoundland portion of the Study Area
Scrub/Heathland/ Wetland	Mosaic of Conifer Scrub, Kalmia Heathland and Wetland.	Exclusive to Newfoundland portion of the Study Area
Wetland	Three typical tree species (Betula sp., Larix laricina, Picea mariana), a large variety of shrub and ground cover species.	Found in the Labrador and Newfoundland portions of the Study Area
Note: Developed by Minaskuat Inc. 2009a.		

Data Analysis

Based on the findings of the literature review, regional overviews of the presence, abundance and distribution of waterfowl, passerines, birds of prey and upland game in the Study Area have been developed and provided for the following geographic regions (described in Section 2.1): Lower Churchill River and Lake Melville; Southeastern Labrador; Northern Peninsula; Central and Eastern Newfoundland; and Avalon Peninsula. In terms of spatial overlap with the Study Area, habitat use by avifauna during breeding is of greatest interest to this Project and thus was a key focus of the analyses. Migration, breeding and staging in the vicinity of the Strait of Belle Isle are also discussed and include seabirds and shorebirds, in addition to the avifauna groups mentioned.

A complete description of the available information and existing environmental conditions for representative species or species group was prepared according to:

- Primary Sources of Information – An overview of the relevant and available information and research completed within the past approximately 20 years in the province;
- Existing Conditions and Status – Information on the distribution and population status of the species in the province, where available;
- Habitat Association and Distribution in the Study Area – Species distribution and any regional differences, habitat relationships [according to habitat types identified by Minaskuat Inc. (2009a)] and extensive habitat mapping. Where they exist, data associated with the proposed transmission corridor were incorporated;
- Limiting Factors – Natural or human factors which may be affecting the status of a species in the region (e.g., hunting, trapping, predation and other disturbances).

Species of avifauna included in this Component Study represent several important groups of birds, including waterfowl, birds of prey, passerines, upland game and species designtated as at risk by COSEWIC, or listed under *SARA* and/or *NLESA*. A total of 14 avifauna species were selected for detailed review that are a listed species,

exhibit affinities for a particular habitat type and/or are representative of a particular avifauna group (e.g., early versus late nesting species):

- Harlequin Duck – This species has received a great deal of attention since first designated as *Endangered* by COSEWIC in 1990, which was subsequently downgraded to *Vulnerable* (*NLESA*) and a species of Special Concern (*SARA*). Characteristics that make this species particularly *Vulnerable* to development include specific habitat requirements (i.e., rocky and fast-flowing sections of rivers and/or their tributaries) and high fidelity to breeding areas (females return to the same section of river each breeding season). Open water is an ELC unit that was mapped however, the experience of the Study Team (e.g., Trimper et al. 2008) and others (Thomas et al. 2008) indicates the inappropriateness of assuming Harlequin Duck presence in NL based on broad landscape features.
- Canada Goose (*Branta canadensis*) – This species occurs throughout the province, has a very distinct habitat association (i.e., ribbed fens and fen-marsh complexes), are of cultural importance to aboriginal and other residents within the province and are representative of early nesting waterfowl.
- Surf Scoter (*Melanitta perspicillata*) – This species is representative of the late-nesting waterfowl group and have distinct habitat associations (preferring shallow and rocky lakes). While this species is not known to breed on the Island, they are widespread in Labrador.
- Rusty Blackbird (*Euphagus carolinus*) – This species has been designated as a species of Special Concern under *SARA* and as *Vulnerable* under the *NLESA*. They are distributed throughout the Study Area but are relatively uncommon.
- Red Crossbill (*Loxia curvirostra percna*) – This species is listed as *Endangered* under *SARA* and *NLESA*. The *percna* subspecies is found only in Newfoundland and has a specific habitat preference for mature forests.
- Gray-cheeked Thrush (*Catharus minimus*) – This species is listed as *Vulnerable* under the *NLESA*.
- Olive-sided Flycatcher (Contopus cooperi) – This species is federally protected under *SARA* (Threatened) and listed as Threatened under *NLESA*.
- Blackpoll Warbler (*Dendroica striata*) – This species is ubiquitous throughout the province but has a specific habitat preference for coniferous forests. This was one of the most common species identified during passerine surveys along the transmission corridor in 2008.
- Wetland Sparrows [Swamp Sparrow (*Melospiza georgiana*), Song Sparrow (*Melospiza melodia*), Lincoln's Sparrow (*Melospiza lincolnii*), and Savannah Sparrow (*Passerculus sandwichensis*)] – These species were selected based on their preference for a specific and relatively limited habitat type (i.e., riparian marsh habitat). This 'category' of four passerines was first identified during baseline investigations for the Lower Churchill Hydroelectric Generation Project (Minaskuat 2008a). In Labrador, the distribution of these species was found to be closely associated with productive wetlands (e.g., riparian marsh). Due to their role as an indicator of this relatively uncommon habitat (at least in Labrador) and the amount of baseline information already assembled by Nalcor Energy, the same Wetland Sparrows category was incorporated in the Labrador-Island Transmission Link assessment.
- Osprey – This species is at the top of the food chain and is therefore an indicator of the status of lower trophic levels. Specific habitat requirements include tall trees near a water body, commonly on islands in streams, or along the shore of smaller tributaries.
- Bald Eagle – This species is similarly at the top of the food chain and therefore an indicator of the status of lower trophic levels. Similar to Osprey, habitat requirements of this species are based on small-scale localized biophysical parameters.

- Short-eared Owl (*Asio flammeus*) – This species is listed as *Vulnerable* under *NLESA* and of Special Concern under *SARA*.
- Ruffed Grouse (*Bonasa umbellus*) – This species generally has a relatively limited distribution and more specialized habitat requirements than other upland game species [such as Spruce Grouse (Falcipennis canadensis)], being closely associated with aspen (Populus sp.) habitats.
- Common Nighthawk (Chordeiles minor) – This species is listed as Threatened under *NLESA* and is federally protected under *SARA*(Threatened) in 2007.
- Seven additional avifauna species of special conservation status in Newfoundland and Labrador were also evaluated and found to occur outside the Study Area and/or there were no recent records of their presence in the province.
- Barrow's Goldeneye (*Bucephala islandica*) – Listed as *Vulnerable* under *NLESA* and of Special Concern under *SARA*
- Eskimo Curlew (*Numenius borealis*) – Listed as *Endangered* under *NLESA* and *SARA*
- Piping Plover (*Charadrius melodus*) – Listed as *Endangered* under *NLESA* and *SARA*
- Red Knot (*Calidris canutus rufa*) – Listed as *Endangered* under *NLESA* and designated *Endangered* by COSEWIC
- Chimney Swift (*Chaetura pelagica*) – Listed as Threatened under *NLESA* and *SARA*
- Ivory Gull (*Pagophila eburnea*) – Listed as *Endangered* under *NLESA* and *SARA*
- Peregrine Falcon (*Falco peregrinus anatum* and *Falco peregrinus tundrius*) – Listed as *Vulnerable* under *NLESA* and of Special Concern (*tundrius subspecies*) or Threatened (*anatum subspecies*) under *SARA*

Table 2-7 The Likelihood of Occurrence for Avifauna Species by Region (Based on Field Work and Literature Review Such as Habitat Availability and Species Range)

Avifauna Species	Lower Churchill River and Lake Melville	Southeastern Labrador	Strait of Belle Isle	Northern Peninsula	Central and Eastern Newfoundland	Avalon Peninsula
Waterfowl						
Harlequin Duck	✓	✓	✓	✓	✓	✓
Canada Goose	✓	✓	✓	✓	✓	✓
Surf Scoter	✓	✓	✓	-	-	-
Passerines						
Rusty Blackbird	✓	✓	Potential	Infrequent	Infrequent	Infrequent
Red Crossbill	-	-	-	Unlikely	Unlikely	Infrequent
Gray-cheeked Thrush	✓	✓	Potential	✓	✓	✓
Olive-sided Flycatcher	✓	Likely	Potential	✓	✓	✓
Blackpoll Warbler	✓	✓	✓	✓	✓	✓
Wetlands Sparrows:						
Swamp Sparrow	✓	✓	Potential	✓	✓	✓
Song Sparrow	✓	Potential	Potential	✓	✓	✓
Lincoln's Sparrow	✓	✓	Potential	✓	✓	✓
Savannah Sparrow	✓	✓	Potential	✓	✓	✓

Bird's of Prey						
Osprey	✓	✓	Potential	✓	✓	✓
Bald Eagle	✓	✓	Potential	✓	✓	✓
Short-eared Owl	Infrequent	✓	✓	✓	No records	
Upland Game						
Ruffled Grouse	✓	✓	-	✓	✓	✓
Other Species of Special Conservative Status						
Common Nighthawk	Infrequent	Infrequent	Unlikely	Seasonal	Seasonal	Seasonal
Barrow's Goldeneye	-	-	Potential	Potential	Seasonal	Seasonal
Eskimo Curlew	-	-	-	-	-	-
Piping Plover	-	-	-	Seasonal	Seasonal	Seasonal
Red Knot	-	-	-	Seasonal	-	Seasonal
Chimney Swift	-	-	-	-	-	-
Ivory Gull	Seasonal	-	Potential	-	-	Seasonal
Peregrine Falton	-	-	Potential	Seasonal	-	Seasonal

Notes:

1. Geographic Regions are described in Section 2.1 and Figure 2-2.
2. Primary sources of information are discussed for each species/species group in Section 3.0.
3. "-" indicates no known occurrencea.
4. Definitions:
   Unlikely – not believed to be present
   Likely – believed to be present
   Potential – may be present but not confirmed
   Infrequent – confirmed to be present but infrequently observed
   No records
5. Seasonal – winter use; summer use (breeding); or spring/fall migrant only

Based on the literature review and data from previous studies along the transmission corridor [e.g., Minaskuat Inc. (2009a), AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) and Jacques Whitford (1999a, 2000a), as well as passerine surveys in 2008], habitat quality was assessed for each species or species group, where appropriate. Habitat quality was classified as:

- primary habitat: provides foraging, protection, nesting and resting habitat;
- secondary habitat: provides an abundance of one or more (or marginal amounts of all) of the critical elements; or
- tertiary habitat: provides marginal foraging, protection or resting opportunities or may only be used during transit.

A series of detailed avifauna habitat quality maps were subsequently generated, based on the ELC habitat types identified and mapped by Minaskuat Inc. (2009a) (Table 2-6), for select species. For each species, separate maps were produced for the Southeastern Labrador, Northern Peninsula, Central and Eastern Newfoundland and Avalon Peninsula regions, based on the coverage of the ELC completed for the HVdc transmission corridor. Maps are colour-coded to reflect habitat quality and indicate the percentage of primary, secondary and tertiary habitat available on an Ecoregion basis, within each of the larger geographic regions.

This evaluation and mapping of potential avifauna habitat suitability is, as a result of the nature and extensive geographic scale of the Project and the regional focus of the ELC upon which it is based, intended to give a general overview of the potential for portions of the Study Area to support particular avifauna species. The mapping is therefore not intended to indicate definitively whether a particular species is currently found in a

specific location. Rather, it provides a description of the potential use of an area, at a regional scale, across the Study Area. In this regard, the avifauna habitat potential mapping should be considered along with the survey data and information from the literature that precedes it. The results do not mean the most important habitats are those with the most species – this is merely a characteristic of those habitats.

Also, a key focus of this study is on avifauna that are currently designated as species of special conservation concern under federal (*SARA*) and/or provincial (*NLESA*) legislation. This includes providing information on the likely presence/absence and distribution of such species in the Study Area (based on the avifauna surveys, existing literature, etc.), as well as, where possible and applicable, identifying and mapping potential habitat quality (primary, secondary or tertiary) to support such species across the Study Area. However, for some such species, key habitat preferences and requirements are quite specific and localized, and cannot be mapped at the scale of this Project and ELC. Where potential habitats are mapped for such species, it should be noted that these habitat ratings are not meant to denote "critical habitat" or other habitat definitions as specified in the *SARA* or other applicable legislation.

2.3 Study Team

The *Avifauna Component Study* was conducted on behalf of Nalcor Energy by Stantec Consulting Ltd. The Study Team included a project manager/regional lead in Labrador, supported by two additional regional leads (Corner Brook and St. John's), who were responsible for liaison with regulatory agencies in their respective areas. Additional team members included personnel responsible for supporting data collection and administrative support. The Study Team and their respective roles are presented in Table 2-8. Brief biographical statements, highlighting roles and responsibilities and relevant education and employment experience are provided in Appendix B.

Table 2-8 Avifauna Study Team

***Avifauna Component Study* Report**	
Role	**Study Team Member**
Project Manager	Perry Trimper
Regional Leads	Perry Trimper - Labrador
	Tina Newbury – Corner Brook
	Elizabeth Way – St. John's
Lead Report Authors	Karen Rashleigh
	Shawna Peddle
	John Pennell
	James Loughlin
GIS/Mapping	Stephen Rowe
	Carolyn Pelley
	Jackie Bowman
	Erin Marshall
	Bernie MacNeil
Senior Review	Earle Hickey
Senior Advisor	Colleen Leeder
2008 Passerine (Songbird) Field Survey Team	
Project Manager	Perry Trimper
Study LeaD	Steve Gullage
Advisor/Back-up To Study Lead	Marcel Gabhauer
Lead Field Observers	Steve Gullage, Barbara Frei, Marie-Anne Hudson, Brad Zitske

Field Technicians	Matthew Andrew, Jennifer Mitchell. John Pennell, Chris Brown
Data Management and Reporting	Barbara Frei, Tina Newbury, Karen Rashleigh, Perry Trimper
Data Management/GIS Mapping	Carolyn Pelley
Senior Review/Advisor	Marcel Gahbauer

3.0 RESULTS AND ANALYSIS

Species of avifauna included in this study include waterfowl, passerines, birds of prey, upland game birds and species of special conservation status that breed in the following geographic regions of the Study Area: Lower Churchill River and Lake Melville; Southeastern Labrador; Northern Peninsula; Central and Eastern Newfoundland; and the Avalon Peninsula. Given the uniqueness of the Strait of Belle Isle compared to other geographic regions of the Study Area (in terms of the marine and shoreline habitat, as well as proposed infrastructure), it has been discussed separately and encompasses any existing information on the aforementioned avifauna groups, as well as seabirds and shorebirds that breed, stage and/or migrate through the Strait of Belle Isle.

The following sections are organized according to species group (i.e., waterfowl, passerines, birds of prey, upland game birds and species of special conservation status) and species in the Strait of Belle Isle. A general overview of the presence, abundance and distribution of each group is presented, in addition to more detailed presentation of the literature and results of previous investigations in the Study Area, for 14 key species or species groups.

3.1 Waterfowl

Waterfowl in Newfoundland and Labrador can be subdivided into an early-nesting group, comprising dabbling ducks and geese, and a late-nesting group, comprising sea ducks and diving ducks. The species selected for detailed assessment and habitat mapping are representative of these two groups and included species of special conservation status.

3.1.1 Regional Overviews

The following provides a general overview of the presence, abundance and distribution of waterfowl species in the Study Area by geographic region.

3.1.1.1 Lower Churchill River and Lake Melville

A variety of waterfowl species are found along the Churchill River and associated tributaries (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999; Goudie 1991a; Bateman 1992; Chaulk and Turner 2002; LGL Limited 2008) throughout the May to October period. Large numbers of staging waterfowl are typical in spring, related to traditional use of the area by birds, as well as to access open water and foraging areas early in spring when most other areas are still ice-covered (LGL Limited 2008). While some breeding does occur along the main stem of the Churchill River, it is the adjacent areas (tributaries) that generally support a greater abundance and diversity of waterfowl species. Waterfowl do use the area for staging/molting in the fall; however, relatively little information is available for this period. Results from relevant studies related to the Project include:

- Aerial and grounds surveys by AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) identified 18 species of ducks (seven dabblers, two divers and nine sea ducks) and one species of goose (Canada Goose).

- Large numbers of waterfowl (>2,000) are found along the Churchill River during spring staging (LGL 2008). Surf Scoter comprised approximately half of all observations. Small groups of Long-tailed Duck (*Clangula hyemalis*) were generally associated with Surf Scoter.
- Other species that have been documented along the Churchill River during staging include Green-wing Teal (*Anas crecca*), American Black Duck (*Anas rubripes*), Lesser Scaup (*Aythya affinis*), Ring-necked Duck (*Aythya collaris*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), White-winged (*Melanitta fusca*) and Black (*Melanitta nigra*) Scoter and Harlequin Duck, in relatively smaller proportions (Goudie 1991a; Bateman 1992; Jacques Whitford 1996a, 1997a, 1998a; AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999; Chaulk and Turner 2002; LGL Limited 2008).
- The waterfowl species that are known to breed along the lower Churchill River are comprised primarily of Canada Goose, American Black Duck, Common Goldeneye and Common and Red-breasted Merganser (LGL Limited 2008). In addition to these species, AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) also reported large numbers of Surf Scoter along the main stem of the Churchill River during the breeding season.
- The adjacent foothills and upper tributaries of the lower Churchill River are used extensively for breeding by a greater diversity of waterfowl species (LGL Limited 2008). The Harlequin Duck, a species of special conservation status, breeds along the larger tributaries of the lower Churchill River (Goudie 1991a; Bateman 1992; Jacques Whitford 1996a, 1997a, 1998a). Large numbers of Canada Geese (220) were found along the Churchill River during fall staging (September) (LGL Limited 2008).

Within the High Boreal Forest Ecoregion, Goudie and Whitman (1987) indentified several species of waterfowl including Canada Goose, Green-wing Teal, American Black Duck, Mallard (Anas platyrhynchos), Northern Pintail (Anas acuta), scaup, scoters, Common Goldeneye and mergansers. In general, this Ecoregion is considered particularly important for diving ducks (Meades 1991; Bateman and Hicks 1995). Results from relevant studies related to the Project include:

- LGL Limited (2008) found approximately 3,300 staging waterfowl in the area in May, comprised of roughly equal numbers of diving and dabbling ducks. Diving ducks were generally associated with northern shorelines of Goose Bay and inner Lake Melville, while dabbling ducks and geese were located on both northern and southern shorelines.
- Relatively large concentrations of scaup, American Black Duck, Canada Goose, Northern Pintail, and Green-wing Teal were reported in the Goose Bay and inner Lake Melville areas (LGL Limited 2008).
- One pair of American Wigeon (Anas americana) was found at the mouth of the Kenamu River (LGL Limited 2008).

In general, the Lower Churchill River and Lake Melville region is particularly important for spring staging waterfowl and supports breeding waterfowl populations along the main stem of the river as well as (and to a larger degree) the associated tributaries. At least 18 species of waterfowl occur in the area, including staging and breeding Harlequin Duck, a species of special conservation status (see Section 3.1.2.1).

3.1.1.2 Southeastern Labrador

A variety of waterfowl species are found in Southeastern Labrador during staging, molting and for breeding and include species of dabbling ducks, diving ducks and geese, although generally at low densities (Goudie and Whitman 1987). American Black Duck, Canada Goose, mergansers, Common Goldeneye, Green-wing Teal and

Surf Scoter are generally found in the area (Goudie and Whitman 1987; Jacques Whitford 1998c) between May and October. Results from relevant studies related to the Project include:

- Many rivers are still frozen in May when birds first arrive in spring (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999), thereby limiting the number of suitable staging areas.
- During spring staging surveys in 1998 (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999), one pair of Harlequin Duck was recorded on the St. Paul River. Pairs and individuals of other waterfowl species were observed during spring staging and included relatively high numbers of Canada Goose (62), and to a lesser extent American Black Duck (27), Green-wing Teal (23), Common Merganser (27) and Common Goldeneye (19). Ring-necked duck, Red-breasted Merganser and Surf Scoter were also documented during spring staging, but in low numbers.
- Common species observed during breeding were Canada Goose (on nest or with young) and Common Goldeneye, which were seen in pairs in the Study Area in Labrador (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). Other species observed during the breeding season were similar to that of staging, but included low numbers of Lesser Scaup.
- East of the proposed transmission corridor, surveys along the Trans Labrador Highway study corridor identified similar waterfowl species during spring staging/breeding, with the addition of Mallard, Northern Shoveler (Anas clypeata) and Greater Scaup (Aythya marila) (Jacques Whitford 1998c). While not identified during staging/breeding surveys, one Northern Pintail was recorded during molting. Other species observed during molting included small numbers of Canada Geese, American Black Duck, Mergansers, Surf Scoter and Greater Scaup.

In general, the Southeastern Labrador area supports species of waterfowl during staging, breeding and molting stages. However, densities are generally low, but there are areas with seasonally high waterfowl densities. Waterfowl use the headwaters of the Eagle River during spring breeding and moulting periods. Moulting waterfowl (e.g., Common Goldeneye, Scaup sp., Ring-necked Duck, American Black Duck, Canada Goose and Merganser sp.) were found using the area in relatively high concentrations on the Eagle River plateau during a reconnaissance flight in 2008 (CWS unpublished data).

3.1.1.3 Northern Peninsula

A variety of waterfowl species are found along the Northern Peninsula during staging and breeding, including Canada Goose, American Wigeon, American Black Duck, Mallard, Northern Pintail, Green-wing Teal, Harlequin Duck, Common Goldeneye, Common Merganser, Red-breasted Merganser and Ring-necked Duck (Goudie 1987; Goudie and Gilliland 2008; Warkentin and Newton 2009). The Harlequin Duck is largely restricted to the Northern Peninsula region of the Newfoundland Study Area during the breeding season (Thomas 2008; Warkentin and Newton 2009).

Results of earlier studies of waterfowl in the Northern Peninsula Forest and Long Range Barrens Ecoregions found overall lower numbers of waterfowl in these areas compared to other Ecoregions in Newfoundland that overlap the current Study Area, with the exception of the Maritime Barrens Ecoregion (Goudie 1987). The most frequently encountered species were American Black Duck, Common Goldeneye and Common Merganser; however relative abundances varied between years. Goudie (1987) also reported relatively low densities of Canada Geese in the Northern Peninsula and Long Range Barrens Ecoregions in general. This contrasts somewhat with results of previous studies related to this Project, as outlined below:

- AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) found waterfowl on the Northern Peninsula to be relatively abundant compared with the remainder of the Study Area in

Newfoundland. Canada Goose, in particular, were noted in relatively high numbers during spring staging and breeding periods, and were found nesting on the Main River, Upper Main River and the Torrent River (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999).

- One pair of Harlequin Duck was recorded on the Torrent River in June 1998 (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999), within the known breeding range of this species (Thomas 2008). Goudie and Gilliland (2008) observed increasing numbers of Harlequin Duck pairs on the Torrent River during the 1990's. These authors also stated that "*A high rate of brood production in 1997 and 1998, compared to adjacent watersheds, suggests the possibility that the Torrent River system may behave as a source population for the general region of northern Newfoundland."*
- An unusually high number of Black Scoter (49 near Portland Creek) were documented during the spring staging period in 1998 (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999).
- Pairs and individuals of other species that were found during the spring staging and breeding periods are American Black Duck, Green-wing Teal, Ring-necked Duck, Common Goldeneye, Common Merganser and Red-breasted Merganser (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999).

In general, the Northern Peninsula hosts a variety of waterfowl species and is important in terms of supporting relatively large numbers of breeding Harlequin Duck. Rivers in higher elevations along the western side of the Long Range Mountains appear particularly important for this species (Gilliland et al. 2008a). Based on the previously referenced studies, at least 12 species of waterfowl are associated with this region of the province, during staging and/or breeding.

3.1.1.4 Central and Eastern Newfoundland

A relatively small variety of waterfowl species are found in the Central and Eastern Newfoundland region during staging and breeding. Between 1978 and 1979, observations of waterfowl in the Central Newfoundland Forest Ecoregion identified relatively high densities of Green-wing Teal, American Black Duck, Ring-necked Duck and Common Goldeneye, compared to densities of other species observed, including Common and Red-breasted Merganser and Canada Goose (Goudie 1987). Results from relevant studies related to the Project include:

- AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) recorded relatively low numbers of waterfowl during 1998 surveys. Of the few records available, mergansers were the most common (less than 25 recorded during May and June surveys).
- Species identified during staging were American Black Duck, Green-wing Teal, Ring-necked Duck, Common Merganser and Canada Geese (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999).
- Species identified during the breeding season were Green-wing Teal, Canada Goose, Common Merganser and Red-breasted Merganser (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999).

The Central and Eastern Newfoundland region in general supports small numbers of waterfowl species during staging and breeding, based on the findings of AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999). However there are local areas where relatively high densities of breeding waterfowl can be found such

as: Upper Humber River watershed below Birchy Pond (a variety of waterfowl species); Gander (Ring-necked Duck); and in the Swift Current/Meta Ponds areas (breeding Canada Geese) (CWS unpublished data). As a result of this work and Goudie (1987), seven waterfowl species were identified in this region. Other species that may occur in Central and Eastern Newfoundland include American Wigeon and Mallard (Warkentin and Newton 2009).

3.1.1.5 Avalon Peninsula

Waterfowl species diversity is relatively low on the Avalon Peninsula during staging and breeding. Goudie (1987) found American Black Duck, along with Green-winged Teal, to be most abundant in the Avalon Forest Ecoregion (>450 recorded each year in 1978 and 1979), with relatively smaller densities of Ring-necked Duck, Common Goldeneye and Northern Pintail. Environment Canada has documented relatively high densities of Canada Goose, American Black Duck, Green-winged Teal and Ring-necked Duck (CWS unpublished data). The results of surveys associated with the Project found:

- Only three species of waterfowl were documented during spring staging in the Study Area on the Avalon Peninsula, in 1998 (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999): American Black Duck (one pair and four individuals), one Ring-necked Duck, and one pair of Common Goldeneye.
- Surveys during the breeding season found only one pair of American Black Duck, one Green-wing Teal and one Ring-necked Duck (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999).
- Greater Scaup has been detected on the southern part of the Avalon Peninsula (CWS unpublished data).

While waterfowl numbers are apparently low, the Avalon Peninsula provides habitat for breeding Greater Scaup and migrating Surf and Black Scoters that are generally only found in this region of the Island (Warkentin and Newton 2009). At least five species of waterfowl have been identified on the Avalon Peninsula, based on the studies mentioned, however several other species occur in this region and include Canada Goose, Mallard, American Wigeon, and Common and Red-breasted Merganser (Warkentin and Newton 2009).

3.1.2 Key and Representative Waterfowl Species

Key species of waterfowl identified were Harlequin Duck, Canada Goose, American Black Duck, Ring-necked Duck and Surf Scoter. Harlequin Duck have received a great deal of attention since first designated as *Endangered* by COSEWIC in 1990, which was subsequently downgraded to a species of *Special Concern* (*SARA*) and *Vulnerable* (*NLESA*). Characteristics that make this species particularly *Vulnerable* to development include specific habitat requirements (i.e., rocky and fast-flowing sections of rivers and/or their tributaries) and high fidelity to breeding areas (females return to the same section of river each breeding season). This species may occur at low densities throughout Labrador but in Newfoundland are known to currently breed only on the Northern Peninsula.

Canada Goose occur throughout the province, are representative of early nesting waterfowl, have a distinct habitat association (i.e., ribbed fens and fen-marsh complexes) and are of cultural importance to aboriginal and other residents within the province.

American Black Duck represent an early-nesting species for the island portion of the study area. This dabbling duck breeds in a wide variety of wetland habitat and winters in inland ponds but primarily along the coast in salt water.

Surf Scoters are representative of the late-nesting waterfowl group, have distinct habitat associations (preferring shallow and rocky lakes). They are widespread in Labrador but are not known to breed on the Island. Ring-necked Duck is another late-nesting species on the island portion of the study area. This diving duck prefers shallow, freshwater wetlands with a variety of aquatic vegetation.

3.1.2.1 Harlequin Duck

Harlequin Duck is a sea duck that is considered unique among waterfowl for its preference for clear, fast-flowing rivers and streams for breeding (Robertson and Goudie 1999). In eastern Canada, the breeding range extends throughout a large portion of northern Quebec and northern Labrador, with isolated breeding ranges on the Northern Peninsula of Newfoundland and on the northeast Gaspé Peninsula and northern New Brunswick (Robertson and Goudie 1999). After breeding, individuals migrate to coastal areas of North America and Greenland.

This species is protected by *SARA*, the *Migratory Birds Convention Act* and the *NLESA*. The eastern population of the species is currently in rebound, with numbers steadily increasing over the past 10 years (Nalcor Energy 2009a). The COSEWIC designation of *Endangered* (in 1990) was downgraded to Special Concern in 2001 to reflect this population increase (Jones and Goudie 2008). Protection of habitat for this species is not included in this level of protection.

Primary Sources of Information

Earlier aerial waterfowl surveys along the larger tributaries of the lower Churchill River in support of the Lower Churchill Hydroelectric Generation Project in 1991 and 1992 identified breeding pairs of Harlequin Duck in Labrador (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). Surveys of the lower Churchill River watershed in the late 1990s for other proponents (Jacques Whitford 1996a, 1997a, 1998a) confirmed breeding and staging within the watershed.

AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) conducted aerial and ground waterfowl surveys within this watershed and along the entire Labrador-Island Transmission Link in 1998. More recent surveys conducted as part of the Lower Churchill Hydroelectric Generation Project in 2006-2007 provided further insight regarding this species and population status within the watershed. The distribution of Harlequin Duck in Labrador was most recently reviewed by Trimper et al. (2008).

On the Island of Newfoundland, surveys of Harlequin Duck breeding sites were conducted along a select number of rivers on the Northern Peninsula in 2008 (Jones and Goudie 2008). Goudie and Gilliland (2008) reviewed research conducted on the Torrent River from 1993 to 2002. An overview of the presence of this species in Newfoundland was completed by Thomas (2008). Research on the distribution and abundance of Harlequin Duck breeding in Newfoundland was compiled by Gilliland et al. (2008a). The primary sources of information reference recent dedicated aerial surveys for this species. These areas have been surveyed extensively by the study team and others. Many of these breeding locations are well known, therefore a more accurate description of current distribution is provided rather than extrapolating from mapping.

Existing Conditions and Status

Studies based on satellite telemetry suggest the existence of two Harlequin Duck subpopulations in Newfoundland and Labrador: one that breeds in northern Quebec and Labrador and overwinters in southwest

Greenland (eastern subpopulation); and one that breeds in southern Labrador, Newfoundland, New Brunswick, and the Gaspé Peninsula, and winters mostly in Maine (southeastern subpopulation) (Brodeur et al. 2002). At least 111 rivers systems/sections have been surveyed in Labrador in the last 20 years (comprising over 800 helicopter survey hours), confirming widespread distribution of the species in 67 percent of the areas surveyed (Trimper et al. 2008).

Population estimates by the provincial government were approximately 1,300 individuals in the southeastern subpopulation, and 5,000 to 10,000 in the eastern subpopulation (IFWD species fact sheet, undated). Population trends are increasing for the southeastern population (up to 3,700), but are unknown for the remainder of the eastern population. Less than 2,000 individuals winter in eastern Canada (Environment Canada 2009; Robertson and Goudie 1999). Goudie (1989) suggested this species may never have been as numerous as other sea ducks wintering in eastern North America, and that the population may be at or near minimum viable population size with present numbers. Densities of 0.042-0.187 birds/km were estimated breeding on the Northern Peninsula (Gilliland et al. 2008a). These numbers may represent twenty percent of wintering Harlequin Duck in Eastern North America.

The largest known molting site for this species in Newfoundland is North Grey Island, where 159 individuals were counted in 1999 (Gilliland et al. 2002). Sightings have increased considerably (Thomas 2008), suggesting an increase on the Island over the last 10 years.

Habitat Association and Distribution in the Study Area

Harlequin Duck move inland in the spring to breed in riparian habitat along fast-flowing, turbulent rivers (Environment Canada 2009). Most are found at the inlets and outlets of ponds, where water is fastest (Goudie and Gilliland 2008). Breeding pairs in the lower Churchill River watershed prefer staging for short periods along the River, in open areas where they can rest, feed and progress with courtship prior to the thaw of interior rivers and streams (Nalcor Energy 2009a). There is a high degree of site fidelity, with females returning annually to the same sites to breed (Nalcor Energy 2009a). There is no evidence for movement between one river/watershed and another (Robertson and Goudie 1999).

Sites used for breeding elsewhere in Labrador (i.e., Hebron Fiord) were narrower, with higher pH and temperature, a larger substrate, steeper shorelines, and greater vegetation cover on islands and shorelines than unused streams (Rodway 1998). Numbers of invertebrates were also higher in used streams. In the Torrent River (within the Northern Peninsula), habitat conditions were similar, with fast flowing, well-oxygenated water with active populations of Chironomidae larvae attached to the substrate (Goudie and Gilliland 2008). Slower moving reaches and flooded lake backshores may also be used in times of periodic aquatic insect booms, to take advantage of increased forging opportunities (Goudie 2004, cited in Jones and Goudie 2008).

It is difficult to assign a rating for habitat quality for Harlequin Duck at the mapping scale necessary for this Project, as their habitat requirements are based on small-scale and localized biophysical parameters, such as availability of grassy areas on the banks of clear, fast-flowing rivers with rocky substrates.

Lower Churchill River and Lake Melville

Individuals and pairs of Harlequin Duck have been documented during staging along the Churchill River and its tributaries, through various investigations (e.g., Goudie 1991a; Bateman 1992; AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999; Jacques Whitford 1996a, 1997a, 1998a; LGL Limited 2008). The majority of breeding rivers within the lower Churchill River watershed are upstream of Gull Island (i.e., outside the current Study Area), with the exception of Penas River (Nalcor Energy 2009a).

Southeastern Labrador

In the Study Area, this species is known to breed on the Minipi River (e.g., Jacques Whitford 1997a, 1998a) and may occur in the St. Paul River, where a pair was observed staging in 1998 (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). Outside of the Study Area, individuals have been recorded near the St. Peter Islands, along the south coast. An estimated five breeding pairs are found in this region despite the apparent availability of suitable habitat (Trimper et al. 2008).

Northern Peninsula

Most breeding activity of Harlequin Duck in Newfoundland occur on the Northern Peninsula but there are breeding records from southeastern Newfoundland on the Bay du Nord River (IBA 2012). (Environment Canada 2009). The Torrent River is the most important of these (Thomas 2008; Goudie and Gilliland 2008). During dedicated surveys in support of the Labrador-Island Transmission Link in 1998, one pair was recorded on this river during spring staging surveys, with an additional four sightings (all female) during the breeding season (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). An increase of 15 breeding pairs was seen between 2006 and 2008 surveys along rivers in this region, with a total of 71 individuals seen in 2008 (Jones and Goudie 2008). It has been estimated that 20 percent of the known wintering population of eastern North America breeds on the Northern Peninsula (Gilliland et al. 2008a). An estimated 128+45 male Harlequin Duck (indicated pairs) breed along the rivers of western and northern Newfoundland (Gilliland et al. 2008a).

Central and Eastern Newfoundland

There is no documented evidence of recent activity; however, isolated observations of Harlequin Duck interior Newfoundland were reported between 1983 and 2005 (Thomas 2008).

Avalon Peninsula

While this species is not known to breed in this region, they do occur in coastal waters, including the Cape St. Mary's Ecological Reserve, during winter, staging and molting (Thomas 2008). A small number of individuals that summer in the reserve has also been documented (Thomas 2008).

Limiting Factors

Hunting (although banned, some illegal and/or accidental take does occur), oil spills (which can affect intertidal feeding areas and result in bioaccumulation of petrochemicals in aquatic invertebrates, as well as direct oiling of birds), habitat alteration through contamination and destruction, stream alteration by development or logging, and fluctuations in food levels can affect breeding success (Galt et al. 1991; Goudie 1989; Robertson and Goudie 1999; Trust et al. 2000; Thomas and Robert 2001). There is also concern that this species and other sea ducks in general may be at risk of suffering health effects or even mortality as a result of elevated heavy metal concentrations (e.g., cadmium and selenium) (Henny et al. 1995). Increases in predator populations, climate

change, the amount of precipitation, prevailing wind patterns, and changes in ocean primary productivity have also been suggested as limiting factors for this species (Morrison 2001).

According to Robertson and Goudie (1999), the greatest limiting factor to Harlequin Duck success is logging, either through direct removal of or disturbance to riparian areas, or through increased siltation in rivers.

Hydroelectric development and aquaculture and fishing activities have also been suggested as threats to the species (Environment Canada 2006a). While low-level flying may have some behavioural effects, there has been no demonstrated population level effect on the species (Goudie and Jones 2003, cited in Environment Canada 2006a; Jacques Whitford 2001b; Thomas and Robert 2001). Distribution of active nests of birds of prey has been suggested as an influence on the location of breeding pairs (Heath 2001).

3.1.2.2 Canada Goose

Canada Goose are the most widely distributed goose in North America. Its breeding range extends from eastern Labrador to western Alaska and as far south as the 49th parallel. While many Canada Goose undergo annual migrations, some remain year-round, including areas along the southwest coast of Newfoundland (Mowbray et al. 2002).

Within their range, Canada Goose exhibit variable morphology, with body size being the most pronounced. In general, the smallest bodied subspecies are found furthest north, although Canada Goose in Labrador are considered part of the 'large-bodied group' (Mowbray et al. 2002).

The Canada Goose is an example and indicator species of early-breeding waterfowl. Canada Geese breeding in Labrador, southern Quebec, and on the Island of Newfoundland belong to the North Atlantic population, subspecies Branta canadensis canadensis, while those nesting throughout northern Quebec, especially along the shores of Ungava Bay and eastern Hudson Bay, belong to the Atlantic Population (composed largely of *Branta canadensis interior*) (Cotter 2009). The large amount of available habitat in Labrador makes this a critical area for individuals within the North Atlantic Flyway population (Nalcor Energy 2009a) (i.e., population of Canada Goose following a migration route along the North Atlantic coast, including portions of Newfoundland and Labrador).

Long-term pair bonds, fidelity to both breeding and wintering areas, and movement in groups make Canada Geese relatively easy to study and manage (Mowbray et al. 2002).

Primary Sources of Information

As part of the 1998 waterfowl baseline research associated with the Labrador-Island Transmission Link, AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) conducted aerial and ground surveys for waterfowl within the lower Churchill River watershed and along the proposed transmission corridor (from the Churchill River to Soldiers Pond) in 1998. Considerable information is also available from numerous waterfowl surveys conducted throughout Newfoundland and Labrador (e.g., Goudie and Whitman 1987; Turner and Chaulk

2000; Chaulk and Turner 2007) and through baseline studies for other proponents (e.g., DND 1994; Minaskuat Limited Partnership 2004a, 2005a, 2007a). Observations of Canada Goose were also noted during the passerine surveys in support of this Project's environmental baseline research in 2008. Breeding pair and other waterfowl surveys were conducted within the lower Churchill River watershed during 2006 and 2007 (LGL Limited 2008). Detailed information on Canada Goose in general has been compiled in the Birds of North America series (Mowbray et al. 2002).

Existing Conditions and Status

The breeding range of the Canada Goose extends from northern Canada to the St. Lawrence River and north central United States, with wintering from southern Canada to the Gulf of Mexico (Government of Newfoundland and Labrador 2009). They are a native species to Newfoundland and Labrador and breed throughout the province.

Surveys along the transmission corridor in 1998 identified the Canada Goose as one of the most abundant waterfowl species (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). Studies conducted during the spring migration in Labrador in 2000 (Chaulk and Turner 2007) indicated that the Canada Goose was the most abundant waterfowl species in central Labrador.

Habitat Association and Distribution in the Study Area

Canada Goose are attracted to deltaic areas with shallow water for foraging, and rely upon open, fast-flowing water when they arrive in early spring. For nesting, this species prefers peatlands and fluvial sites in boreal regions (Mowbray et al. 2002). In Labrador, nesting Canada Geese show a particular association with ribbed fens and fen-marsh complexes (Goudie and Whitman 1987; Minaskuat Limited Partnership 2005a). Nests are typically located on small islands within the wetland complex (Minaskuat Limited Partnership 2004a, 2005a, 2007a). During the avifauna surveys in support of the Project in 2008, geese were noted in wetland and scrub/heathland/wetland habitats in the Study Area.

Molting and autumn-staging geese, which tend to occur outside the Study Area, have more restricted habitat associations, favoring marshes and other extensive shallow areas with abundant emergent vegetation and semi-aquatic plants (Mowbray et al. 2002). Along the Churchill River, molting geese tend to congregate in wetlands at the mouths of tributaries, with the Upper Brook wetland complex being of particular importance (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999; LGL Limited 2008).

The Canada Goose feeds on sedges, grasses, aquatic vegetation and roots during spring migration and summer, but the birds switch to berries and seeds post-fledging (fall and winter) (Mowbray et al. 2002). Mosses, graminoids, woody plants, low-lying herbaceous plants, and spikemoss have all been associated with Canada Goose breeding habitat in Labrador (LGL Limited 2008).

Table 3-1 summarizes primary, secondary and tertiary breeding habitat quality for Canada Goose. Primary wetland habitat for this species occupies 1,088 km^2 (10 percent) of the Study Area in Newfoundland, and 1,512 km^2 (23 percent) in Labrador. Note that the actual amount of primary habitat is lower as Canada Goose prefer specific wetland types such as string bogs that provide island nesting sites for breeding (Goudie and Whitman 1987; Minaskuat Limited Partnership 2005a).

Table 3-1 ELC Habitat Types and Relative Quality for Canada Goose

ELC Habitat Type	Breeding Habitat Quality	Notes
Alpine Vegetated	tertiary	
Black Spruce and Lichen Forest	tertiary	
Burn	tertiary	
Conifer Forest	tertiary	
Conifer Scrub	tertiary	
Cutover	tertiary	
Exposed Bedrock	tertiary	

Hardwood Forest	tertiary	
Kalmia Lichen/Heathland	tertiary	
Lichen Heathland	tertiary	
Mixedwood Forest	tertiary	
Open Conifer Forest	tertiary	
Rocky Barrens	tertiary	
Scrub/Heathland/Wetland	secondary	
Wetland	primary	Preferred nesting habitat is string bogs; some pairs breed in marshes or fens.
Notes: 1. Habitat types are described in Table 2-6. 2. Habitat Quality is described in Section 2.2.4.		

Secondary habitat is represented by scrub/heathland/wetland habitat, which is a combination of habitats, a portion of which are attractive for breeding. Remaining habitats in Table 3-1 were classified as tertiary, based on limited foraging, nesting, protection, resting or feeding opportunities.

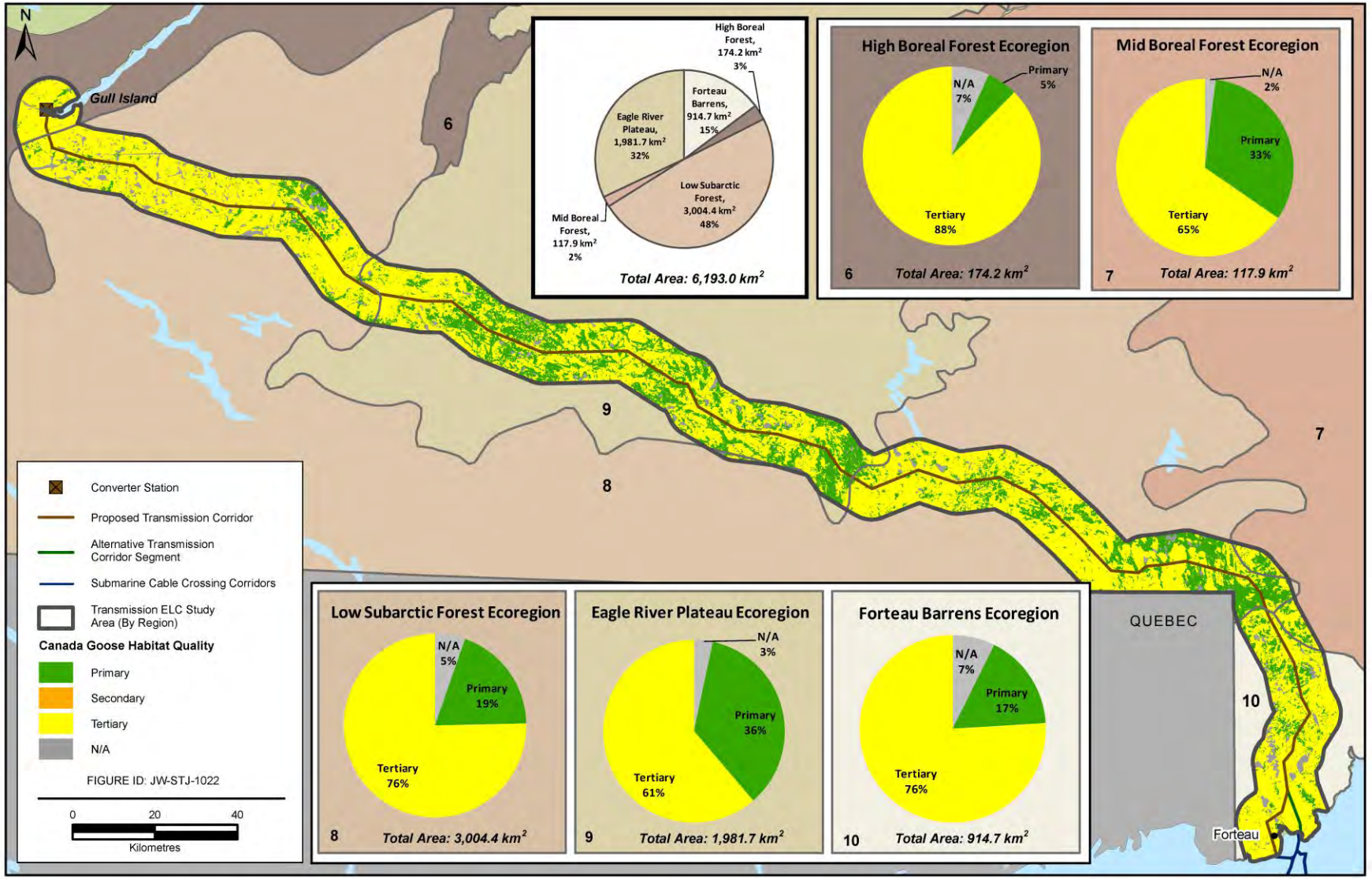
Lower Churchill River and Lake Melville

Relative large numbers of Canada Goose were recorded during 1999 surveys along the Churchill River between Muskrat Falls and Big Pena's River, particularly during molting in late summer (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). This species breeds along the main stem of the Churchill River (LGL Limited 2008), as well as in the area surrounding Goose Bay (Minaskuat Limited Partnership 2004a, 2005a). Concentrations of moulting Canada Geese have been observed on the Eagle River (CWS unpublished data).

Southeastern Labrador

Most of the primary breeding habitat for Canada Goose in the Southeastern Labrador region occurs within the Eagle River Plateau Ecoregion, where it represents 36 percent of the 1,981.7 km^2 Ecoregion in the Study Area (Figure 3-1). Areas of primary habitat do occur in the other Ecoregions, but they tend to be concentrated such as in the eastern end of the Low Subarctic Forest Ecoregion. Note that as scrub/heathland/wetland habitats are found only on the Island, there was no secondary habitat identified for Canada Goose in the Study Area in this region.

Figure 3-1 Canada Goose Habitat Quality: Southeastern Labrador



Throughout the Southeastern Labrador Study Area, geese (four pairs, 11 individuals) were recorded on nests along some rivers and sections surveyed along the transmission corridor during June 1998 (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). During passerine surveys in support of the Project in 2008, Canada Goose were occasionally observed, including five at a single point count location within the Eagle River Plateau Ecoregion and another 15 sightings or evidence of Canada Goose documented in the Study Area during ELC surveys.

Elsewhere in the lower Churchill River watershed, LGL Limited (2008) noted 51 individuals along the main branch of the lower Churchill River, nine along Upper Brook, and 389 along inner Lake Melville from English Point to Grey's Point. Up to 300 pairs may congregate along the Upper Brook wetland in the lower Churchill watershed prior to fall departure (Nalcor Energy 2009a). These results were confirmed by AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) who observed geese at the mouth of the Churchill River at Upper Lake Melville and concentrations at the mouth of Upper Brook. Molting was also observed at the mouth of Upper Brook later in the season (one pair with brood, 27 molting individuals), as well as the south side of Gull Lake (12 molting), and near the mouth of Falls Brook (12 molting, one pair with brood). These studies have confirmed that the lower sections of the Churchill River are important staging areas for waterfowl in spring and fall (Nalcor Energy 2009a).

Northern Peninsula

Although over 4,000 km^2 in area, the Northern Peninsula region possesses relatively low amounts of primary breeding habitat for Canada Goose (Figure 3-2). Percentages of primary habitat by each of the represented Ecoregions are 11 percent or less for this species (Figure 3-2). In the Strait of Belle Isle Barrens Ecoregion, primary habitat is found only along the coast. Some primary habitat is found in small proportions in the other two Ecoregions, with small clusters inland from Bellburns (Northern Peninsula Forest Ecoregion) and between Portland Creek Pond and Parson's Pond (Long Range Barrens Ecoregion).

During 2008 ELC surveys, seven sightings and/or evidence of Canada Goose were reported in wetland habitat in the Study Area in this region. During the June 1998 survey, geese (29 pairs, 33 individuals) were noted on nests or with young on Castor's River, Torrent River and Main River (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999), areas that are generally comprised of secondary and tertiary habitats. Their use of relatively lower quality habitats is likely reflective of the low availability of primary habitat in this region in general. Main River, in particular, appears to be an important area for staging, breeding, and pre-molting aggregations. This observation was noted in the 1998 surveys. Due to the scale of the ELC however, this habitat feature could not be detected.

Central and Eastern Newfoundland

Primary habitat is sporadic and in low proportions (13 percent) throughout the dominant Ecoregion (Central Newfoundland Forest) in the Study Area in Central and Eastern Newfoundland, with a small cluster found west of Terra Nova National Park (Figure 3-3). A noticeable concentration of primary habitat is located in the Long Range Barrens Ecoregion, where it forms 74 percent of that Ecoregion (Figure 3-3). Secondary habitat is generally limited in this region (only 10 percent of the Central Newfoundland Forest Ecoregion), with the exception of an area near North West Brook, south of Clarenville (Figure 3-3).

Figure 3-2 Canada Goose Habitat Quality: Northern Peninsula

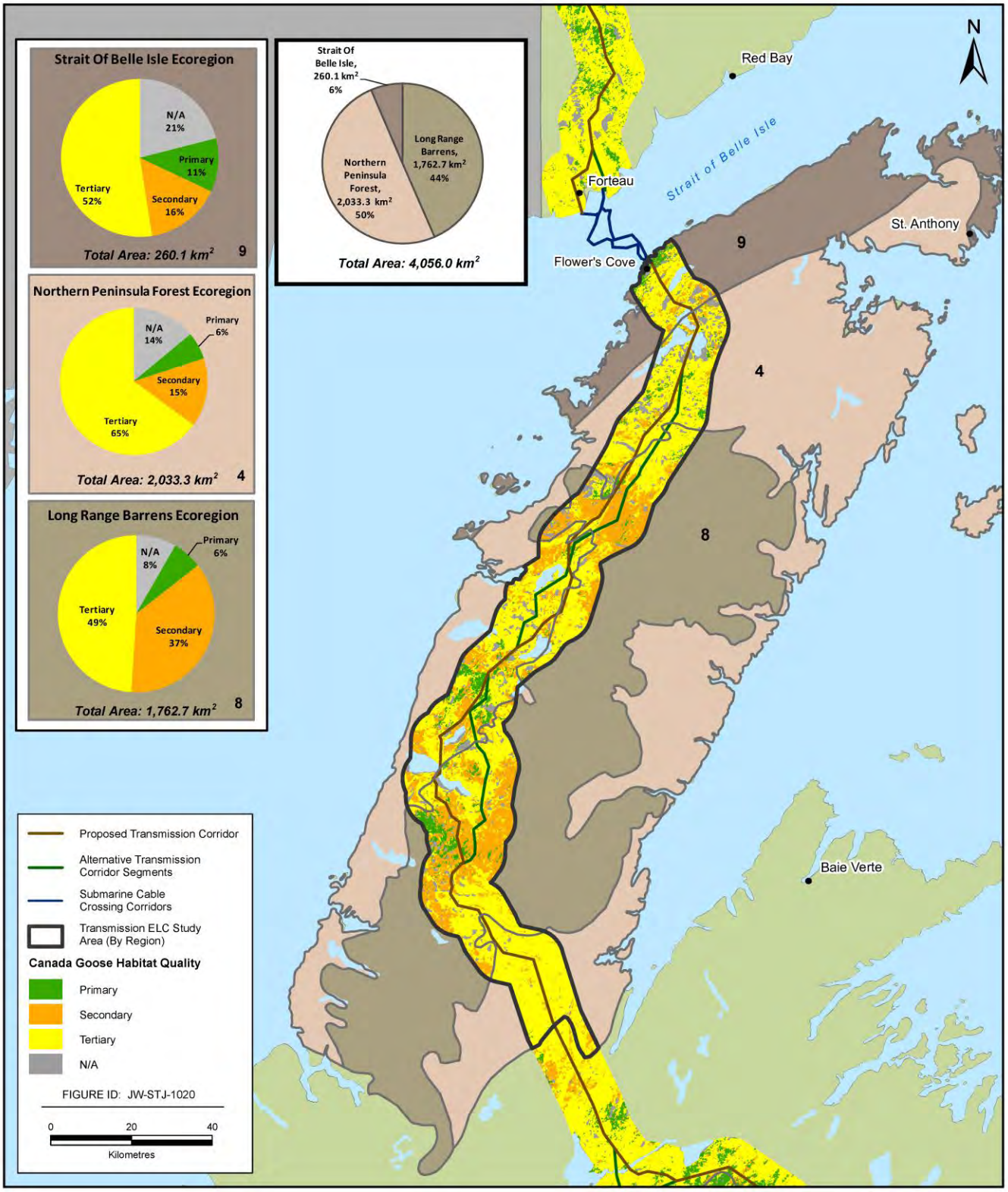
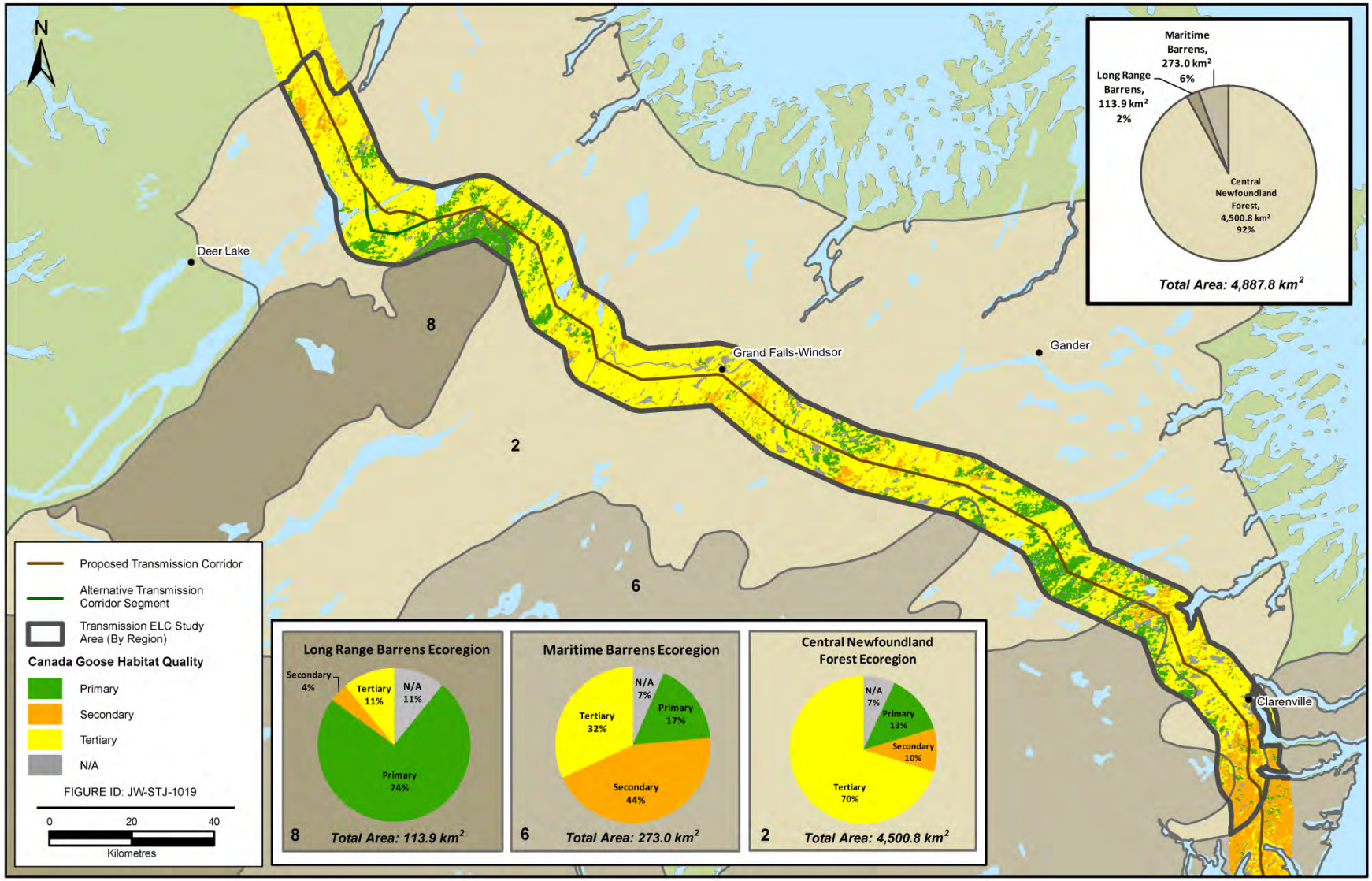


Figure 3-3 Canada Goose Habitat Quality: Central and Eastern Newfoundland



During the June 1998 surveys, Canada Goose were rarely encountered (two pairs, including one with a brood) in the Central and Eastern Newfoundland section of the Study Area (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). During other surveys in support of the baseline research for this Project, five sightings and/or evidence of geese were reported in wetland habitat incidentally during ELC surveys.

On the Island, protection is provided at a Canada Goose Sanctuary near Clarenville-Shoal Harbour, a regionally unique area where the birds stay through the winter, and leave in the summer.

Avalon Peninsula

This region of the Study Area is made up of largely secondary and tertiary habitat for Canada Goose (Figure 3-4). Primary habitat covers 4 percent of the Maritime Barrens Ecoregion and only 1 percent of the Avalon Forest Ecoregion (Figure 3-4). This species was not recorded during the June 1998 survey of the Study Area on the Avalon Peninsula (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). However, Canada Goose was documented incidentally during other surveys in support of the Project, in 2008 - two Canada Goose were documented in scrub/heathland/wetland habitat during the passerine surveys and seven were observed together at a single location during ELC field surveys.

Limiting Factors

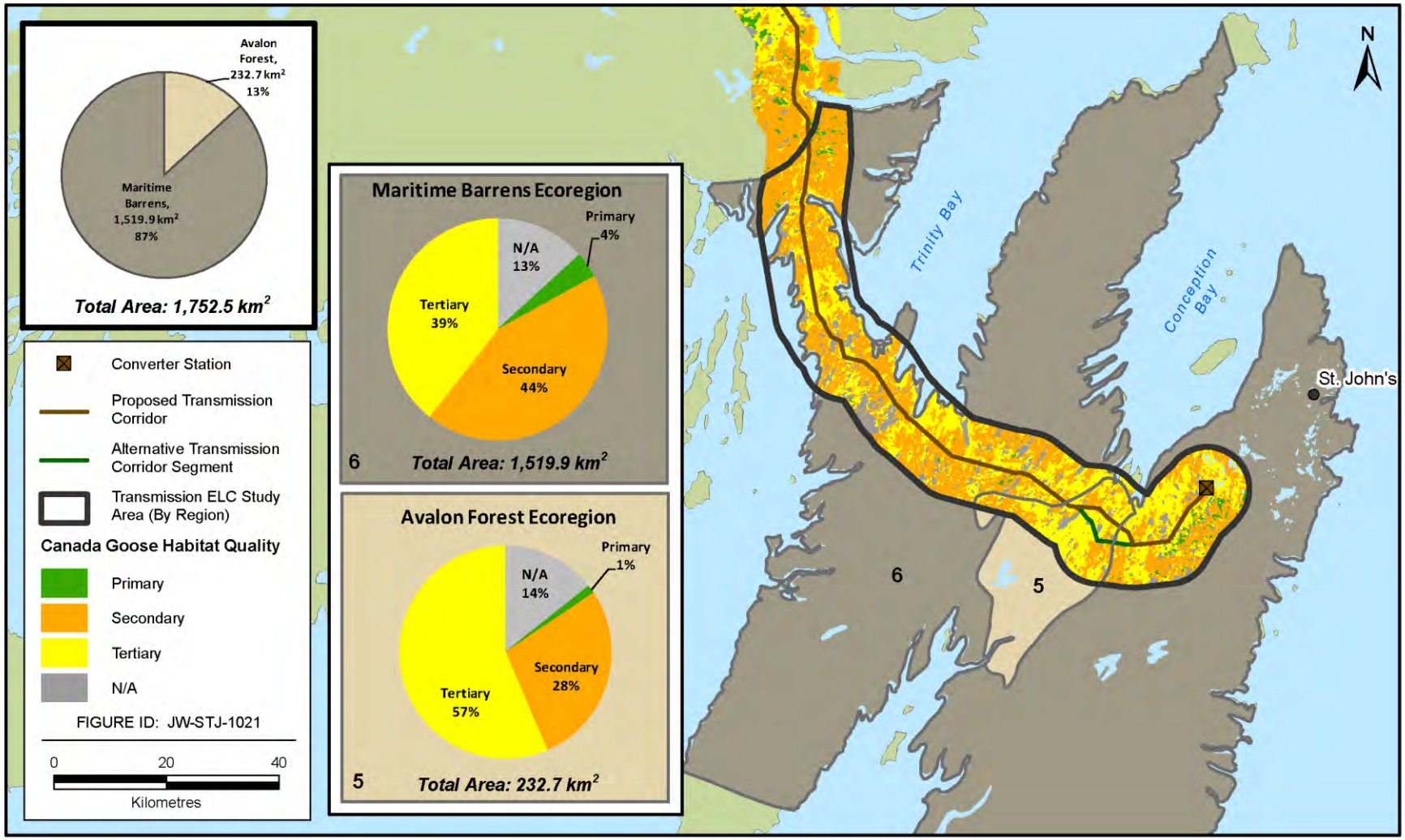
Hunting is a limiting factor throughout its winter range and for subsistence in northern breeding areas (Mowbray et al. 2002) and changes in harvest rates have been linked to adult survival (Rexstad 1992). Productivity can be affected by very low snow melt in northern areas, resulting in late starts to nest initiation, and smaller than average clutch size (Raveling 1978). Predators of geese include fox (*Vulpes sp*.), lynx (*Felis lynx*), Golden Eagle (*Aquila chrysaetos*), Bald Eagles (Government of Newfoundland and Labrador 2009), Herring Gull, Iceland Gull (*Larus glaucoides*), Glaucous Gull (*Larus hyperboreus*) and Parasitic Jaeger (*Stercorarius parasiticus*), Common Raven (*Corvus corax*), black bear (*Ursus americanus*) and American Crow (*Corvus brachynchos*) (Mowbray et al. 2002).

3.1.2.3 Surf Scoter

Surf Scoter are a species of sea duck that breed and winter exclusively in North America, with a large breeding range encompassing northern Quebec and a portion of Labrador (Savard et al. 1998). Birds migrate to wintering grounds along the east and west coasts of North America (Savard et al. 1998). Once considered the least studied duck in North America (Savard et al. 1998), it has since been the focus of several dedicated studies, particularly in eastern Canada (e.g., Savard et al. 1999; Gilliland et al. 2008b; Savard et al. 2007; Sea Duck Joint Venture Management Board 2001).

Surf Scoter is an example/indicator species of late-breeding waterfowl that are of continental importance due to a general decline (CWS 2007a). However, this species is widespread and increasing in northeastern Canada (CWS 2007b) and data suggest central Labrador is within the core breeding area for this species (Gilliland et al. 2008b). The Labrador population moves through the North Atlantic Flyway before wintering along the Atlantic Coast.

Figure 3-4 Canada Goose Habitat Quality: Avalon Peninsula



Primary Sources of Information

As part of the 1998 baseline research associated with the Labrador-Island Transmission Link Project, AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) conducted aerial and ground surveys for waterfowl in 1998. Observations of waterfowl were also noted in the Study Area during passerine surveys in support of the Project in 2008. As part of the Lower Churchill Hydroelectric Generation Project EA, breeding pair and other waterfowl surveys were conducted during 2006 and 2007 in the lower Churchill River watershed (LGL Limited 2008).

Elsewhere in Newfoundland and Labrador, relevant studies dedicated to scoters were completed by Savard and Lamothe (1991) and Gilliland et al. (2008b). In addition, considerable information is available from numerous waterfowl surveys conducted throughout Newfoundland and Labrador (e.g., Goudie and Whitman 1987; Robert and Savard 2008; CWS 2008). In addition, an overview of Surf Scoter has been compiled for the Birds of North America series (Savard et al. 1998).

Existing Conditions and Status

Surf Scoters were counted during the Eastern Waterfowl Survey, which shows a measurable increase in population in the Eastern Boreal Shield since 1990 (CWS 2008). Population size was estimated to be six to eight pairs/100 km^2 in the lower Churchill River watershed, during helicopter surveys in 2007 (Nalcor Energy 2009a). In 2008, surveys in support of the Lower Churchill Hydroelectric Generation Project observed breeding density was approximately 19 pairs/100 km^2, similar to the highest breeding densities reported in Quebec. If these numbers are accurate, they would suggest a population of approximately 555 to 1,765 pairs within the Churchill River watershed, and would extend the known breeding range into southern Labrador (Nalcor Energy 2009a).

Beyond the breeding season, the St. Lawrence Estuary is an important molting and staging area for scoter species, with 2006 surveys during fall staging indicating nearly 80,000 birds, and surveys during molt in late July and early August of 2006 indicating approximately 50,000 scoters (mostly male Surf and White-winged Scoters) (J.P. Savard, pers. comm., cited in CWS 2008). Along the Labrador coast in 1998 and 1999, between 50,000 and62,000 molting scoters were recorded (S. Gilliland, pers. comm., cited in CWS 2008).

Habitat Association and Distribution in the Study Area

Surf Scoters in Labrador prefer shallow, rocky lakes and avoid rivers and large, deep lakes (Goudie and Whitman 1987; Savard and Lamothe 1991) and feed mainly on freshwater invertebrates during breeding (Warkentin and Newton 2009). Nests are at variable distances from open water, often on an island, and concealed by grass (Warkentin and Newton 2009), conifer branches or windfall (Savard et al. 1998 and references therein). Known breeding areas include the upper watershed of some tributaries of the lower Churchill River, in the foothills of the Mud Lake-Mealy Mountains area and on wetlands along the proposed transmission corridor to Churchill Falls (LGL Limited 2008; Nalcor Energy 2009a). Incidental sightings during surveys along the Study Area in 2008 found 11 scoters in habitat classified as conifer forest, within the Low Subarctic Forest Ecoregion.

Primary, secondary and tertiary habitats associated with Surf Scoter are not easy to discern, due to the highly specific and localized nature of preferred habitat features, specifically shallow, rocky lakes at higher elevations.

Lower Churchill River and Lake Melville

Pairs (eight), individuals (six) and groups of two or more (eight) Surf Scoter were recorded within survey blocks south of Churchill Falls in June 1998, as well as over 100 individuals along the main stem of the Churchill River

(AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). There is no evidence that any pairs breed along the Churchill River itself, but rather in the upper tributaries of the watershed, in the adjacent foothills of the Mud Lake-Mealy Mountains, and in local wetlands (LGL Limited 2008; Nalcor Energy 2009a).

Southeastern Labrador

Although Surf Scoter were not recorded during waterfowl surveys in the Study Area in 1998, Surf Scoter were occasionally observed during other surveys in support of the baseline research for this Project, including 11 at a single point count during passerine surveys in 2008. Through other initiatives (Robert and Savard 2008; Gilliland et al. 2008b), Surf Scoter have been identified as one of the most abundant and widespread waterfowl species in portions of the military Low Level Training Area surveyed that either overlaps or is immediately adjacent to the Study Area in Labrador.

Island of Newfoundland

Although present during staging and molting, this species is not known to breed in Newfoundland (Warkentin and Newton 2009). Surf Scoters were not present during breeding surveys in 1998, in any region of the Study Area on the Island (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999) and there were no incidental sightings during recent ELC surveys in support of the baseline research for this Project.

Limiting Factors

Fishing nets, oil spills and hunting pressure are all limiting factors for this species (Savard et al. 1998). In addition, weather conditions during staging, breeding, and the first two weeks of life when ducklings are *Vulnerable* to cold, may negatively affect this species (Savard et al. 1998).

3.2 Passerines

Passerines are generally small to medium-sized 'perching' birds in that the configuration of three toes forward and one toe backwards allow them to perch on a variety of surfaces. The other unique feature of this order of birds is the specialized vocal organ which allows them to produce a wide range of vocalizations (songs and calls) (U.S. Fish and Wildlife Service 2002). Passerines in the Study Area include members of the flycatcher, corvid, thrush, warbler, finch and sparrow families. Collectively, they occupy a wide range of terrestrial habitats from riparian areas to burns to mature forest. The point counts were not established to avoid or seek out rare species but rather characterize land bird assemblage by habitats within the area of interest. It is not considered appropriate for all species but does provide insight as to the expected species by habitat.

The *Migratory Birds Convention Act* (MBCA) was designed to protect and conserve migratory birds, both as populations and individual birds, and their nests (internet site: Government of Canada 1994a). In Canada, the MBCA and associated *Migratory Birds Regulations* (internet site: Government of Canada 1994b) are administered through Environment Canada by the Canadian Wildlife Service (CWS) (internet site: Government of Canada 1994a). Coverage of the MBCA includes songbirds (e.g. warblers, thrushes, and sparrows, waterfowl (eg. ducks, loons and geese), and seabirds (e.g. gulls and terns) but does not include grouse, ptarmigan, hawks, eagles, owls, crows or jays (Environment Canada 1991). The *Migratory Birds Regulations* prohibit the disturbance, destruction, or taking of a nest, nest shelter, eider duck shelter or duck box of a migratory bird, or the possession of a live migratory bird, or a carcass, skin, nest or egg of a migratory bird (internet site: Government of Canada 1994b). Permits for these activities cannot be issued by the federal government

Environment Canada (2011).

The *Species at Risk Act,* 2002 (SARA) was established to provide wildlife species additional protection against extirpation, extinction or endangerment (internet site: Government of Canada 2002). This includes protection from human activity. Species at risk are classified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as extirpated, endangered, threatened or of special concern depending on the level of risk. Like the MBCA, this affords protection at a federal level by prohibiting the killing, harming, harassment, capture or taking, or collection of a listed species, and the damage or destruction of a residence of a listed species (internet site: Government of Canada 2002).

Provincially, wildlife species at risk are managed under the *Newfoundland and Labrador Endangered Species Act*, 2004 (NLESA), designed to complement federal SARA legislation. The NLESA protects wildlife species, subspecies or populations within the province that are considered endangered, threatened or vulnerable based on recommendations from COSEWIC or the provincial Species Status Advisory Committee (SSAC) (internet site: Government of Newfoundland and Labrador 2004). Under NLESA it is prohibited to disturb, harass, injure or kill any individual of a listed species, disturb or destroy the residence of listed species, or be in possession of individuals of a listed species (internet site: Government of Newfoundland and Labrador 2004). There are currently 14 bird species listed under NLESA (NLDEC 2012a).

There are three levels of mitigation measures to be implemented with an Avifauna Management Plan:

- Level I - designed to reduce the likelihood of interaction during clearing and other construction activities;
- Level II - considerations personnel should be aware of that may identify an active nest; and
- Level III – protocols for aerial and ground avifauna surveys that should be completed by ornithologists in areas of potential habitat within or near the Project footprint.

The species selected for detailed assessment and habitat mapping represented a variety of ecological niches and include species of special conservation status (e.g., Gray-cheeked Thrush) and species with limited distributions due to specific habitat requirements (i.e., wetland sparrows). Species such as Blackpoll Warbler were also included, as they were found in relatively high abundance during previous surveys and are widely distributed throughout the Study Area (Minaskuat Inc. 2008a; 2007-2008 surveys along the transmission corridor reported herein).

Regional overviews of passerines in the Study Area are also provided. This overview summarizes the major findings of a Project-specific study investigating passerine presence and distribution along the proposed transmission corridor in 2008 (refer to Section 2.2 for an overview of the nature and methods of this study). A similar study was conducted in 2006-2007 in support of the Lower Churchill Hydroelectric Generation Project (Minaskuat Inc. 2008a). This earlier field program documented passerines along the lower Churchill River valley and the Goose River in Labrador.

3.2.1 Results of the 2008 Passerine Bird Survey along the Proposed Transmission Corridor

The proposed transmission corridor passes through a variety of Ecoregions that provide a diverse array of habitats. The ecoregion consideration was important but as noted elsewhere, access, weather and other logistic issues also influenced where points could be deployed. In the Study Area, a total of 4,308 birds representing 87 species were recorded (Appendix C) at 321 point counts along 33 transects, in 2008 (Table 3-2). This included 57 species of passerines, 19 species of water birds, five species of woodpeckers, four species of birds of prey, and two species classified as 'other'. Warblers (18 species) and sparrows (nine species) were the most diverse families. Flyovers (141 observations) were removed from habitat analyses, as habitat relationships were difficult to assign, thereby reducing the dataset to 4,158 birds. Three species were recorded only as flyovers: Ring-necked Duck, Northern Gannet and European Starling (Sturnus vulgaris).

Table 3-2 Summary of Point Count Surveys of Passerines across Ecoregions

	Ecoregions								
	AF	**CNF**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**ERP**
Number of transects	1	10	2	2	2	5	5	2	4
Total Number of points	11	104	18	17	18	51	46	24	32
Alpine Vegetated	0	0	-	0	-	0	0	0	-
Black Spruce and Lichen Forest	-	-	0	-	1	-	-	-	3
Burn	0	0	0	0	4	0	0	0	0
Conifer Forest	0	3	0	0	3	1	5	0	2
Conifer Scrub	0	1	10	0	0	1	0	0	1
Cutover	1	47	-	0	-	4	6	0	-
Exposed Bedrock	-	-	0	-	0	-	-	-	0
Hardwood Forest	-	-	0	-	3	-	-	-	0
Kalmia Lichen/Heathland	0	0	-	1	-	2	0	0	-
Lichen Heathland	-	-	6	-	0	-	-	-	0
Mixedwood Forest	2	36	0	0	1	11	2	0	3
Open Conifer Forest	0	3	0	0	3	0	12	8	7
Rocky Barrens	0	0	-	0	-	1	0	0	-
Scrub/Heathland/Wetland	6	4	-	8	-	26	8	0	-
Wetland	0	5	2	1	3	1	12	13	15
Other/Unclassified	2	5	0	7	0	4	1	3	1
Species Richness (Total number of species)	25	58	39	28	36	41	47	38	44
Number of individuals	118	1,186	356	268	269	480	753	296	434
Species Diversity (Mean species per point)	**8.8**	8.6	**10.6**	6.6	7.9	7.9	**9.9**	**9.4**	7.8
Mean species SE	(0.4)	(0.3)	(0.5)	(0.4)	(0.6)	(0.3)	(0.4)	(0.6)	(0.5)
Species Abundance (Mean individuals per point)	10.7	11.4	**19.8**	**15.8**	**14.8**	9.4	**16.4**	12.3	**13.6**
Mean individuals SE	(0.7)	(0.4)	(1.6)	(1.7)	(1.2)	(0.4)	(0.9)	(1.0)	(1.2)

Notes:
1. AF – Avalon Forest; MB – Maritime Barrens; CNF – Central Newfoundland Forest; NPF – Northern Peninsula Forest; FB – Forteau Barrens; SBIB – Strait of Belle Isle Barrens; LRB – Long Range Barrens; ERP – Eagle River Plateau; LSF – Low Subarctic Forest.
2. Ecoregions are shown in Figure 2-1.
3. Mean species and individuals per point above the overall average are in bold.
4. SE – Standard Error.

Within the 15 km wide ELC Study Area along the transmission corridor, passerine species diversity ranged from 6.6 species per survey point in the Long Range Barrens to 10.6 in the Forteau Barrens, and mean abundance from 9.4 individuals per point in the Maritime Barrens to 19.8 in the Forteau Barrens (Table 3-2). Overall mean abundance and species richness were 13.0 individuals and 8.5 species, respectively, per point count.

The total number of species recorded in an Ecoregion (i.e., species richness) ranged from 25 species in the Avalon Forest Ecoregion to 58 in the Central Newfoundland Forest Ecoregion (Table 3-2). Although this may be reflective of sampling effort, as only 11 point counts were completed in the former Ecoregion versus 104 in the latter (Table 3-2).

Four species were among the five most abundant birds in the majority of the nine Ecoregions surveyed (Table 3.3): Yellow bellied Flycatcher (*Empidonax flaviventris*) (five Ecoregions), American Robin (*Turdus migratorius*; six Ecoregions), Blackpoll Warbler (five Ecoregions), and White-throated Sparrow *(Zonotrichia albicollis*; eight Ecoregions). Another seven species were among the top five in just a single Ecoregion: American Crow (Strait of Belle Isle Barrens), Common Raven (Strait of Belle Isle Barrens), Yellow-rumped Warbler (*Dendroica coronate*; Avalon Forest), Yellow Warbler (*Dendroica petechia*; Central Newfoundland Forest), American Redstart (*Setophaga ruticilla*; Central Newfoundland Forest), Lincoln's Sparrow (Long Range Barrens), and Savannah Sparrow (Long Range Barrens).

Table 3-3 Most Abundant Passerine Species in each Ecoregion

Ecoregion	Five Most Abundant Species (Decreasing from Left to Right)				
AF	Yellow-bellied Flycatcher (1.4)	Northern Waterthrush (1.3)	American Robin (1.2)	Yellow-rumped Warbler (1.1)	Blackpoll Warbler (0.9)
CNF	White-throated Sparrow (1.7)	American Robin (0.9)	Yellow-bellied Flycatcher (0.8)	Yellow Warbler (0.7)	Northern Waterthrush (0.6)
FB	Fox Sparrow (2.2)	Northern Waterthrush (1.7)	Blackpoll Warbler (1.7)	White-throated Sparrow (1.6)	American Robin (1.4)
LRB	White-throated Sparrow (2.7)	Lincoln's Sparrow (2.7)	Blackpoll Warbler (2.0)	Fox Sparrow (1.0)	Savannah Sparrow (0.9)
LSF	Fox Sparrow (2.1)	White-throated Sparrow (1.6)	Dark-eyed Junco (1.3)	Swainson's Thrush (1.2)	Ruby-crowned Kinglet (1.1)
MB	Yellow-bellied Flycatcher (0.9)	Blackpoll Warbler (0.8)	American Robin (0.7)	White-throated Sparrow (0.7)	Northern Waterthrush (0.7)
NPF	White-throated Sparrow (2.4)	Yellow-bellied Flycatcher (1.8)	Ruby-crowned Kinglet (1.1)	American Robin (1.1)	Blackpoll Warbler (0.8)
SBIB	American Robin (1.3)	Yellow-bellied Flycatcher (1.0)	American Crow (1.0)	White-throated Sparrow (0.8)	Common Raven (0.8)
ERP	Fox Sparrow (1.7)	Ruby-crowned Kinglet (1.5)	White-throated Sparrow (1.4)	Dark-eyed Junco (0.9)	Swainson's Thrush (0.8)

Notes:
1. (#) indicates mean number of individuals per point.
2. AF – Avalon Forest; MB – Maritime Barrens; CNF – Central Newfoundland Forest; NPF – Northern Peninsula Forest; FB – Forteau Barrens; SBIB – Strait of Belle Isle Barrens; LRB – Long Range Barrens; ERP – Eagle River Plateau; LSF – Low Subarctic Forest.
3. Ecoregions are shown in Figure 2-1.
4. Overall abundances are presented in Table 3-4.

The most abundant species overall were White-throated Sparrow, Yellow-bellied Flycatcher, American Robin, Fox Sparrow (*Passerella iliaca*), and Northern Waterthrush (*Seiurus noveboracensis*); however, the species composition of the most abundant species varied by Ecoregion (Table 3-4).

Abundance indices were calculated by Ecoregion for the 42 avifauna species encountered a minimum of 10 times (Table 3-4). These indices represent how common each species is relative to other species within each ecoregion. Species were also omitted from this list if all or the majority of observations were made from a single point count. Eleven species had a mean abundance of at least one individual per point in one or more Ecoregions: Yellow-bellied Flycatcher (three Ecoregions), Ruby-crowned Kinglet (Regulus calendula; three), Swainson's Thrush (*Catharus ustulatus*; one), American Robin (four), Blackpoll Warbler (two), Yellow-rumped Warbler (one), Northern Waterthrush (two), Lincoln's Sparrow (one), White-throated Sparrow (six), Fox Sparrow (four) and Dark-eyed Junco (*Junco hyemalis*; one).

Table 3-4 Abundance Indices for 42 Breeding Passerine Species within each Ecoregion

Species (Ranked in sequence of overall abundance)	Ecoregions								
	AF	**CNF**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**ERP**
White-throated Sparrow	0.82	**1.67**	**1.56**	**2.71**	**1.61**	0.69	**2.39**	0.83	**1.41**
Yellow-bellied Flycatcher	**1.36**	0.81	0.44	0.35	0.44	0.88	**1.83**	**1.00**	0.13
American Robin	**1.18**	0.90	**1.44**	0.76	0.11	0.71	**1.07**	**1.29**	0.38
Fox Sparrow	0.18	0.50	**2.17**	**1.00**	**2.06**	0.43	0.54	0.67	**1.66**
Northern Waterthrush	**1.27**	0.60	**1.67**	0.29	0.72	0.69	0.54	0.79	0.72
Ruby-crowned Kinglet	0.64	0.47	0.50	0.24	**1.06**	0.37	**1.13**	0.17	**1.50**
Blackpoll Warbler	0.91	0.06	**1.67**	**2.00**	0.06	0.78	0.85	0.75	0.31
Dark-eyed Junco	0.82	0.40	0.56	0.12	**1.28**	0.55	0.11	0.25	0.94
Yellow-rumped Warbler	**1.09**	0.53	0.17	0.24	0.06	0.61	0.54	0.33	0.50
Swainson's Thrush		0.12	0.33	0.88	**1.22**	0.06	0.70	0.38	0.75
Yellow Warbler		0.67	0.78			0.35	0.07	0.13	0.34
Black and White Warbler	0.09	0.44	0.78	0.24	0.06	0.25	0.54	0.29	0.06
Lincoln's Sparrow		0.10	0.33	**2.71**	0.17		0.22	0.50	0.09
Black-throated Green Warbler		0.36		0.65		0.08	0.63		0.03
Hermit Thrush	0.27	0.34	0.28	0.06	0.33	0.25	0.28		0.09
American Redstart		0.59	0.06	0.06	0.11		0.17		0.16
Magnolia Warbler		0.38		0.06		0.12	0.52	0.13	0.03
Savannah Sparrow	0.09	0.06	0.61	0.88	0.28	0.29	0.11	0.21	0.22
Wilson's Warbler	0.09	0.06	0.33	0.29	0.72	0.18	0.11	0.08	0.06
Alder Flycatcher		0.21	0.28	0.12	0.11		0.17		0.25
Pine Siskin			0.44	0.18	0.06		0.30	0.08	0.53
White-crowned Sparrow		0.01		0.41	0.22		0.59		0.09
Mourning Warbler		0.13	0.22				0.41		0.03
Swamp Sparrow	0.09	0.10				0.43		0.21	
Purple Finch	0.36	0.10	0.06			0.14	0.13	0.21	0.03
Tennessee Warbler		0.13	0.39	0.18	0.28	0.02	0.07		
Orange-crowned Warbler		0.01	0.11		0.44			0.13	0.56
Winter Wren			0.78				0.26		0.06
Gray Jay		0.03	0.11	0.06	0.39		0.11		0.28
Nashville Warbler		0.05	0.33		0.33	0.02	0.04	0.21	
Common Yellowthroat		0.11	0.22			0.16			
Rusty Blackbird					0.22	0.02			0.56

Species (Ranked in sequence of overall abundance)	Ecoregions								
	AF	**CNF**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**ERP**
Tree Swallow			0.50		0.17	0.02			0.31
Boreal Chickadee	0.09	0.02	0.06	0.12	0.17	0.06	0.15	0.04	0.06
American Goldfinch	0.09	0.07			0.11	0.16		0.08	
Grey-cheeked Thrush		0.02	0.22	0.71			0.04		
Red-breasted Nuthatch	0.09	0.12					0.07		
Ovenbird		0.14							
Pine Grosbeak		0.04			0.22	0.06	0.04	0.04	
Golden-crowned Kinglet	0.09	0.06		0.06		0.04	0.04		
Black-capped Chickadee	0.09	0.07				0.06			
Olive-sided Flycatcher		0.03					0.17		
Mean species per count	**8.8**	**8.6**	**10.6**	**6.6**	**7.9**	**7.9**	**9.9**	**9.4**	**7.8**
Mean individuals per count	**10.7**	**11.4**	**19.8**	**15.8**	**14.8**	**9.4**	**16.4**	**12.3**	**13.6**

Notes:
1. Abundance indices are calculated as the mean number of individuals per point count for each Ecoregion, and include only those species that were encountered a minimum of 10 times.
2. Species abundance indices above the mean individuals per point count for a given Ecoregion are in bold.
3. Blank cells indicate that the species was not recorded.
4. AF – Avalon Forest; MB – Maritime Barrens; CNF – Central Newfoundland Forest; NPF – Northern Peninsula Forest; FB – Forteau Barrens; SBIB – Strait of Belle Isle Barrens; LRB – Long Range Barrens; ERP – Eagle River Plateau; LSF – Low Subarctic Forest.
5. Ecoregions are shown in Figure 2-1.

Of the 42 species listed in Table 3-4, 32 have declining population trends, of which 23 are considered statistically significant (Sauer et al. 2008). These include species of special conservation status (Rusty Blackbird and Olive-sided Flycatcher), as well as seven of the nine species found in all Ecoregions: Ruby-crowned Kinglet, American Robin, Blackpoll Warbler, Yellow-rumped Warbler, Black-and-white Warbler (*Mniotilta varia*), Wilson's Warbler (*Wilsonia pusilla*) and Savannah Sparrow.

To describe habitat relationships within the Study Area, observations of individual passerine species were assigned to one of the 15 ELC habitat classifications (as described in Table 2-6), based on geographic location. Results of this analysis confirmed that passerine abundance and species diversity varied among sampled habitat types (Table 3-5). Species diversity (mean number of species per point count) ranged from 7.4 in conifer forest habitat to 10.0 in rocky barrens habitat, though the latter is based on only one point count. With this removed, conifer scrub (9.9) and wetland (9.4) habitats rank the highest in species diversity. The range in species abundance (mean number of birds per point count) between habitats types was greater compared to species diversity, with 10.2 birds per point count in mixedwood forest habitat to as high as 18.7 in conifer scrub habitat (Table 3-5).

Table 3-5 Mean Number of Passerine Species and Birds by Habitat Type

Habitat Type	Number of Points	Mean Species per Point	Mean Birds per Point
Wetlands	53	9.36 (3)	15.92 (3)
Kalmia Lichen Heathland (Newfoundland only)	2	8 .00 (11)	16 .00 (4)
Mixedwood Forest	57	8.14 (10)	10.18 (13)
Cutover (Newfoundland only)	59	9.15 (5)	13.00 (9)
Open Conifer Forest	33	8.51 (7)	12.24 (10)

Habitat Type	Number of Points	Mean Species per Point	Mean Birds per Point
Conifer Forest	14	7.36 (13)	10.57 (12)
Black Spruce Lichen Forest (Labrador only)	4	8.25 (9)	15.00 (5)
Conifer Scrub	13	9.92 (2)	18.69 (1)
Burn (Labrador only)	4	8.25 (9)	14.00 (7)
Scrub Heathland Wetland Complex (Newfoundland only)	52	8.56 (6)	13.08 (8)
Hardwood Forest (Labrador only)	3	8.33 (8)	14.3 (6)
Lichen Heathland (Labrador only)	6	9.17 (4)	16.17 (2)
Rocky Barrens (Newfoundland only)	1	10.00 (1)	11.00 (11)

Notes:
1. (#) indicates relative rank for each parameter, no adjustment for sample size.
2. Habitat Types are described in Table 2-6.
3. Other/Unclassified Habitats accounted for 12 point counts.

Species diversity and abundance within ELC-defined habitat types were further subdivided according to the Ecoregions that intercept the Study Area (Table 3-6). Habitats with an above average number of species per point (indicated in black) were: cutover habitat in the Avalon Forest and Central Newfoundland Forest Ecoregions; wetland and/or wetland complexes in the Low Subarctic Forest, Northern Peninsula Forest and Central Newfoundland Forest Ecoregions; Kalmia lichen heathland habitat in the Long Range Barrens Ecoregion; open conifer forest in the Strait of Belle Isle Barrens Ecoregion; and Black Spruce lichen forest in the Low Subarctic Forest Ecoregion (Table 3-6). Species abundance in these habitats was generally, but not consistently, also above the average (Table 3-6).

Table 3-6 Relative Importance of Habitat Types within each Ecoregion of the Study Area

Habitat Type	# of Points	Habitat % of Total Ecoregion	# Points/ 100 km^2	Mean # Species per Point	Mean # Birds per Point
Eagle River Plateau (ERP)					
Black Spruce /Lichen	3	6.9	2.2	7.67	14.67
Conifer Forest	2	8.6	1.2	4.50	5.00
Conifer Scrub	1	12.7	0.4	6.00	10.00
Mixedwood Forest	3	0.8	18.8	7.00	11.67
Open Conifer	7	30.8	1.1	5.57	8.14
Wetland	15	35.4	2.1	9.60	17.60
Other/Unclassified Habitat	1	3.3	1.5	9.00	14.00
TOTAL ERP	**32**			**7.84**	**13.56**
Forteau Barrens (FB)					
Conifer Scrub	10	29.6	2.9	11.40	22.10
Lichen Heathland	6	26.9	1.9	9.17	16.17
Wetland	2	13.3	1.3	11.00	19.00
TOTAL FB	**18**			**10.61**	**19.78**
Low Subarctic Forest (LSF)					
Black Spruce/Lichen Forest	1	2.4	1.3	10.00	16.00
Burn	4	2.1	6.2	8.25	14.00
Conifer Forest	3	28.9	0.3	7.00	15.67
Hardwood Forest	3	0.1	88.2	8.33	14.33
Mixedwood Forest	1	0.5	6.1	8.00	14.00
Open Conifer Forest	3	28.5	0.3	6.67	12.33
Wetland	3	19.5	0.5	8.67	18.00
TOTAL LSF	**18**			**7.94**	**14.83**
Strait of Belle Isle Barrens (SBIB)					

Habitat Type	# of Points	Habitat % of Total Ecoregion	# Points/ 100 km^2	Mean # Species per Point	Mean # Birds per Point
Open Conifer Forest	8	25.2	7.1	11.5	15.38
Wetland	13	8.9	32.7	8.00	10.15
Other/Unclassified Habitat	3	43.1	1.6	9.67	13.67
TOTAL SBIB	**24**			**9.38**	**12.33**
Northern Peninsula Forest (NPF)					
Conifer Forest	5	26.9	0.9	7.80	10.00
Cutover	6	5.2	5.7	8.83	14.00
Mixedwood Forest	2	13.6	0.7	7.50	13.00
Open Conifer	12	16.5	3.5	8.92	13.42
Scrub/Heathland/Wetland	8	15	2.6	12.63	21.25
Wetland	12	6	9.8	10.67	20.00
Other/Unclassified Habitat	1	14.2	0.3	13.00	22.00
TOTAL NPF	**46**			**9.91**	**16.37**
Long Range Barrens (LRB)					
Kalmia Lichen Heathland	1	0.7	7.3	9.00	24.00
Scrub/Heathland/Wetland	8	34.8	1.2	7.38	20.50
Wetland	1	10.1	0.5	6.00	16.00
Other/Unclassified Habitats	7	8.3	4.4	5.43	9.14
TOTAL LRB	**17**			**6.59**	**15.76**
Central Newfoundland Forest (CNF)					
Conifer Forest	3	5.3	1.2	9.00	11.30
Conifer Scrub	1	2.6	0.8	4.00	6.00
Cutover	47	16.8	6.2	9.30	13.26
Mixedwood Forest	36	30.6	2.6	7.34	8.92
Open Conifer Forest	3	13.2	0.5	7.00	9.00
Scrub/Heathland/Wetland	4	9.5	0.9	8.25	11.50
Wetland	5	13.3	0.8	10.20	13.00
Other/Unclassified Habitat	5	7.3	1.5	5.40	7.60
TOTAL CNF	**104**			**8.55**	**11.40**
Maritime Barrens (MB)					
Conifer Forest	1	3.9	1.2	7.00	7.00
Conifer Scrub	1	0.9	5.3	5.00	6.00
Cutover	4	4.4	4.4	8.00	9.50
Kalmia Lichen Heathland	2	4.5	2.2	5.00	5.50
Mixedwood Forest	11	16.3	3.3	8.73	9.73
Rocky Barren	1	3.9	1.3	10.00	10.00
Scrub/Heathland/Wetland	26	35.1	3.6	7.61	9.50
Wetland	1	6.1	0.8	9.00	11.00
Other/Unclassified Habitat	4	22.9	0.9	9.00	10.75
TOTAL MB	**51**			**7.90**	**9.41**
Avalon Forest (AF)					
Cutover	1	11.6	3.7	10.00	15.00
Mixedwood Forest	2	37.7	2.3	7.00	9.00
Scrub/Heathland/Wetland	6	28	9.2	9.00	10.17
Other/Unclassified Habitats	2	14.3	6.0	9.50	12.00
TOTAL AF	**11**			**8.82**	**10.73**

Notes

1. Above average values are shaded in black, near average in white (within ± one from the average), and below average in gray.
2. Other/Unclassified Habitats includes habitats that did not fit any ELC descriptions, habitats that were originally classified as 'Exposed Earth' and habitats originally classified as 'open water' based on satellite imagery.

The most abundant passerine species recorded during surveys in Labrador and on the Island of Newfoundland, and their "importance indices", are presented in Tables 3-7 and 3-8, respectively, according to habitat type. The most abundant species did not always have the highest importance index consistent with their habitat affinities. The one exception was Fox Sparrow, which had high importance indices in all habitat types except lichen heathland in Labrador (Table 3-7) and White-throated Sparrow, which was highest in 6 of 10 habitat types in Newfoundland (Table 3-8).

Table 3-7 Most Abundant Species by Habitat Type and Their Importance Indices in Labrador

Passerine Species	Habitat Type - Labrador							
	Black Spruce Lichen	**Burn**	**Lichen Heathland**	**Conifer Forest**	**Conifer Scrub**	**Mixedwood**	**Open Conifer**	**Wetland**
Blackpoll Warbler	-	-	**0.088**	-	**0.043**	0.016	0.010	0.019
Fox Sparrow	**0.067**	**0.071**	0.048	**0.087**	**0.043**	**0.078**	**0.094**	**0.044**
Ruby-crowned Kinglet	**0.067**	0.036	0.019	**0.087**	0.030	0.063	0.063	0.038
Dark-eyed Junco	**0.067**	0.036	0.038	0.018	0.013	0.047	0.031	0.030
Swainson's Thrush	**0.067**	0.036	0.118	0.035	0.013	0.063	0.021	0.030
White-throated Sparrow	**0.067**	**0.071**	**0.167**	-	0.017	0.063	0.031	0.033
Yellow-bellied Flycatcher	-	0.054	0.010	-	0.013	0.016	0.010	0.011

Notes:
1. Bold indicates species had the highest importance index for this habitat type.
2. Blank cells indicate that the species was not recorded.
3. Each species listed was most abundant in at least one habitat type.

Table 3-8 Most Abundant Species by Habitat Type and Their Importance Indices in Newfoundland

Passerine Species	Habitat Type - Newfoundland									
	Conifer Forest	**Conifer Scrub**	**Cut-over**	**Hard-wood**	**Kalmia Lichen Heathland**	**Mixed wood**	**Open Conifer**	**Rocky Barren**	**Scrub Heathland Wetland**	**Wet-land**
American Robin	**0.077**	0.083	0.052	0.020		0.056	0.058	-	0.051	0.038
Blackpoll Warbler	0.012	-	0.013	0.020	**0.156**	0.029	0.035	-	0.054	0.038
Fox Sparrow	0.033	-	0.043	0.020	**0.063**	0.029	0.026	-	0.036	0.040
Lincoln's Sparrow	-	-	0.009	-	**0.188**	-	0.019	-	0.017	0.026
Northern Waterthush	0.033	0.083	0.038	-	-	0.058	0.042	-	0.039	0.026
Dark-eyed Junco	0.022	**0.167**	0.023	0.020	-	0.029	0.019	-	0.025	0.019
Swainson's Thrush	0.022	-	0.005	**0.061**	-	0.021	0.035	-	0.013	0.017

Passerine Species	Habitat Type - Newfoundland									
	Conifer Forest	**Conifer Scrub**	**Cut-over**	**Hard-wood**	**Kalmia Lichen Heathland**	**Mixed wood**	**Open Conifer**	**Rocky Barren**	**Scrub Heathland Wetland**	**Wet-land**
White-throated Sparrow	0.055	0.083	**0.069**	**0.061**	**0.125**	0.064	0.058	**0.100**	**0.057**	**0.053**
Yellow-bellied Flycatcher	**0.077**	**0.167**	0.037	0.041	**0.063**	**0.066**	**0.068**	-	0.048	0.049
Yellow-rumped Warbler	**0.077**	0.083	0.030	-	0.063	0.058	0.042	-	0.036	0.015

In terms of the total number of species observed, conifer scrub habitat in Newfoundland had the lowest species richness (seven species observed), while cutover habitat types (including all forest harvesting methods) had the greatest (51 species) (Appendix C). The second most common habitat (in terms of the total number of species) was wetland habitat in Newfoundland (45 species). The high number of species recorded in cutover habitat likely reflects a range in age of cutovers and/or harvesting methods (e.g., clear-cut, selective logging) that were surveyed. Habitat diversity created within cutovers may result in the provision of suitable habitat for early successional species (Simon et al. 2000), ground nesters, shrub nesters, ground gleaners and aerial feeders (Artman 1990).

In summary, the key results of the 2008 passerine surveys and points for consideration were:

- A combined total of 57 passerine species were recorded over 321 point counts along 33 transects, during the breeding season in 2008. This was a focused study, with the intent to provide information on breeding passerines to support the EA for the Project. The ELC field program and resultant habitat classifications (described in Table 2-6) were a fundamental component.
- Breeding passerine assemblages were assessed according to their distribution, abundance, and diversity across Ecoregions in the Study Area (described in Table 2-1) and within ELC-based habitat types. Analyzing habitat types by Ecoregion provided information on regional differences in habitat suitability.
- The province of Newfoundland and Labrador is a large and diverse region, and as such, geographic differences in habitat suitability within a species' range need to be considered. Many avian species are at the limit of their continental range in the province and their habitat requirements differ locally compared to requirements at the centre of their range. Geographic differences with the province, such as elevation, may also affect where a species would be found.
- Habitat types were sampled in approximate proportion to its availability in the Study Area, with the exception of hardwood forest habitat in the Low Subarctic Forest Ecoregion, where the number of plots per 100 km^2 was comparatively low.
- Several species were among the most abundant birds across multiple Ecoregions and/or habitats (e.g., White-throated Sparrow, Yellow-bellied Flycatcher, Blackpoll Warbler, American Robin), one species was found in only a single Ecoregion (i.e., Ovenbird, Seiurus aurocapillus, in the Central

Newfoundland Forest Ecoregion) and several species were not found in any of the sampled habitats [e.g., Red Crossbill, Chipping Sparrow (*Spizella passerina*)].

- Across sampled Ecoregions in the Study Area, mean species diversity ranged from 6.6 species per point count in the Long Range Barrens Ecoregion to 10.6 in the Forteau Barrens Ecoregion (Table 3-2). Mean abundance ranged from 9.4 individuals per point count in the Maritime Barrens Ecoregion to 19.8 in the Forteau Barrens Ecoregion.
- Across sampled habitat types, mean species diversity ranged from 7.4 species per point count in conifer forest habitat and 10.0 in rocky barrens habitat (Table 3-5). Only one point count was completed in the latter habitat type, so with this removed, the highest diversity was found in conifer scrub habitat (9.9). Mean abundance across habitats ranged from 10.2 in mixedwood forest habitat to 18.7 in conifer scrub habitat.
- While, overall, conifer scrub habitat supported the greatest diversity and abundance across sampled habitats (note however that this habitat type had the lowest diversity and abundance when considering only Newfoundland), and the Forteau Barrens Ecoregion supported the greatest diversity and abundance across sampled Ecoregions, other important habitat types were also identified when data were separated according to habitat types within each Ecoregion (versus across all Ecoregions) (see Table 3-6). Particularly, habitats such as cutovers, wetlands/wetland complexes, black spruce lichen forests, and Kalmia/lichen heathlands were found to have an above average species diversity and/or species abundance within some Ecoregions (Table 3-6).
- Species richness, in terms of the total number of species recorded (not adjusted for sampling effort) was greatest in cutover habitats (51 species). Species diversity in this habitat type was also higher than average in the Avalon Forest and Central Newfoundland Forest Ecoregions. In other areas where cutover habitat was sampled, species diversity was at (Maritime Barrens Ecoregion) or below (Northern Peninsula Forest Ecoregion) the average.
- Cutover habitat was expected to support a greater richness in terms of avian species. Various types of openings are created dependent on the type of forest harvesting method used in a given area. These openings and edges create habitat for a variety of species including early successional species, ground nesters, shrub nesters, ground gleaners and aerial feeders (Artman 1990). Forests with selective logging at low intensities may actually support greater avian species richness and densities than unharvested forests (Hunter 1990; Simon et al. 2000). Temporal differences since the forest harvesting occurred also influences the species that would be associated with cutover habitat. Within the 2008 passerine field program, all types of harvesting methods and variation in time since disturbance occurred were sampled and therefore a range of ecological niches were surveyed.
- Many avian species are not limited to a particular habitat type and their association with a particular habitat type, such as cutover habitat, may be temporary as they move across the landscape (Villard et al. 1992). Despite this, passerine diversity within the cutover habitat type was relatively consistent across sampled Ecoregions (i.e., 8.0 to 10.0 species per point count) compared to the other habitats (e.g., 4.0 to 11.4 species per point count in conifer scrub habitat).
- Wetland and scrub/heathland/wetland habitats also had relatively high species richness, in terms of the total number of species recorded (40 to 45 species) (Appendix C). However, when adjusted for sampling size (i.e., mean number per point count), no consistent trends were found and species diversity and abundance ranged from below average to above average across Ecoregions (Table 3-4).

- Three species of special conservation status were recorded in the Study Area: Rusty Blackbird, Grey-checked Thrush; and Olive-sided Flycatcher. A total of 23 Rusty Blackbird were recorded (18 in the Eagle River Plateau, four in the Low Subarctic Forest and one in the Maritime Barrens Ecoregions); 20 Gray-cheeked Thrush (four in the Forteau Barrens, two in the Northern Peninsula Forest, 12 in the Long Range Barrens and two in the Central Newfoundland Forest Ecoregions); and 11 Olive-sided Flycatcher (three in the Central Newfoundland Forest and eight in the Northern Peninsula Forest Ecoregions).
- Relative abundance in an Ecoregion must be considered in the context of the associated level of survey effort within Ecoregions. For example, while Olive-sided Flycatcher was relatively more abundant in the Northern Peninsula Forest Ecoregion, this Ecoregion received a relatively high level of survey effort, resulting in a low abundance index for this species in this Ecoregion (0.17 individuals/point). Note that five individuals were from three sightings in Labrador.
- Some species, such as Tennessee Warbler (*Vermivora peregrine*), were associated with two different habitat types (mixedwood and conifer scrub habitats, in Labrador), as indicated by their importance indices. This same species was more strongly associated with mixedwood and deciduous forests along the Churchill River, also in Labrador. On the Island, Tennessee Warbler was strongly associated with deciduous forest, as well as other habitat types, though to a lesser extent.
- An assessment of survey parameters over the course of the field program indicated that neither mean species richness nor abundance appeared to change in relation to date during the survey. Precipitation and wind conditions can influence the activity of birds and/or the ability of observers to detect them; however, the majority of point counts were conducted in the absence of precipitation (85 percent) and heavy winds (88 percent). Surveys were cancelled in situations with sustained high winds and/or steady precipitation.

The information obtained from the 2008 passerine survey, along with habitat classifications and their distribution in the Study Area provided through the ELC, formed the basis for the habitat quality mapping exercise for the following passerine section of this Component Study.

3.2.2 Regional Overviews

The following provides a detailed overview of the presence, abundance, distribution and habitat associations of passerines in the Study Area.

3.2.2.1 Lower Churchill River and Lake Melville

The 2006 and 2007 study of passerines along the Churchill River in support of the Lower Churchill Hydroelectric Generation Project (Minaskuat Inc. 2008a) provides detailed information on the diversity, relative abundance and habitat associations of breeding passerine species in this region. Prior to this, much of the work related to passerines focused on western Labrador, primarily related to forest harvesting practices (e.g., Schwab et al. 2001, 2006; Simon et al. 2000, 2002). Information from the North American Breeding Bird Survey reported a total of 43 species over a 12 year period for the Happy Valley-Goose Bay route (North American Breeding Bird Survey 2006).

This diversity of species was confirmed and expanded during the baseline studies along the Churchill River in 2006-2007 (Minaskuat Inc. 2008a), where the following results were obtained:

- Surveys along the Churchill River identified 42 species and 2,265 individual breeding passerines in 2006, and 50 species and 5,174 individuals in 2007.
- The most widespread species were Swainson's Thrush and White-throated Sparrow (usually the most densely occurring species in all of the different habitat types), and Tennessee and Black-throated Green Warblers were among the most abundant species in mixed forests.
- The index of density for breeding passerines was highest overall in hardwood, white spruce (Picea glauca), and mixed fir (Abies sp.) forests (Minaskuat Inc. 2008a). Dark-eyed Junco had the highest index of density overall in 2006, but was commonly located in spruce forests. The Yellow Warbler showed strong habitat associations, to riparian and wetland habitat, but was not among the top five species in any other habitat type.
- Species of special conservation status were recorded and included 16 Rusty Blackbird and nine Gray-cheeked Thrushes.

Existing and available information on passerines from Minaskuat Inc. (2008a) in the Lake Melville region is limited to surveys along the Goose River, with the following results:

- An average of 7.2 birds and 6.1 species per point count were recorded, and found to be not significantly different from 7.6 birds and 5.4 species per point count along the Churchill River.
- Individuals encountered less frequently in this area (compared to the Churchill River) were White-throated Sparrow, Yellow Warbler and Tennessee Warbler, while the Common Raven and the Magnolia Warbler (*Dendroica magnolia*) were encountered more frequently.

The Lower Churchill River and Lake Melville region in general supports a diversity of passerine species during the breeding season. Species such as Swainson's Thrush and White-throated Sparrow were widespread across habitats, with higher overall densities (all species combined) generally found in hardwood, white spruce and mixed fir forests. The High Boreal Forest-Lake Melville Ecoregion represents the most northerly boreal forest Ecoregion in Labrador and contains a greater abundance and diversity of deciduous trees compared to other areas in Labrador (Minaskuat Inc. 2008a) and therefore is expected to support a larger diversity of passerine species.

3.2.2.2 Southeastern Labrador

Passerine surveys along the proposed Trans Labrador Highway (Phase III) identified a diversity of species in the Southeastern Labrador region. Survey blocks were established within representative Ecoregions traversed by the proposed route and 39 species were identified in the High Boreal Forest - Lake Melville Ecoregion, 45 species in the Low Subarctic Forest - Mecatina River Ecoregion, 51 species in the Eagle River Plateau Ecoregion and 41 species in the Mid Boreal Forest - Paradise River Ecoregion (Jacques Whitford 2003b). Fourteen of 71 species were confirmed breeding, 23 were considered probably breeding and the remainder was considered possibly breeding (Jacques Whitford 2003b).

Relevant results from the 2008 passerine survey in support of the current Project include:

- 39 species were associated with the Forteau Barrens Ecoregion, 36 with the Low Subarctic Forest Ecoregion and 44 with the Eagle River Plateau Ecoregion.
- The most abundant species during 2008 surveys in the Study Area in Southeastern Labrador was Fox Sparrow.

- Other commonly recorded species were Northern Waterthrush, White-throated Sparrow, Ruby-crowned Kinglet, American Robin, Blackpoll Warbler, Dark-eyed Junco and Swainson's Thrush.
- Species abundance was higher than the average of 13.0 individuals/point count in all three Ecoregions in this region (19.8 in the Forteau Barrens, 14.8 in the Low Subarctic Forest and 13.6 in the Eagle River Plateau Ecoregion), while species richness was higher than average only in the Forteau Barrens (10.6 versus 8.5 species/point).

Overall, species diversity in this region of Labrador is similar to other areas of Labrador previously surveyed (including the Lower Churchill River). Fox Sparrow was indicated to be particularly abundant along the proposed transmission corridor in this region, and the Forteau Barrens Ecoregion was found to support both the highest diversity and abundance of passerine species in the Southeastern Labrador region of the Study Area.

3.2.2.3 Northern Peninsula

Studies dedicated to passerine species on the Northern Peninsula were relatively limited. The 2008 passerine surveys comprise one of the most comprehensive studies available in this region. Results from this program include:

- A total of 47 species were identified in the Northern Peninsula Forest Ecoregion and 28 in the Long Range Barrens Ecoregion. For comparison, AMEC (2002) compiled a list of 37 passerine species, based on a review of the existing information on passerines in the region that may occur in this geographic region (particularly the Main River watershed).
- Among the most abundant species in the Study Area on the Northern Peninsula was White-throated Sparrow, Yellow-bellied Flycatcher, Ruby-crowned Kinglet, American Robin, Blackpoll Warbler, Fox Sparrow, Swainson's Thrush, Lincoln's Sparrow and Northern Waterthrush. Of these, Lincoln's Sparrow (Long Range Barrens) and Savannah Sparrow (Long Range Barrens) were among the top five species in a single Ecoregion.
- Species abundance was higher than the average of 13.0 individuals/point in the Northern Peninsula Forest (average 16.4 individuals/point) and Long Range Barrens (average 15.8 individuals/point) Ecoregions and species richness was above the average of 8.5 species/point in the Northern Peninsula Forest (average 9.9 species/point) and Strait of Belle Isle Barrens (average 9.4 species/point) Ecoregions.

Overall, the Northern Peninsula Forest Ecoregion appears to support both the highest diversity and abundance of passerine species in the larger Northern Peninsula region of the Study Area. Although diversity and abundance were lower in the Long Range Barrens Ecoregion, Lincoln's Sparrow and Savannah Sparrow were among the top five species found there and did not occur in the top five in any other Ecoregion in Newfoundland.

3.2.2.4 Central and Eastern Newfoundland

In 1995, passerine surveys were carried out in Terra Nova National Park, in the far eastern portion of this region, adjacent to the Study Area. Although the park is outside of the proposed transmission corridor, similar species would be expected in the Central and Eastern Newfoundland region of the Study Area, as a large portion of the park lies in the Central Newfoundland Forest Ecoregion. Twenty-one passerine species were identified in the park, with higher numbers associated with fir and mixed fir-spruce stands (Jacques Whitford 1996d). White-

throated Sparrow, Yellow-rumped Warbler and Yellow-bellied Flycatcher were the most abundant species during surveys (Jacques Whitford 1996d).

Similar to this, the findings of the 2008 passerine survey associated with the Project indicate:

- A total of 58 species in the Central Newfoundland Forest Ecoregion. No point counts were conducted in the other (relatively minor) Ecoregions in this region of the Study Area.
- The five most common species in the Central Newfoundland Forest Ecoregion were White-throated Sparrow, American Robin, Yellow-bellied Flycatcher, Yellow Warbler and Northern Waterthrush. Yellow-rumped Warbler was also recorded in this Ecoregion, but in lower numbers.
- The Central Newfoundland Forest Ecoregion was the only Ecoregion where the Yellow Warbler was among one of the top five species.
- Species abundance and species richness were 11.4 individuals and 8.6 species per point count, respectively, along this portion of the Study Area.

In terms of the total number of species recorded in an Ecoregion, the Central Newfoundland Forest Ecoregion has the highest species richness compared to all other Ecoregions investigated on the Island (although both the mean number of species and mean number of individuals per point count were below the overall average). Common species in this region include White-throated Sparrow, American Robin, Yellow-bellied Flycatcher, Northern Waterthrush and Yellow Warbler. Yellow Warbler was one of the top five species found in the Central Newfoundland Forest Ecoregion, but did not appear as one of the top five in any other Ecoregion on the Island.

3.2.2.5 Avalon Peninsula

Although occurring more than 20 years ago, one study on the Avalon Peninsula examined passerine diversity near South Head, along the east coast inland from Gull Island, and identified 22 species of passerines in that area, including the federally and provincially listed species Red Crossbill and Rusty Blackbird (Vassallo and Rice 1981). Amongst the more common species were Fox Sparrow, Northern Waterthrush and Blackpoll Warbler (Vassallo and Rice 1981). Although outside of the Study Area, the species identified by Vassallo and Rice (1981) were associated with boreal forest passerines and likely similar in composition to species in the Study Area. In comparison, the 2008 passerine survey along the proposed transmission corridor found:

- A total of 25 species were identified in the Avalon Forest Ecoregion and 41 in the Maritime Barrens Ecoregion during surveys in 2008.
- The most common species in the Study Area in this region were Yellow-bellied Flycatcher, Northern Waterthrush, American Robin, Yellow-rumped Warbler, White-throated Sparrow and Blackpoll Warbler.
- Species abundance was 10.7 individuals/point count in the Avalon Forest Ecoregion and species richness was 8.8 species/point and considered above average. Species abundance and species richness were 9.4 individuals and 7.9 species per point count, respectively, in the Maritime Barrens Ecoregion.

Overall, while the Avalon Forest Ecoregion appears to support slightly higher diversity and abundance of passerine species in this region of the Study Area, this is based on only one series of point counts (i.e., one transect, reflective of its relatively minor contribution (13 percent) to the Study Area on the Avalon Peninsula). In general, a variety of species were found on the Avalon Peninsula, with Yellow-bellied Flycatcher, Northern

Waterthrush, American Robin, Yellow-rumped Warbler, White-throated Sparrow and Blackpoll Warbler amongst the more common.

3.2.3 Key and Representative Passerine Species

Key species and species groups identified were Rusty Blackbird, Red Crossbill, Gray-cheeked Thrush, Olive-sided Flycatcher, Blackpoll Warbler and Wetland Sparrows (including Swamp Sparrow, Song Sparrow, Lincoln's Sparrow and Savannah Sparrow). Rusty Blackbird, Red Crossbill, Gray-cheeked Thrush and Olive-sided Flycatcher were selected primarily based on their designation as species of special conservation status under *SARA* and/or the *NLESA*, as well as consideration of any specific (i.e., limiting) habitat requirements (e.g., Red Crossbill). Blackpoll Warbler and Wetland Sparrows were selected because they are found throughout the province but have specific habitat preferences (i.e., coniferous forests and marsh habitats, respectively).

3.2.3.1 Rusty Blackbird

The breeding range of Rusty Blackbird is located predominantly in Canada, where it breeds as far north as the treeline, from Alaska in the west to Newfoundland and Labrador in the east (Avery 1995). It is the most northerly breeding blackbird in North America (Avery 1995). Within this range, they are typically associated with wet forests and wetland habitats, including fens, bogs, muskegs, beaver ponds and swamps (Avery 1995).

The Rusty Blackbird is listed as a *Species of Special* Concern under *SARA* and as *Vulnerable* under the *NLESA*. The species is considered Globally *Vulnerable* by the World Conservation Union (IUCN 2007).

Primary Sources of Information

Forest passerine surveys were conducted in the Study Area in 2008 that provide information on the presence, distribution and habitat associations of Rusty Blackbird in the Study Area, as well as records collected during ELC surveys along the transmission corridor, also in 2008. Rusty Blackbird was also documented along the lower Churchill River in 2006 and 2007 (Minaskuat Inc. 2008a). Additional observations of Rusty Blackbird were available through local Breeding Bird Surveys and incidental sightings were available from LGL Limited (2007). Avery (1995) compiled information regarding Rusty Blackbird in the Birds of North America Series.

Existing Conditions and Status

Rusty blackbird occurs in all provinces and territories, and breeds throughout Newfoundland and Labrador in suitable habitat (SSAC 2010). The species winters in the central and eastern United States, with very few birds wintering in the southern parts of Canada (Environment Canada 2009). The number of Rusty Blackbirds recorded per survey route, from 1965 to 1979, ranged from 0.1 in New Hampshire and Vermont to 8.3 in Newfoundland (Avery 1995). However, population estimates are not available for the eastern populations specifically (estimates for Canada range from 140,000 to 1.4 million) and population decline is suggested at 85 percent since the mid-1960s (Environment Canada 2009).

Habitat Association and Distribution in the Study Area

Rusty Blackbird nest in the outer edges of the boreal forest and along the shores of wetlands, slow-moving streams, peat bogs, marshes, swamps, beaver ponds and pasture edges (Environment Canada 2009). Adults feed mainly on wetland invertebrates, though are considered opportunistic feeders (Warkentin and Newton 2009). Nests are built in riparian vegetation on the edges of coniferous forest wetlands or other bodies of water,

stream buffers in regeneration cutovers and recent burns; in May-June (Environment Canada 2009; COSEWIC 2006). As Powell et al. (2010) found that wetlands actually make up a relatively small percentage of a breeding territory, it is important to note that riparian and other adjacent vegetation are important features of appropriate habitat.

Table 3-9 summarizes primary, secondary and tertiary breeding habitat quality for Rusty Blackbird. Primary wetland and scrub/heathland/wetland habitat for this species occupies 3,330 km^2 (30 percent) of the Study Area in Newfoundland, and 1,512 km^2 (23 percent) in Labrador. Secondary habitat includes conifer scrub, and open conifer, mixedwood and hardwood Forests. Remaining habitats in Table 3-9 were classified as tertiary, based on limited foraging, nesting, protection, resting or feeding opportunities.

Table 3-9 ELC Habitat Types and Relative Quality for Rusty Blackbird

ELC Habitat Type	Breeding Habitat Quality	Notes
Alpine Vegetated	tertiary	No trees present for nesting.
Black Spruce and Lichen Forest	tertiary	
Burn	tertiary	
Conifer Forest	tertiary	
Conifer Scrub	secondary	
Cutover	tertiary	
Exposed Bedrock	tertiary	
Hardwood Forest	secondary	
Kalmia Lichen/Heathland	tertiary	
Lichen Heathland	tertiary	
Mixedwood Forest	secondary	
Open Conifer Forest	secondary	
Rocky Barrens	tertiary	No trees present for nesting.
Scrub/Heathland/Wetland	primary	Prefer wet areas for nesting and feeding.
Wetland	primary	Prefer wet areas for nesting and feeding; 78% of observations in 2008 were associated with this habitat type.

Notes:
1. Habitat types are described in Table 2-6.
2. Habitat Quality is described in Section 2.2.4.
3. While not included in the ELC (Minaskuat Inc. 2009a), riparian habitat is considered primary quality habitat for this species.

Lower Churchill River and Lake Melville

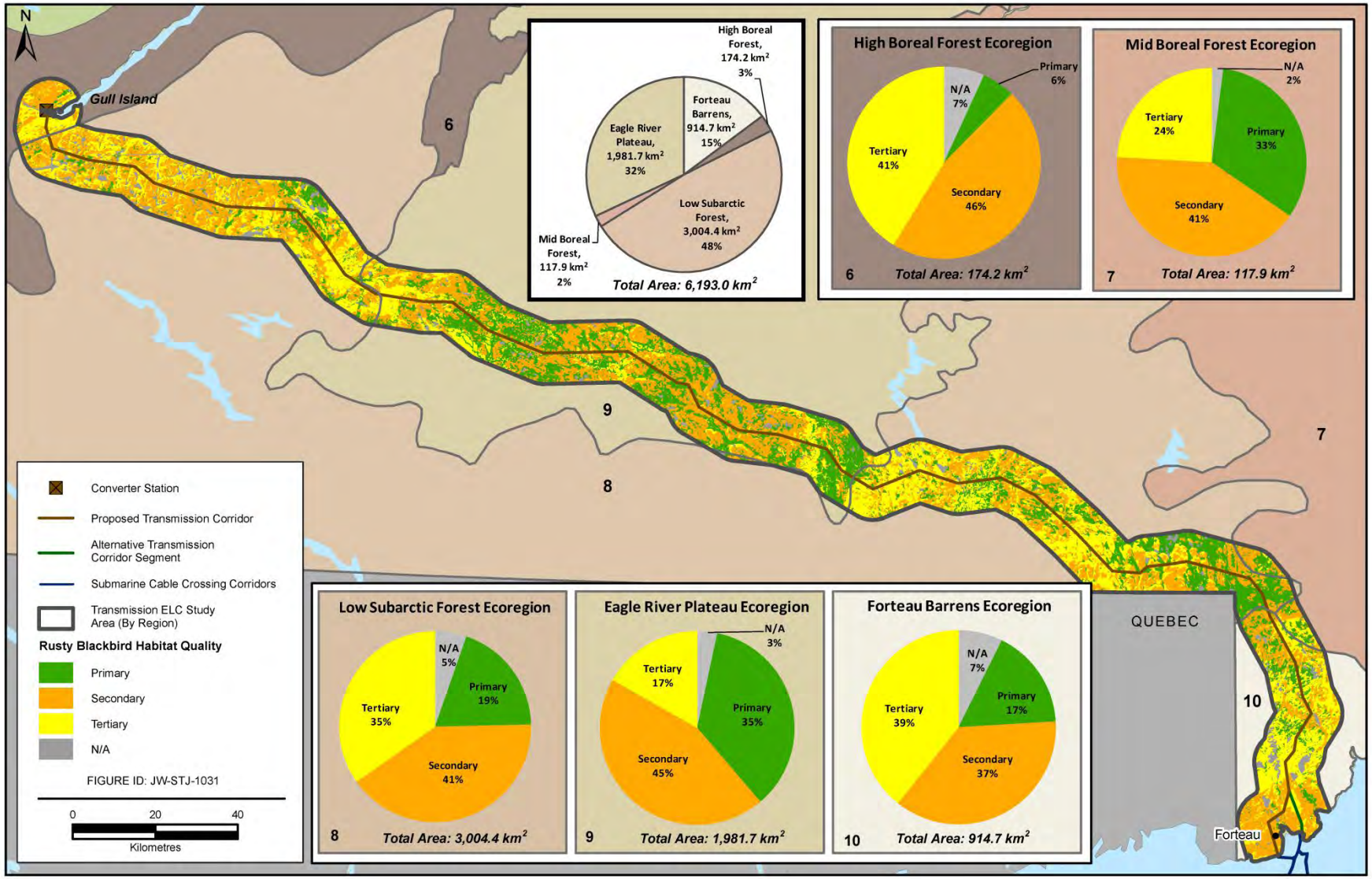
Avifauna surveys along the Churchill River in 2006 and 2007 documented a total of 16 Rusty Blackbirds, primarily associated with wetland habitat in the Study Area (Minaskuat Inc. 2008a). Aerial surveys north of the current Study Area, found a total of eight Rusty Blackbirds in half of the 14 plots surveyed (LGL Limited 2007). However, only four individuals have been documented in over 13 years of the Happy Valley Breeding Bird Survey (Sauer et al. 2007).

Southeastern Labrador

Primary habitat for this species is highest (35 percent) in the Eagle River Plateau Ecoregion of the Study Area in Southeastern Labrador (Figure 3-5), where 18 observations of Rusty Blackbirds were recorded during passerine surveys in 2008. Four other observations were recorded in the Low Subarctic Forest Ecoregion. In addition, one

other observation was made in the Study Area (in primary wetland habitat) during ELC surveys in support of this Project.

Figure 3-5 Rusty Blackbird Habitat Quality: Southeastern Labrador



Island of Newfoundland

Although primary habitat for Rusty Blackbird is generally between 20 and 50 percent in Ecoregions in the Study Area, and as high as 78 percent in the relatively minor Long Range Barrens Ecoregion in Central and Eastern Newfoundland (Figures 3-6 to 3-8), this species is considered uncommon (i.e., not regularly found throughout the island) but an established population can be found in central Newfoundland (Warkentin and Newton 2009). Only one Rusty Blackbird was recorded during the passerine surveys in the Study Area in 2008, in the Maritime Barrens Ecoregion of the Avalon Peninsula.

Limiting Factors

Limiting factors for this species include: habitat destruction through conversion of wetlands into farmland or land suitable for human habitation; creation of hydroelectric reservoirs; bird control programs designed to reduce populations of birds that ravage crops; degradation of wetlands and introduction of dominant species, such as the Red-winged Blackbird (Environment Canada 2009); predation by owls, accipiter hawks and raptors; and food shortages during severe weather in winter and late spring (Avery 1995). Destruction of primary winter habitat in the forests of the Mississippi Valley has also played a role in decline of the species (Environment Canada 2009). Mercury has been determined to be a key threat to this species (Edmonds et al. 2010).

3.2.3.2 Red Crossbill

Red Crossbill occur in southern taiga forests from Alaska to Newfoundland, as well as montane coniferous forests further south (Adkisson 1996). Throughout this range, there are several reproductively isolated groups that exhibit variation in body size, bill size and vocalizations (Adkisson 1996; Environment Canada 2006b), including the *percna* subspecies that occurs predominantly in Newfoundland (with occasional irruptions in the Maritimes) (Environment Canada 2006b).

The *percna* subspecies of Red Crossbill is listed as an *Endangered* Species under *SARA* and the *NLESA*. The Newfoundland subspecies has a thicker bill compared to other populations (IFWD species fact sheet, undated), likely a result of co-evolution with thick-scaled cones found on black spruce trees in the province (Parchman and Benkman 2002).

Primary Sources of Information

Generally, this species has been observed only very infrequently in both formal and informal surveys (Environment Canada 2009). ELC surveys conducted in the Study Area in 2008, as part of the baseline research associated with the Project, did identify this species. Adkisson (1996) provides an account of Red Crossbill in the Birds of North America Series that includes some information on the *percna* subspecies.

Existing Conditions and Status

Red Crossbills are found throughout North America though there has been a marked decline in numbers, with estimated population declines of 75 percent per decade from 1968 to 2002 (Environment Canada 2006b). The *percna* subspecies is likely restricted to Newfoundland and is considered rare, with an estimated 500 to 1,500 individuals remaining (Environment Canada 2006b).

Figure 3-6 Rusty Blackbird Habitat Quality: Northern Peninsula

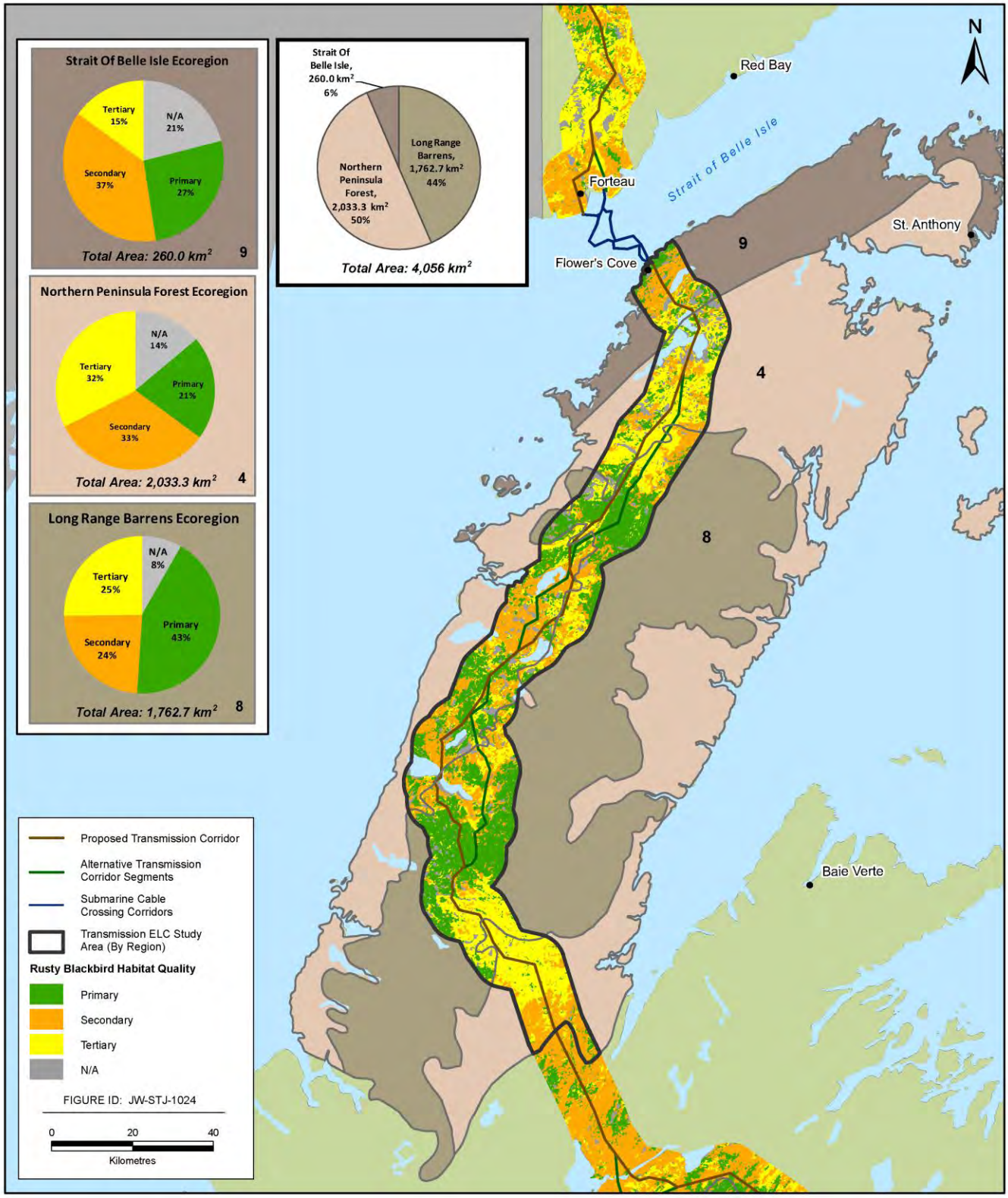


Figure 3-7 Rusty Blackbird Habitat Quality:Central and Eastern Newfoundland

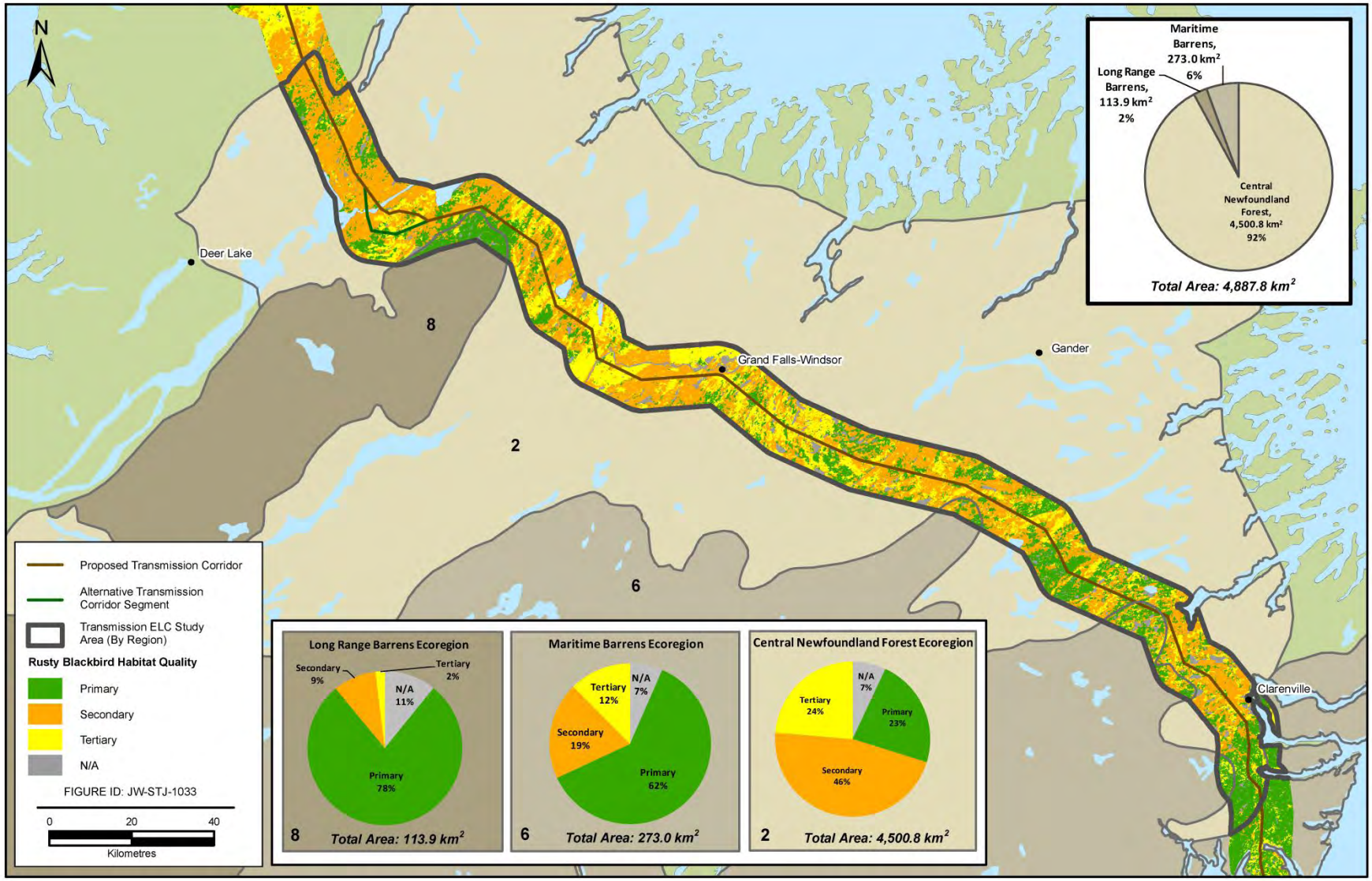
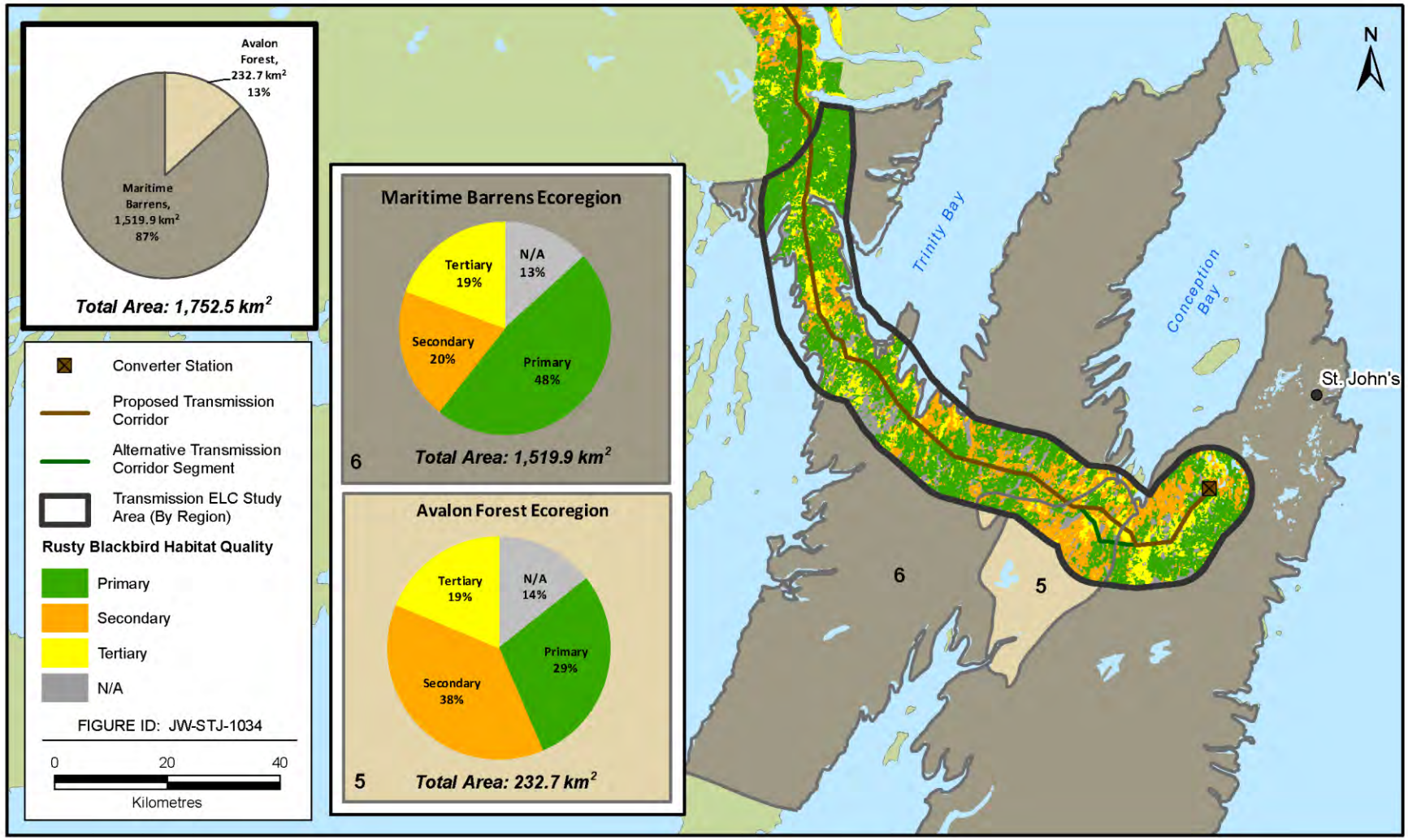


Figure 3-8 Rusty Blackbird Habitat Quality: Avalon Peninsula



Habitat Association and Distribution in the Study Area

Red Crossbills are highly specialized for conifer habitats, generally unlogged or mature forests that produce abundant cones – large, mature black spruce and balsam fir (Abies balsamea) stands, and also red pine, white pine, and white spruce stands (Environment Canada 2009). In Newfoundland, sightings have been made in native red pine and eastern white pine stands, suggesting that these stands have been historically important to the species, and may be linked to their current survival (Environment Canada 2006b). It nests in conifer trees and forages in large flocks based on cone availability (Environment Canada 2009).

Although Red Crossbills have an association with mature coniferous forests, they have an irruptive behaviour and an ability to breed throughout the year in response to cone production. As such, habitat associations are difficult to identify (Environment Canada 2006b).

Labrador

There are no records of the species in Labrador (Environment Canada 2009).

Island of Newfoundland

The potential range for this species, based on the distribution of mature coniferous forests, includes the Northern Peninsula, Central and Eastern Newfoundland and Avalon Peninsula regions (IFWD species fact sheet, undated).

Nests of the *percna* subspecies have been found only in Newfoundland (Environment Canada 2009); however, no nests have been found on the Island since 1977 (Environment Canada 2006b). Recently, two Red Crossbill were recorded incidentally in primary habitat (i.e., mature coniferous forest) in the Central and Eastern Newfoundland region, during the 2008 ELC field program. As well, a number of relatively recent sightings have taken place near Whitbourne, on the Avalon Peninsula, that suggest successful nesting in that area (Environment Canada 2006b).

Limiting Factors
The limited distribution and low numbers make the species more *Vulnerable* to threats (Environment Canada

2006b). Limiting factors include habitat loss and destruction, predation, competition for seeds with other bird species and red squirrels, as well as egg predation by red squirrels (Environment Canada 2006b). Insect invasion and disease in cone-bearing trees, fire, and forestry operations may also threaten food supply and nesting sites (Environment Canada 2006b).

3.2.3.3 Gray-cheeked Thrush

Gray-cheeked Thrush breed in boreal forests from Newfoundland to Siberia, where they are associated primarily with willow (Salix sp.) and alder (Alnus sp.) thickets and low spruce forests with dense undergrowth (Lowther et al. 2001; Dalley et al. 2005). Following breeding, individuals migrate to wintering grounds in South America and occasionally Panama or Costa Rica (Lowther et al. 2001).

Much of the existing information on “Gray-cheeked Thrush” was actually based on studies of Bicknell’s Thrush (Catharus bicknelli), as until recently, these were not considered distinct species (Lowther et al. 2001; Dalley et al. 2005). While some authors have identified Bicknell’s Thrush and Gray-cheeked Thrush as two subspecies of Catharus minimus (e.g., Wallace 1939 and Marshall 2001, cited in Dalley et al. 2005), Dalley et al. (2005) in their

report on the status of Gray-cheeked Thrush in Newfoundland recognize Gray-cheeked Thrush and Bicknell's thrush as distinct species. Within its range, the Gray-cheeked Thrush can be further subdivided into two subspecies: a northern subspecies (*Catharus minimus alicae*) and a Newfoundland subspecies (*Catharus minimus minimus*).

The Grey-cheeked Thrush has not been reviewed by COSEWIC, but is provincially designated as *Vulnerable* under *NLESA* (2005). A management plan for this species was completed by the NLDEC in 2010 (ESBS 2010).

Primary Sources of Information

Forest passerine surveys were conducted in the Study Area in 2008 that provide information on the presence, distribution and habitat associations of Gray-cheeked Thrush in the Study Area, as well as records collected during ELC surveys along the transmission corridor, also in 2008. Gray-cheeked Thrush was also recorded during passerine surveys conducted in 2006 and 2007 in support of the Lower Churchill Hydroelectric Generation Project (Minaskuat Inc. 2008a). In addition to these studies, two other sources of information were the provincial status reports for Gray-cheeked Thrush prepared by Dalley et al. (2005) and SSAC (2010) and the management plan (ESBS 2010). Lowther et al. (2001) also provide an overview of this species in the Birds of North America series.

Existing Conditions and Status

Gray-cheeked Thrush have declined in Newfoundland in recent years. An analysis of data from 1973-2008 suggests a measurable decline in numbers on the Island between 1980 and 2003 (SSAC 2010).

Habitat Association and Distribution in the Study Area

This bird prefers dense low coniferous forest for breeding, including young regenerating forest, open-canopy old growth forest with a dense shrub understory, and dense, stunted spruce on windblown sites or near the treeline (Dalley et al. 2005). In Labrador, the species is found in mature coniferous stands and sparsely forested valleys (Todd 1963). Dominant species include black spruce, white spruce, balsam fir, and tamarack (Dalley et al. 2005). In western Newfoundland, a 1999 study found Gray-cheeked Thrush in mature forests 77 to 87 years old, and absent in younger stands from 40 to 73 years old (Thompson et al. 1999).

From Main River to Little Grand Lake in Newfoundland, Gray-cheeked Thrush are found in old-growth balsam fir forests with canopy gaps but were absent from second growth closed canopy forests (Thompson et al. 1999), birch (Betula sp.) and willow stands and riparian thickets (Whitaker and Montevecchi 1997, cited in Dalley et al. 2005; Marshall 2001, cited in Dalley et al. 2005). Elsewhere in its range, this species is often associated with alder and willow thickets (Lowther et al. 2001). The diet of Gray-cheeked Thrush consists mainly of insects, arachnids, grubs, fruits and berries (Dalley et al. 2005).

Table 3-10 summarizes primary, secondary and tertiary breeding habitat quality for the Gray-cheeked Thrush. Primary habitat for this species includes conifer forest, conifer scrub and mixedwood forest habitats that occupy 3,730 km^2 (33 percent) of the Study Area in Newfoundland, and 2,284 km^2 (35 percent) in Labrador. Five of 20 observations of Gray-cheeked Thrush in the Study Area in 2008 were in habitat classified as primary.

Table 3-10 ELC Habitat Types and Relative Quality for Gray-cheeked Thrush

ELC Habitat Type	Breeding Habitat Quality	Notes
Alpine Vegetated	tertiary	Prefers tall shrubs with dense cover.
Black Spruce and Lichen Forest	tertiary	
Burn	tertiary	
Conifer Forest	primary	Rich sites with a dense understory.
Conifer Scrub	primary	Rich sites with a dense understory.
Cutover	tertiary	
Exposed Bedrock	tertiary	
Hardwood Forest	secondary	
Kalmia Lichen/Heathland	tertiary	
Lichen Heathland	tertiary	
Mixedwood Forest	primary	Rich sites with a dens understory.
Open Conifer Forest	tertiary	
Rocky Barrens	tertiary	
Scrub/Heathland/Wetland	secondary	
Wetland	secondary	

Notes:
1. Habitat types are described in Table 2-6.
2. Habitat Quality is described in Section 2.2.4.
3. While not included in the ELC (Minaskuat Inc. 2009a), riparian habitat is considered secondary quality habitat for this species.

Secondary habitat includes hardwood forest, wetland and scrub/heathland/wetland habitats. During the 2008 passerine surveys in the Study Area, 12 observations were made in secondary habitat. Remaining habitats were classified as tertiary, based on limited foraging, nesting, protection, resting or feeding opportunities.

Lower Churchill River and Lake Melville

Nine Gray-cheeked Thrush were recorded during 2006-2007 passerine surveys as part of the Lower Churchill Hydroelectric Generation Project (Minaskuat Inc. 2008a). Dalley et al. (2005) also note that there are fewer than five documented reports from Happy Valley-Goose Bay and North West River. However, this likely reflects a general lack of documentation of passerines, rather than reflective of the abundance of Gray-cheeked Thrush in Labrador (Nalcor Energy 2009a).

Southeastern Labrador

Dalley et al. (2005) confirmed Gray-cheeked Thrush throughout most of Labrador, but no further north than Hebron Fiord. During passerine surveys in the Study Area in 2008, four Gray-cheeked Thrush were recorded, all in the Forteau Barrens Ecoregion, where primary habitat comprises 45 percent of the area (Figure 3-9). Primary habitat is also relatively abundant in the Low Subarctic Forest Ecoregion (41 percent) that accounts for nearly 50 percent of the Study Area (Figure 3-9).

Island of Newfoundland

Primary habitat for this species is found in all Ecoregions in the Study Area, with the highest percentages found in the Northern Peninsula Forest (43 percent), Central Newfoundland Forest (39 percent) and Avalon Forest (44 percent) Ecoregions (Figures 3-10 to 3-12). Secondary habitat is common and widespread, although particularly concentrated in the Long Range Barrens Ecoregion in Central and Eastern Newfoundland (Figure 3-11) and areas of this Ecoregion on the Northern Peninsula (Figure 3-10).

Figure 3-9 Gray-cheeked Thrush Habitat Quality: Southeastern Labrador

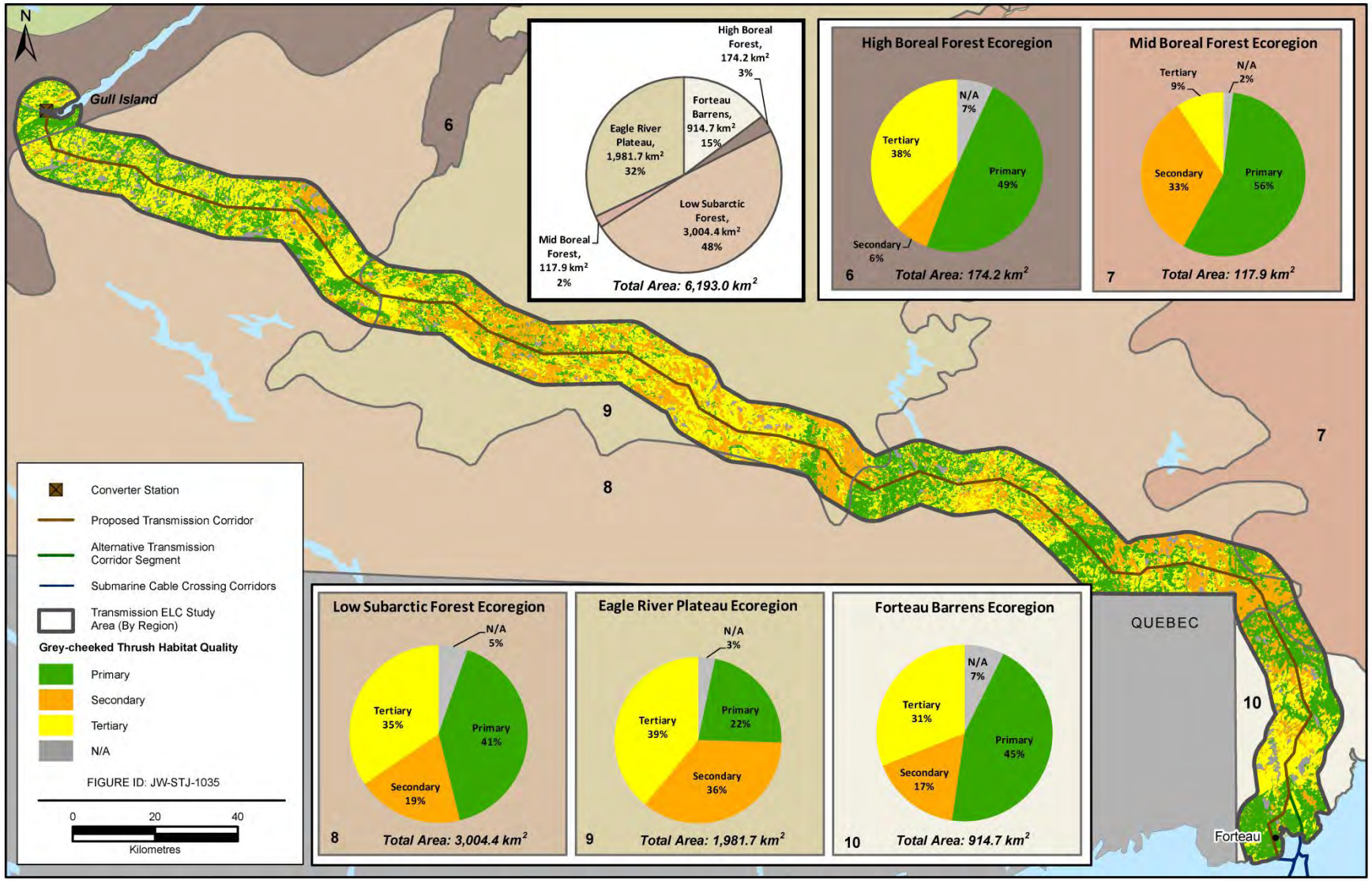


Figure 3-10 Gray-cheeked Thrush Habitat Quality:Northern Peninsula

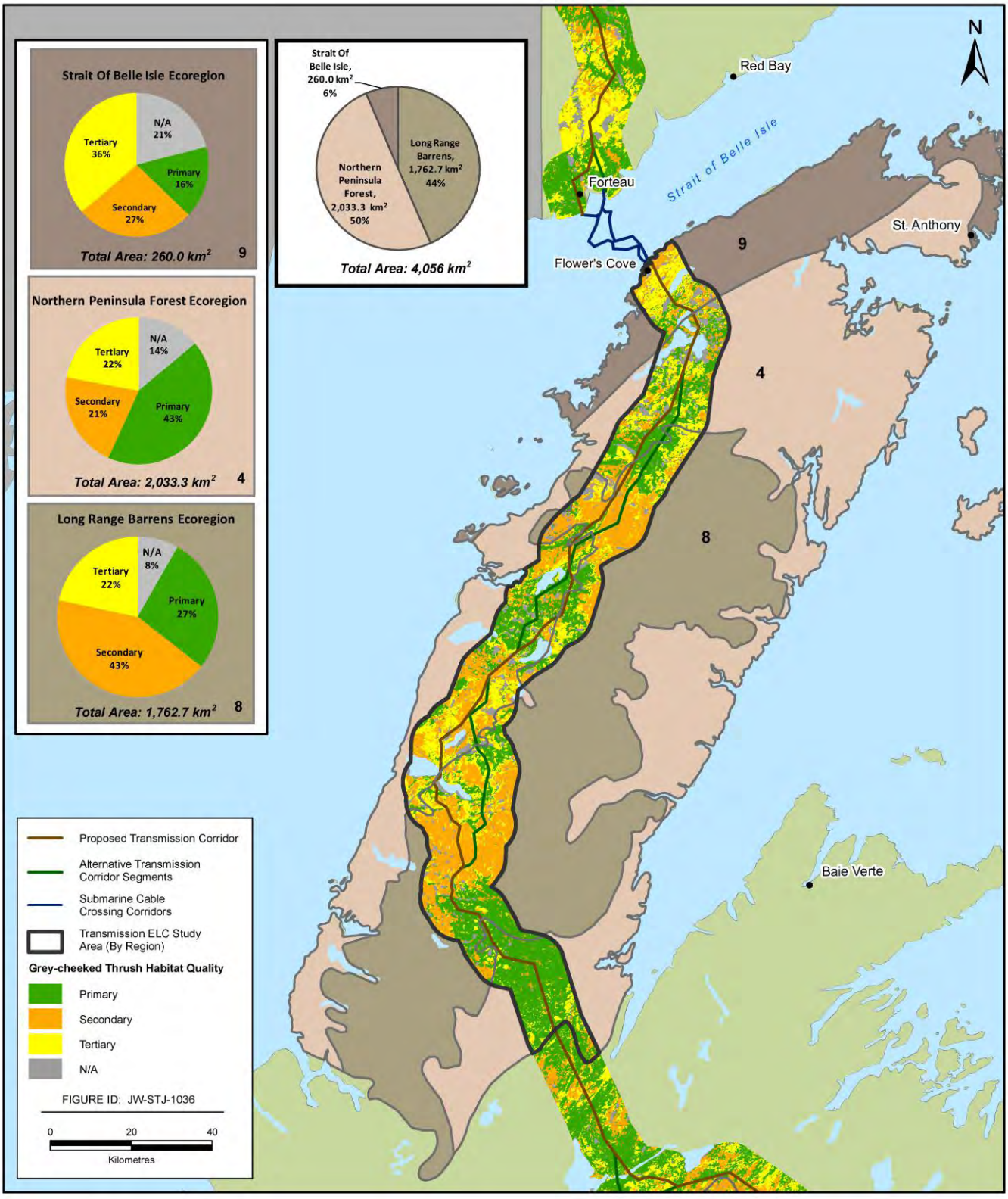


Figure 3-11 Gray-cheeked Thrush Habitat Quality:Central and Eastern Newfoundland

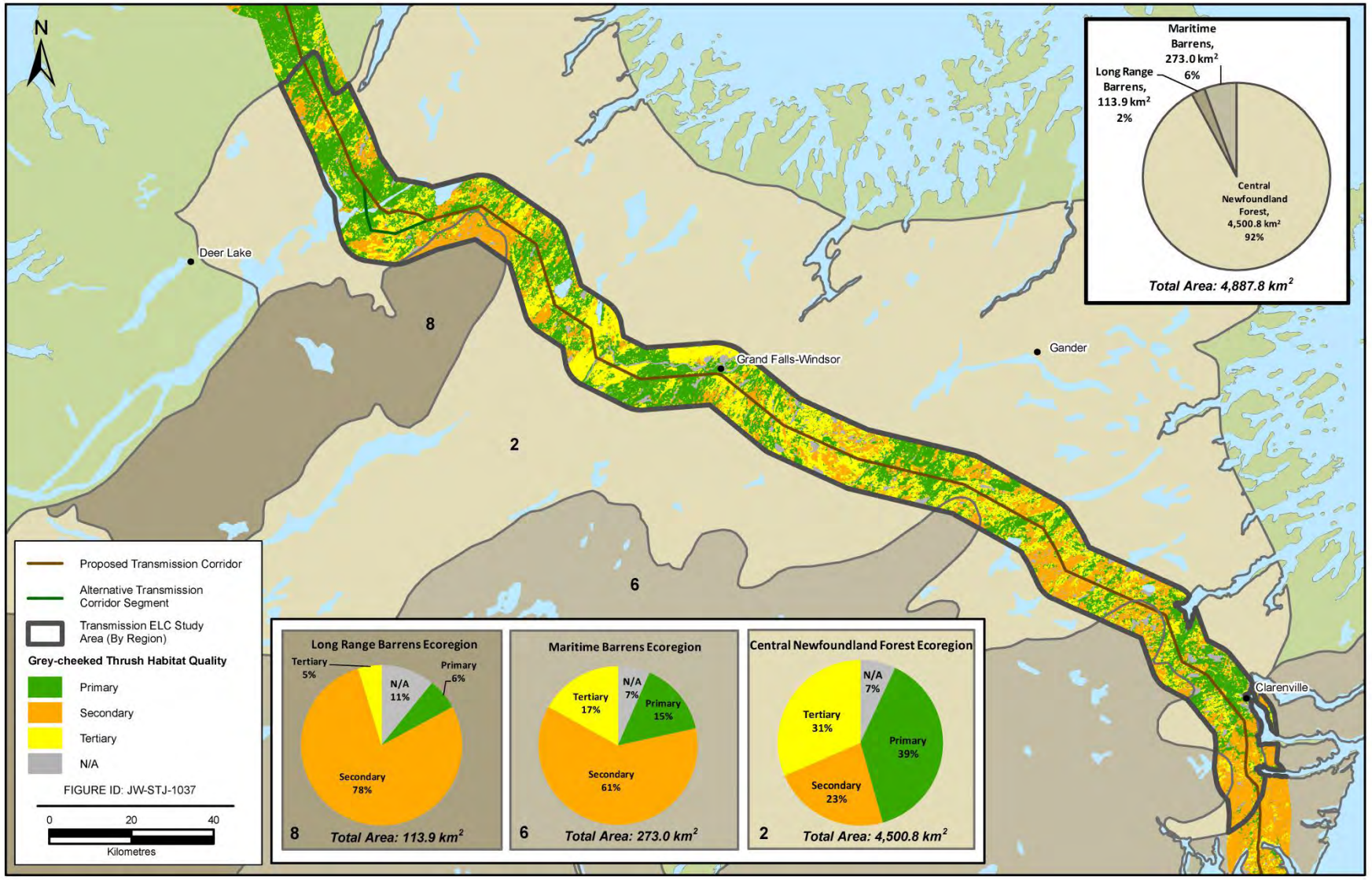
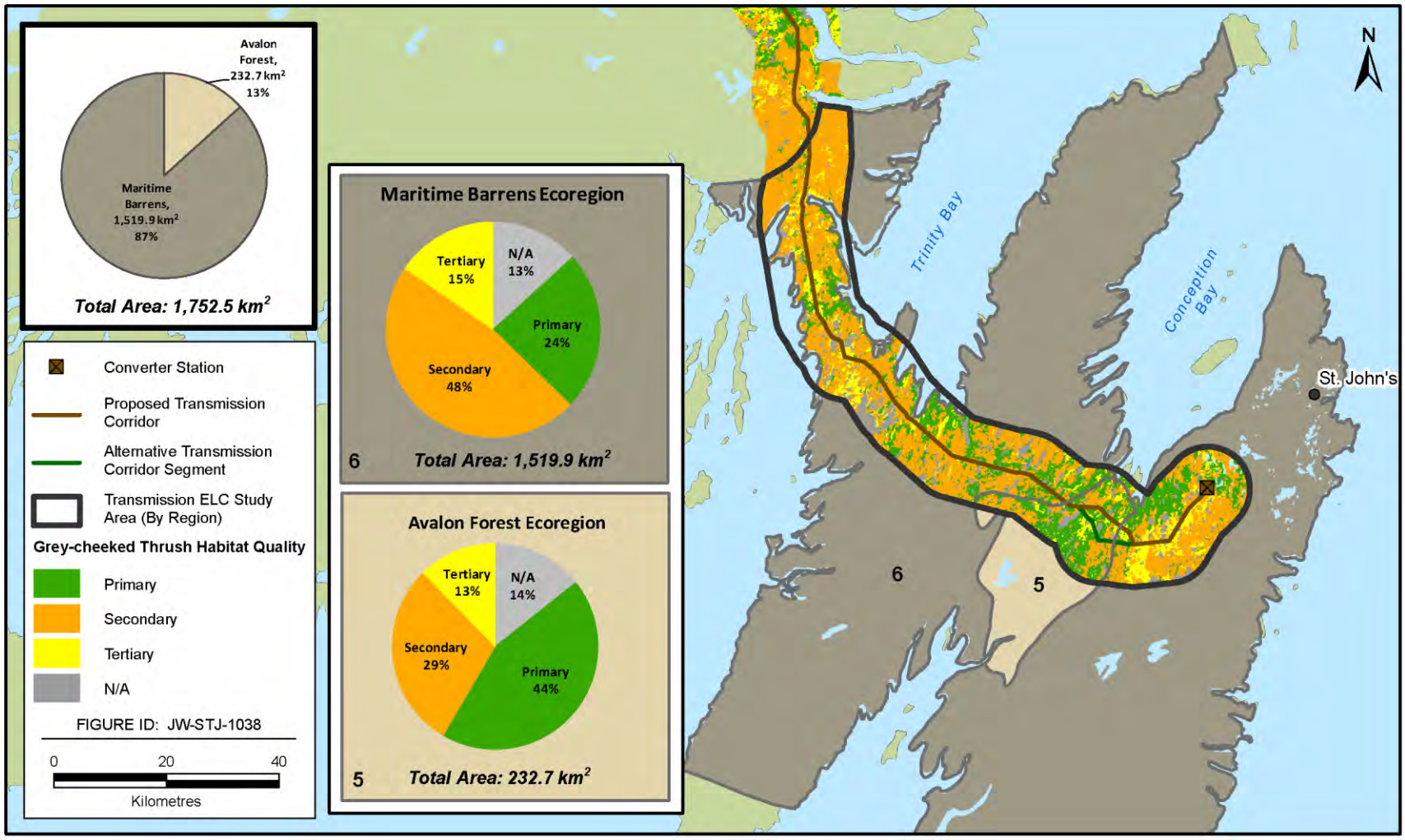


Figure 3-12 Gray-cheeked Thrush Habitat Quality: Avalon Peninsula



Thompson et al. (1999) reported this species throughout the province, on the Avalon Peninsula, western and southern Newfoundland, Placentia Bay, and the islands along the northeast and south coasts. In Newfoundland, the species is most common on the Northern Peninsula (where primary habitat comprises up to 43 percent of Ecoregions; Figure 3-10) and the northeast coast, and less common on the west coast and in the interior (Peters and Burleigh 1951, cited in Dalley et al. 2005). During the 2008 passerine surveys in the Study Area, 16 Gray-cheeked Thrush were observed, including 14 on the Northern Peninsula (primary wetland and scrub/heathland/wetland habitats) and two in mixedwood forest habitat in Central and Eastern Newfoundland. One additional bird was documented in Central and Eastern Newfoundland during ELC surveys, in cutover habitat.

Limiting Factors

Gray-cheeked Thrush declines may be related to habitat loss of breeding and wintering grounds, forestry harvesting, collisions with structures and egg predation by red squirrels (Dalley et al. 2005).

3.2.3.4 Olive-sided Flycatcher

Olive-sided Flycatcher is a tyrant flycatcher that breeds in habitat along forest edges and openings, from Alaska to Newfoundland and Labrador and southwards in the western United States, from sea level to 3,350 m in the Rocky Mountains (Altman and Sallabanks 2000). It is considered one of the most recognizable inhabitants of North America's coniferous forest (Altman and Sallabanks 2000).

The Olive-sided Flycatcher is federally protected under *SARA* (threatened). The species is also considered near-threatened by the World Conservation Union (IUCN 2007). Individuals and nests are protected under the federal *Migratory Birds Convention Act*. The Olive-sided Flycatcher was recently designated as *Threatened* under the *NLESA*.

Primary Sources of Information

Forest passerine surveys were conducted in the Study Area in 2008 that provide insight on the presence, distribution and habitat associations of Olive-sided Flycatcher in the Study Area. Observations of Olive-sided Flycatcher were also noted during ELC surveys in support of this Project in 2008. Additional observations of Olive-sided Flycatcher were recorded during passerine surveys conducted in 2006 and 2007, in support of the Lower Churchill Hydroelectric Generation Project (Minaskuat Inc. 2008a) and recent records from local breeding bird surveys are available through Sauer et al. (2007, 2008). Breeding Bird Survey data provides information on numbers of Olive-sided Flycatchers in central Labrador between 1973-2010 (USGS 2012, accessed online 7 February 2012). In addition, Altman and Sallabanks (2000) provide an overview of this species in the Birds of North America series.

Existing Conditions and Status

The Canadian breeding population has declined measurably between 1966 and 2007 (Sauer et al. 2008). In the 1990s, the world population was estimated at 1.2 million but by 2005 this number had decreased to approximately 700,000 birds, 450,000 of which breed in Canada (COSEWIC 2007a). In Newfoundland, population declines of 1.8 percent per year are noted for the period 1968 to 2006, based on 15 breeding bird survey routes in the province (COSEWIC 2007a).

Habitat Association and Distribution in the Study Area

The Olive-sided Flycatcher is primarily associated with natural and man-made edge habitats, including forest openings, forest edges, farmlands, cutovers, burns, riparian areas and wetland edges (Altman and Sallabanks 2000). These habitats are generally found adjacent to coniferous and mixed-coniferous habitats (Altman and Sallabanks 2000). Generally, in Canada, this species is also associated with open habitats of bogs, muskegs and swamps (Altman and Sallabanks 2000).

Given their primary association with specific and localized riparian and edge habitats, habitat quality indices for Olive-sided Flycatcher have not been able to be mapped in this study.

Lower Churchill River and Lake Melville

Four Olive-sided Flycatchers were recorded in the lower Churchill River valley during baseline surveys in support of the Lower Churchill Hydroelectric Generation Project (Nalcor Energy 2009a) and individuals have been recorded infrequently in surveys along the Happy Valley Breeding Bird survey route (from 1978 to 1999) (Sauer et al. 2007). There were 27 documented observances of Olive-sided Flycatchers along the four BBS routes (Route 36-Happy Valley; Route 37-Ossok; Route 39-Orma Road; and Route 40-Churchill Falls) in central Labrador that have been surveyed intermittently between 1973 and 2010. (USGS 2012, accessed online 7 Feb 2012).

Southeastern Labrador

Olive-sided Flycatcher was not observed in the Study Area in Southeastern Labrador during either passerine or ELC surveys in 2008, although Altman and Sallabanks (2000) indicate that the breeding range of this species extends into a portion of the Southeastern Labrador region.

Northern Peninsula

Eight Olive-sided Flycatcher were recorded on the Northern Peninsula during the 2008 passerine surveys, including six birds from four point counts within scrub/heathland/wetland habitats and two single individuals in each of wetland and cutover habitats. All eight observations were within the Northern Peninsula Forest Ecoregion.

Central and Eastern Newfoundland

Three Olive-sided Flycatcher were documented in the Central and Eastern Newfoundland region during the 2008 passerine surveys, from three separate point counts within the Central Newfoundland Forest Ecoregion. An additional five Olive-sided Flycatcher were heard during the ELC field program, also in 2008.

Avalon Peninsula

This species was not recorded in this region during the 2008 passerine surveys. However, the known breeding range for this species includes the Avalon Peninsula (Altman and Sallabanks 2000).

Limiting Factors

Decline in insect populations, predation (particularly nest predation), habitat loss/modification (including reforestation), collision with motor vehicles, loss of nesting sites, and climate change (Environment Canada 2009) are potential limiting factors for this species. Changes in habitat availability and use of pesticides are of particular importance in the wintering grounds of this species – Panama, and the Andes of Peru and Ecuador

(Nalcor Energy 2009a). Approximately 85 percent of the montane forest regions of the Andes, in which this species winters, have been altered by human activity (Environment Canada 2009).

3.2.3.5 Blackpoll Warbler

Blackpoll Warbler is a common passerine species that breeds within coniferous forests throughout much of northern Canada and Alaska, including Newfoundland and Labrador (Hunt and Eliason 1999). This species undergoes the longest migration of any warbler species, leaving breeding grounds in Northern North America to winter over 8,000 km south in parts of South America (Hunt and Eliason 1999). Within the Study Area, this species was among the top five species (in terms of abundance) in over half of the Ecoregions surveyed in 2008.

Primary Sources of Information

Forest passerine surveys were conducted in the Study Area in 2008 that provide insight on the presence, distribution and habitat associations of Blackpoll Warbler in the Study Area, as well during ELC surveys in support of the Project. Outside of the Study Area, Blackpoll Warblers were recorded during passerine surveys conducted in 2006 and 2007, in support of the Lower Churchill Hydroelectric Generation Project (Minaskuat Inc. 2008a). In addition, Hunt and Eliason (1999), provide detailed information on the species in the Birds of North America series.

Existing Conditions and Status

The boreal forest in Canada accounts for approximately 65 percent of the species' population (Boreal Songbird Initiative 2009). Population trends for the Blackpoll warbler in this region are currently unknown as there is insufficient data for this species within Newfoundland and Labrador (CWS 2013).

Habitat Association and Distribution in the Study Area

In Northern Canada, Blackpoll Warblers are primarily associated with coniferous forests (Hunt and Eliason 1999 and references therein). Breeding records also indicate some use of wetland habitats (spruce bogs or conifer swamps) at elevations ≥700 m (Walley 1989, cited in Hunt and Eliason 1999; Gross 1994, cited in Hunt and Eliason 1999). In Newfoundland, damp coniferous forests rich in lichens, and headlands and barrens with tuckamore are preferred (Warkentin and Newton 2009). Individuals prefer small, stunted trees for nesting, mainly in open or recently cleared areas (Hunt and Eliason 1999; Warkentin and Newton 2009).

Table 3-11 summarizes primary, secondary and tertiary breeding habitat quality for Blackpoll Warbler. Primary habitat for this species includes conifer scrub, cutover and open conifer forest, as well as wetland and scrub/heathland/wetland habitat in some Ecoregions (Table 3-11). Primary habitat for Blackpoll Warbler occupies 2,671 to 6,001 km^2 (24 to 53 percent) of the Study Area in Newfoundland, and 2,576 km^2 (39 percent) in Labrador. Secondary habitat includes black spruce and lichen forest (dry habitat), conifer forest, mixedwood forest as well as wetland and scrub/heathland/wetland habitats in some Ecoregions (Table 3-11). Remaining habitats in Table 3-11 were classified as tertiary, based on limited foraging, nesting, protection, resting or feeding opportunities.

Table 3-11 ELC Habitat Types and Relative Quality for Blackpoll Warblers

ELC Habitat Type	Breeding Habitat Quality	Notes
Alpine Vegetated	tertiary	
Black Spruce and Lichen Forest (dry)	secondary	
Burn	tertiary	
Conifer Forest	secondary	One + one pair documented during 2008 passerine surveys.
Conifer Scrub	primary	
Cutover	primary	
Exposed Bedrock	tertiary	
Hardwood Forest	tertiary	
Kalmia Lichen/Heathland	tertiary	
Lichen Heathland	tertiary	
Mixedwood Forest	secondary	Of the few records in this habitat type, the highest number were located on the Avalon Peninsula.
Open Conifer Forest	primary	
Rocky Barrens	tertiary	
Scrub/Heathland/Wetland	primary – MB and LRB Ecoregions secondary – all other Ecoregions	31% of records were in this habitat type, of which 80% were found in the MB and LRB Ecoregions.
Wetland	primary – NPF Ecoregion secondary – all other Ecoregions	21% of records were in this habitat type, nearly half of which were in the NPF Ecoregion.

Notes:
1. Habitat types are described in Table 2-6.
2. Habitat Quality is described in Section 2.2.4.
3. NPF – Northern Peninsula Forest Ecoregion; MB – Maritime Barrens Ecoregion; LRB – Long Range Barrens Ecoregion (see Figure 2-1).

Lower Churchill River and Lake Melville

The breeding range of this species includes the Churchill River and Lake Melville areas. Nineteen Blackpoll Warbler were recorded during 2006-2007 passerine surveys (Minaskuat Inc. 2008a) and two were incidentally recorded during general wildlife surveys (Minaskuat 2008c) along the Churchill River. Blackpoll Warblers along the Churchill River were generally associated with coniferous forests, particularly in 2007 (Minaskuat Inc. 2008a).

Southeastern Labrador

Primary and secondary habitat for Blackpoll Warblers was identified throughout the Southeastern Labrador Study Area (Figure 3-13). Tertiary habitat was generally low, but comprised 31 percent of the Forteau Barrens Ecoregion (Figure 3-13).

A total of 41 Blackpoll Warbler were recorded during the 2008 passerine surveys along the Study Area, in the Eagle River Plateau (10), Low Subarctic Forest (1) and Forteau Barrens (30) Ecoregions. This species was one of the most abundant species recorded in the Forteau Barrens Ecoregion, where primary habitat accounts for 37 percent of the Ecoregion (Figure 3-13). This Ecoregion also supports the greatest proportion of tertiary habitat compared to all other Ecoregions in the province (Figures 3-13 to 3-16).

Figure 3-13 Blackpoll Warbler Habitat Quality: Southeastern Labrador

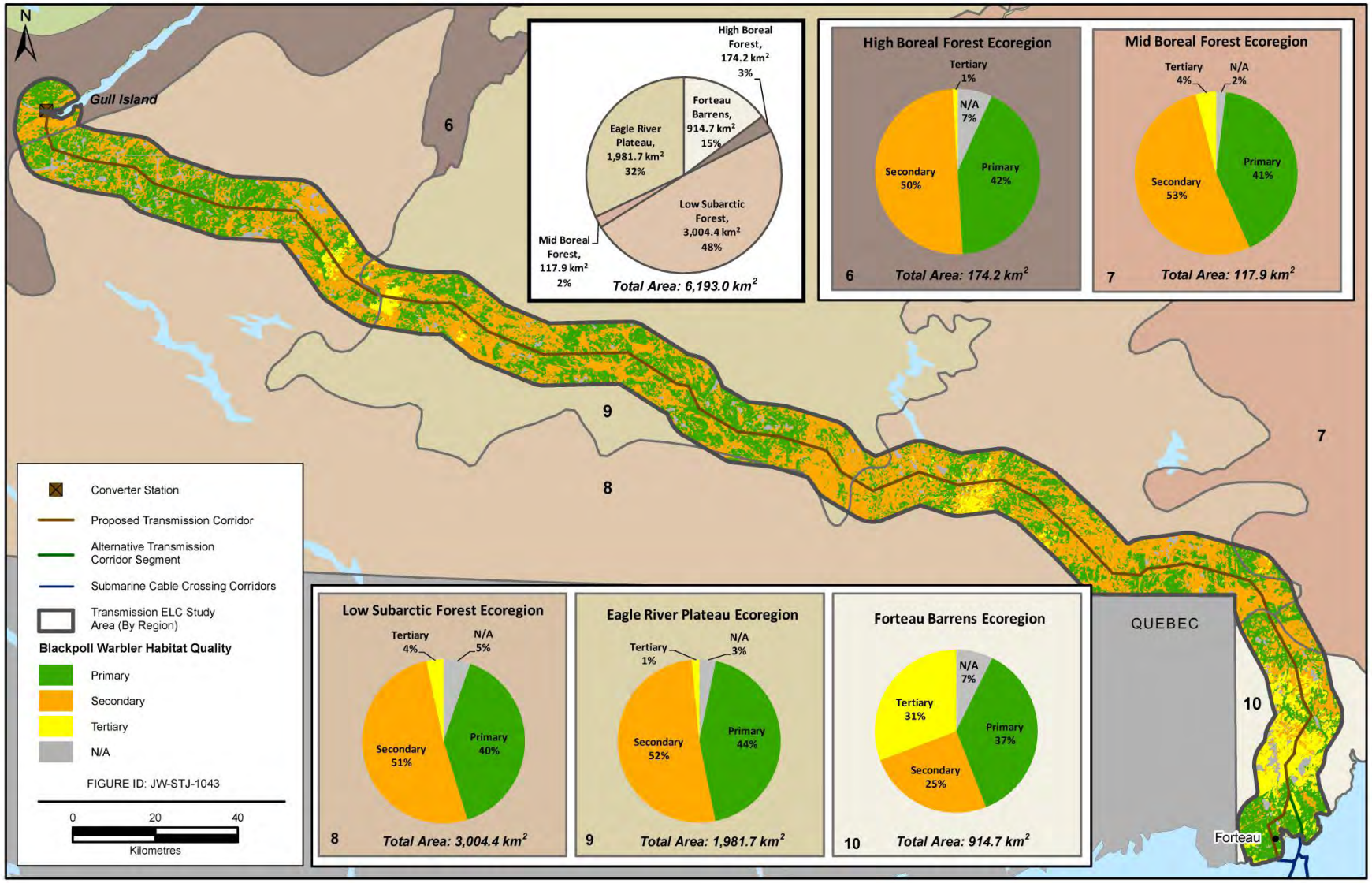


Figure 3-14 Blackpoll Warbler Habitat Quality: Northern Peninsula

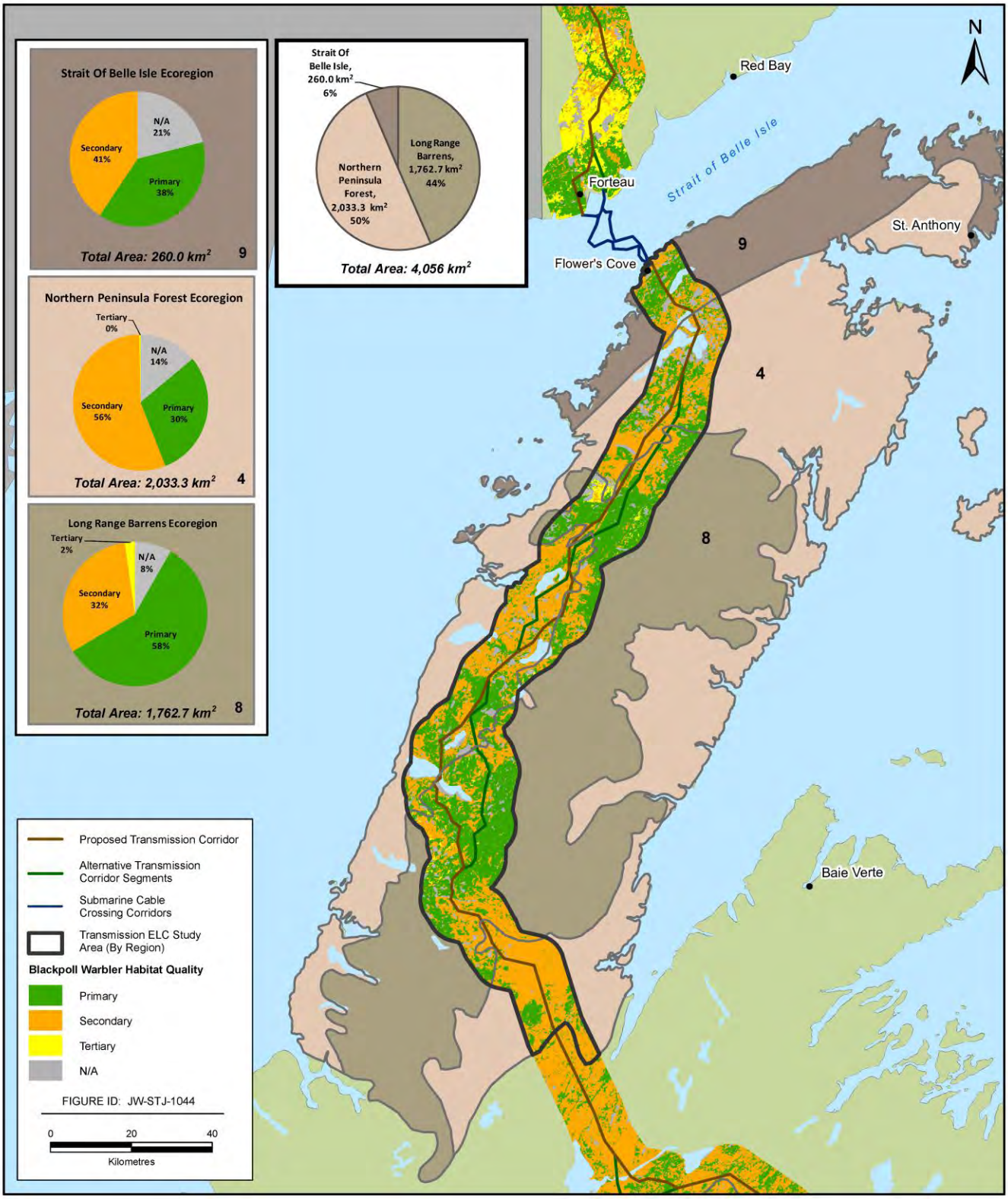


Figure 3-15 Blackpoll Warbler Habitat Quality: Central and Eastern Newfoundland

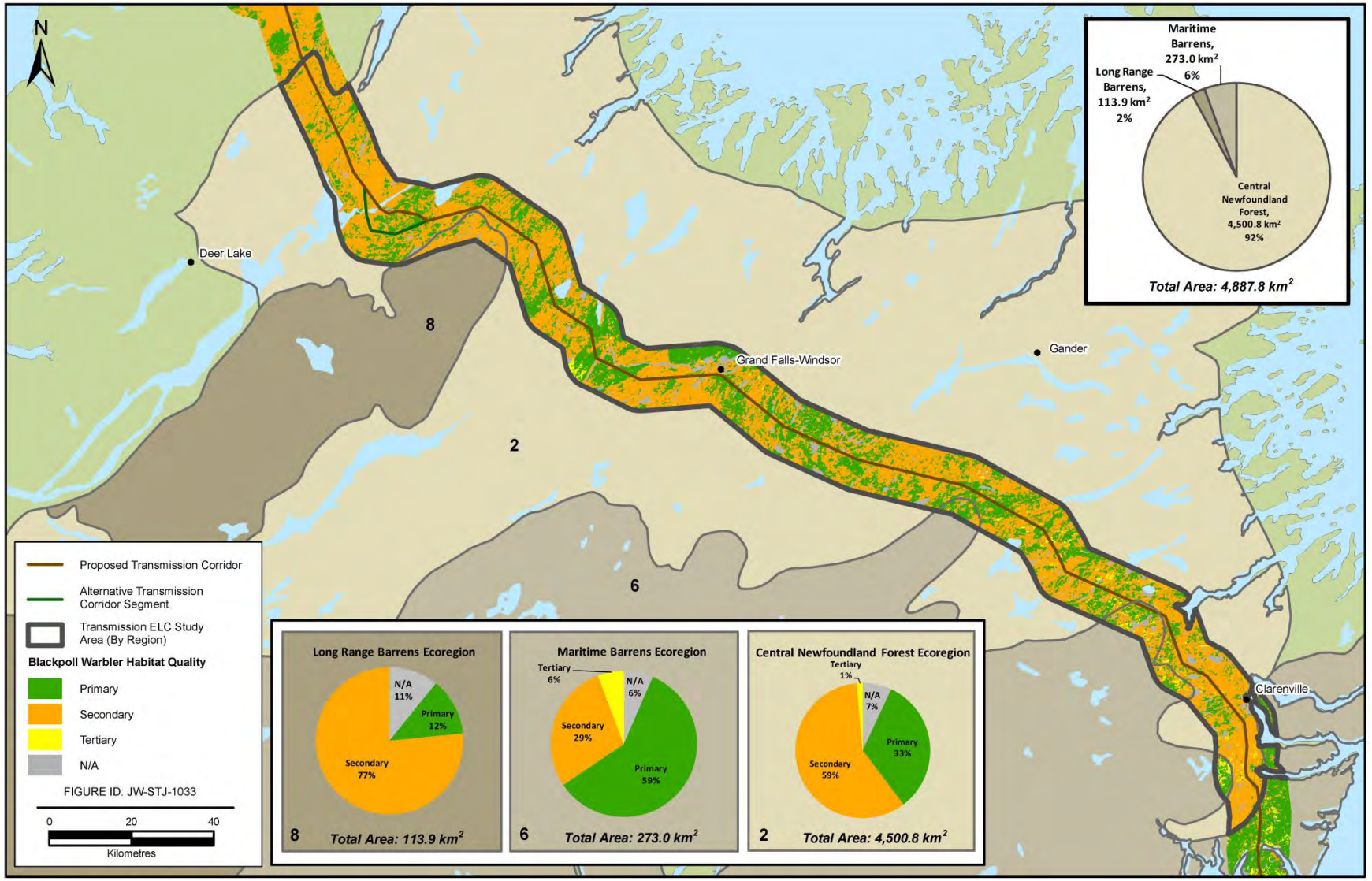
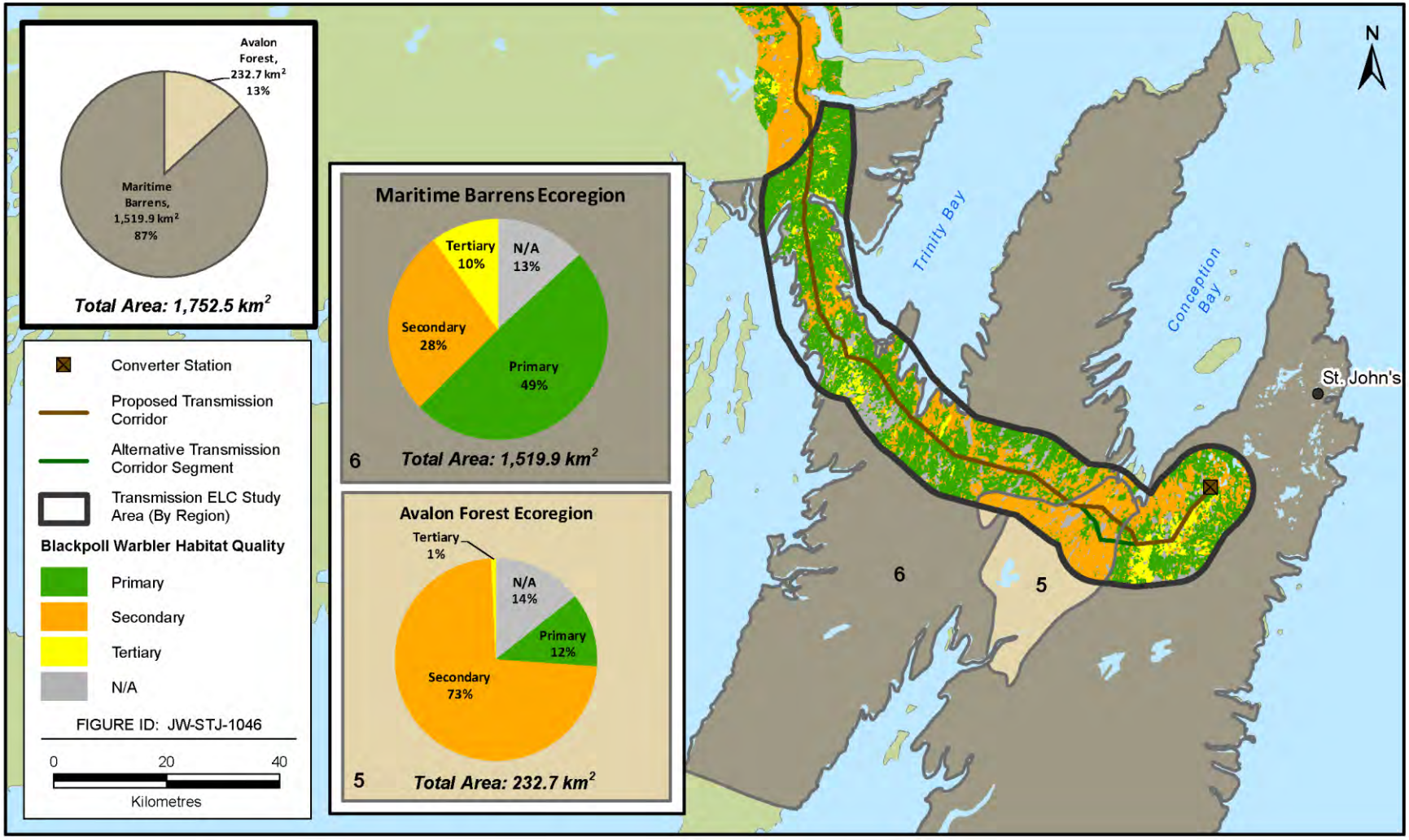


Figure 3-16 Blackpoll Warbler Habitat Quality: Avalon Peninsula



Northern Peninsula

Along the Northern Peninsula, Blackpoll Warblers were frequently recorded during the 2008 surveys, with 34 observations in the Long Range Barrens Ecoregion, 39 in the Northern Peninsula Forest Ecoregion and 18 in the Strait of Belle Isle Barrens Ecoregion. Blackpoll Warbler was one of the most abundant of all species found in the Long Range Barrens Ecoregion, where primary habitat for this species comprises 58 percent of the Ecoregion (Figure 3-14). Secondary habitat is also widely distributed, with tertiary habitat comprising <2 percent of the entire Study Area in this region.

Central and Eastern Newfoundland

While primary and secondary habitats are abundant in this region of the Study Area (Figure 3-15), only six Blackpoll Warbler were recorded during the 2008 surveys. During the ELC field program, one pair of Blackpoll Warbler was also documented, in conifer forest habitat.

Avalon Peninsula

Fifty observations of Blackpoll Warbler were documented in this region of the Study Area in 2008, the majority of which (40) were within the Maritime Barrens Ecoregion, where the highest proportions of primary habitat was found (Figure 3-16). During other surveys in support of the baseline research for this Project, this species was occasionally documented, including eight records during ELC field surveys.

Limiting Factors

No specific limiting factors for this species have been identified (Hunt and Eliason 1999).

3.2.3.6 Wetland Sparrows

Sparrows are a group of passerines that are relatively small birds with cone-shaped bills (Godfrey 1986). Four common sparrow species comprise the 'Wetland Sparrows' group – Swamp Sparrow, Song Sparrow, Lincoln's Sparrow and Savannah Sparrow. These species are widely distributed across North America, but were found to be largely restricted to riparian and wetland habitats during surveys along the lower Churchill River in Labrador in 2006-2007, with only occasional occurrences in other habitat during the breeding season (Minaskuat Inc. 2008a). During winter, these species range from southern Canada to Nicaragua, with a core range in the southern United States and part of Mexico and South America (Ammon 1995; Mowbray 1997; Arcese et al. 2002; Wheelwright and Rising 2008).

Primary Sources of Information

Forest passerine surveys were conducted in the Study Area in 2008 that provide insight on the presence, distribution and habitat associations of Wetland Sparrows in the Study Area. Observations of Wetland Sparrows were also noted during ELC field studies related to the Project in 2008. Passerine surveys conducted in 2006 and 2007 in support of the Lower Churchill Hydroelectric Generation Project documented the presence of all four species in the watershed (Minaskuat Inc. 2008a).

In addition to these, species accounts in the Birds of North America Series have been prepared by Mowbray (1997), Arcese et al. (2002), Ammon (1995) and Wheelwright and Rising (2008), for Swamp Sparrow, Song Sparrow, Lincoln's Sparrow and Savannah Sparrow, respectively.

Breeding Bird Survey data sets from 1973-2010 were summarized for the four routes in central Labrador proximate to and within the study area for these species (USGS 2012,accessed on-line 7 February 2012).

Existing Conditions and Status

All four species are associated with wetland and marsh habitats, and breed from Canada to Nicaragua, with core populations in the United States and Mexico (Nalcor Energy 2009a). Breeding Bird Survey data indicate that for Newfoundland and Labrador, the populations of Swamp Sparrow and Savannah Sparrow have increased since the 1960s, while Lincoln's Sparrow has decreased (CWS 2009). Population trends were not available for Song Sparrow in the province and Warkentin and Newton (2009) indicate this species to be less common than the other three species of Wetland Sparrows. Previous studies on drier terrestrial locations in central Labrador describe Lincoln's Sparrow as less common, and do not mention the others as being encountered (LeCoure et al. 2000; Simon et al. 2000, 2002).

Habitat Association and Distribution in the Study Area

Moisture, tree density, ground vegetation density and habitat area are critical factors that define habitat suitability for Wetland Sparrows (Ammon 1995; Mowbray 1997; Arcese et al. 2002; Wheelwright and Rising 2008). Tree cover is also important, as all four species generally prefer open areas. Nesting sites are generally close to the ground, in areas that provide adequate shelter and access to foraging sites (Ammon 1995; Mowbray 1997; Arcese et al. 2002; Wheelwright and Rising 2008).

The Swamp Sparrow prefers open water, freshwater cattail marshes, brushy meadows, bogs, sedge swamps and brackish marshes. Optimal habitat is found in marshes with open water, dense low vegetation, and available singing perches (Mowbray 1997). The presence of open water is the best indicator of appropriate breeding habitat. Food sources include arthropods, seeds and fleshy fruits (summer), and seeds and fruits (winter). The species overwinters in eastern North America, although not as far north as central Labrador. This species is found in suitable habitat south of the tree-line from British Columbia to Labrador and is at the northern edge of the documented range in Labrador (Mowbray 1997; Nalcor Energy 2009a).

The Song Sparrow is thought to be a habitat generalist, but prefers shrubby habitat near water (Erhlich et al. 1988). Females build open-cup nests in herbs, grasses and shrubs, wherever suitable cover and insects are present (Arcese et al. 2002). Individuals are highly territorial. Cold temperatures, snow cover and reduced availability of seeds in winter result in southward migration from breeding sites in Newfoundland and Labrador.

Lincoln's Sparrow is the most specialized of the four species, preferring low willow cover with dense ground vegetation in boreal regions. There is no real nest or mate fidelity, and nests are constructed in boggy areas and wet meadows (Ammon 1995). Insects are preferred, but individuals will also feed on grass seeds and seeds of low-lying shrubs. Spring migration peaks in late May, and fall migration to overwintering sites in Mexico begins in mid-September.

The Savannah Sparrow is found in more open habitats, such as agricultural fields, fens, meadows, marshes, coastal grasslands and tundra. Nests are built on the ground and individuals forage on seeds and insects. This species avoids areas with extensive tree cover. At northern parts of their range, Savannah Sparrow make use of sedge bogs, dwarf willows, birches and feeds in conifers (Mowbray 1997). In Labrador, where they are widely distributed, wetlands appear to provide the only suitable habitat (Nalcor Energy 2009a).

Observations of Wetland Sparrows in the lower Churchill River watershed from studies in support of the Lower Churchill Hydroelectric Generation Project were almost entirely in riparian or wetland areas, with less than 1 percent of records from another habitat type (Nalcor Energy 2009a). Results from similar studies along the Labrador-Island Transmission Link in 2008 identified 66 percent of all records in wetland or scrub/heathland/wetland habitats. Riparian habitat was not classified as part of the ELC Study conducted in support of the current EA.

Table 3-12 summarizes primary, secondary and tertiary breeding habitat quality for Wetland Sparrows. Primary wetland and scrub/heathland/wetland habitat for this species occupies 3,330 km^2 (30 percent) of the Study Area in Newfoundland, and 1,512 km^2 (23 percent) in Labrador. Cutovers in the Central Newfoundland Forest Ecoregion were classified as secondary habitat, based on numerous observations in this Ecoregion during 2008 surveys. Remaining habitats in Table 3-12 were classified as tertiary, based on limited foraging, nesting, protection, resting or feeding opportunities.

Table 3-12 ELC Habitat Types and Relative Quality for Wetland Sparrows

ELC Habitat Type	Wetland Sparrow Species	Breeding Habitat Quality	Notes
Alpine Vegetated		tertiary	
Black Spruce and Lichen Forest		tertiary	
Burn		tertiary	
Conifer Forest		tertiary	
Conifer Scrub		tertiary	
Cutover	Lincoln's Sparrow	secondary – CNF Ecoregion tertiary – all other Ecoregions	Some records in cutover habitat, primarily associated with the CNF Ecoregion.
Exposed Bedrock		tertiary	
Hardwood Forest		tertiary	
Kalmia Lichen/Heathland		tertiary	
Lichen Heathland	Lincoln's Sparrow	tertiary	Seven LISP recorded in this habitat type in the FB Ecoregion.
Mixedwood Forest		tertiary	
Open Conifer Forest		tertiary	
Rocky Barrens		tertiary	
Scrub/Heathland/Wetland	Song Sparrow Swamp Sparrow Lincoln's Sparrow	primary – prefers marsh habitat	100% of SOSP, 46% of LISP, 41% of SAVS and 42% of SWSP records were in this habitat.
Wetland	Savannah Sparrow Lincoln's Sparrow Swamp Sparrow	primary – prefers marsh habitat	21% LISP, 29% of SAVS and 13% SWSP records were in this habitat.

Notes:
1. Habitat types are described in Table 2-6.
2. Habitat Quality is described in Section 2.2.4.
3. While not included in the ELC (Minaskuat Inc. 2009a), riparian habitat is considered primary quality habitat for this species.
4. CNF – Central Newfoundland Forest Ecoregion (see Figure 2-1).
5. SOSP – Song Sparrow; LISP – Lincoln's Sparrow; SAVS – Savannah Sparrow; SWSP – Swamp Sparrow.

Lower Churchill River and Lake Melville

Observations of Wetland Sparrows were almost exclusively in wetland and riparian habitats during passerine surveys along the lower Churchill River in 2006-2007 (Minaskuat Inc. 2008a). There were 74 observations during 2006 surveys, with 63 located along only three transects – two at Upper Brook and one at Elizabeth River (Minaskuat Inc. 2008a). Similarly, in 2007, 49 of the 110 records were along these same three transects (Minaskuat Inc. 2008a).

The data from the four BBS survey routes in central Labrador were summarized for these four species, from intermittent surveys between 1973-2010. There were a total of 285 Savannah Sparrows; 233 Lincoln's Sparrows and 65 Swamp Sparrows documented proximate to and within the Study area. There were no Song Sparrows documented on these BBS survey routes (USGS 2012, accessed on-line 7 February 2012).

Southeastern Labrador

Tertiary habitat for Wetland Sparrows is dominant in all Ecoregions in the Southeastern Labrador Study Area; however, primary breeding habitat is available throughout the Study Area, particularly in the Eagle River Plateau Ecoregion (Figure 3-17). Secondary habitat was not identified in this portion of the Study Area (Figure 3-17, Table 3-12).

Lincoln's Sparrow and Savannah Sparrow were documented along the Study Area during the 2008 passerine surveys and Swamp Sparrow was incidentally observed in this region during the ELC field program. Although Song Sparrow were not documented during the 2008 field program, this species was documented during the breeding season in the lower Churchill River during field studies in 2006-2007; prior to this, the Song Sparrow was not known to breed in Labrador (Nalcor Energy 2009a). If present in this region of the Study Area, Song Sparrows are likely to be relatively uncommon.

Northern Peninsula

Primary and tertiary habitats are available throughout the Northern Peninsula region of the Study Area, with highest proportions (and concentrations) of primary habitat associated with the Long Range Barrens Ecoregion, where it comprised 43 percent of the Ecoregion (Figure 3-18). Secondary habitat was not identified in this portion of the Study Area (Figure 3-18; Table 3-12).

A total of 98 Wetland Sparrows comprising Lincoln's (68), Savannah (25) and Swamp (5) Sparrow were recorded along the Northern Peninsula region of the Study Area in the 2008 surveys, 61 percent of which occurred within the Long Range Barrens Ecoregion. Observations of Lincoln's Sparrow in this region account for 76 percent of the total records for this species. Song Sparrows are not known to breed on the Northern Peninsula (Warkentin and Newton 2009). During the ELC fieldwork for the transmission project, one Savannah Sparrow and one Lincoln's Sparrow were recorded in primary wetland habitat in this geographic region.

Central and Eastern Newfoundland

Lincoln's (10), Savannah (6) and Swamp (10) Sparrow were recorded along the Central and Eastern Newfoundland Study Area in 2008 and it is likely that Song Sparrow also breed in this region [although generally, Song Sparrow would be considered more common on the southern half versus the central portion of the Island (Warkentin and Newton 2009)]. The Central and Eastern Newfoundland region is the only region where secondary habitat was identified (Figure 3-19), based on a relatively high proportion of sightings in cutover habitat type in this region (Table 3-12). Although higher proportions of primary habitat were found in the remaining two Ecoregions in the Study Area, the total primary habitat available (km^2) was still highest in the

Central Newfoundland Forest Ecoregion (Figure 3-19). During the 2008 ELC surveys, one Lincoln's Sparrow and two Savannah Sparrows were recorded in primary wetland habitat in this region.

Figure 3-17 Wetland Sparrows Habitat Quality: Southeastern labrador

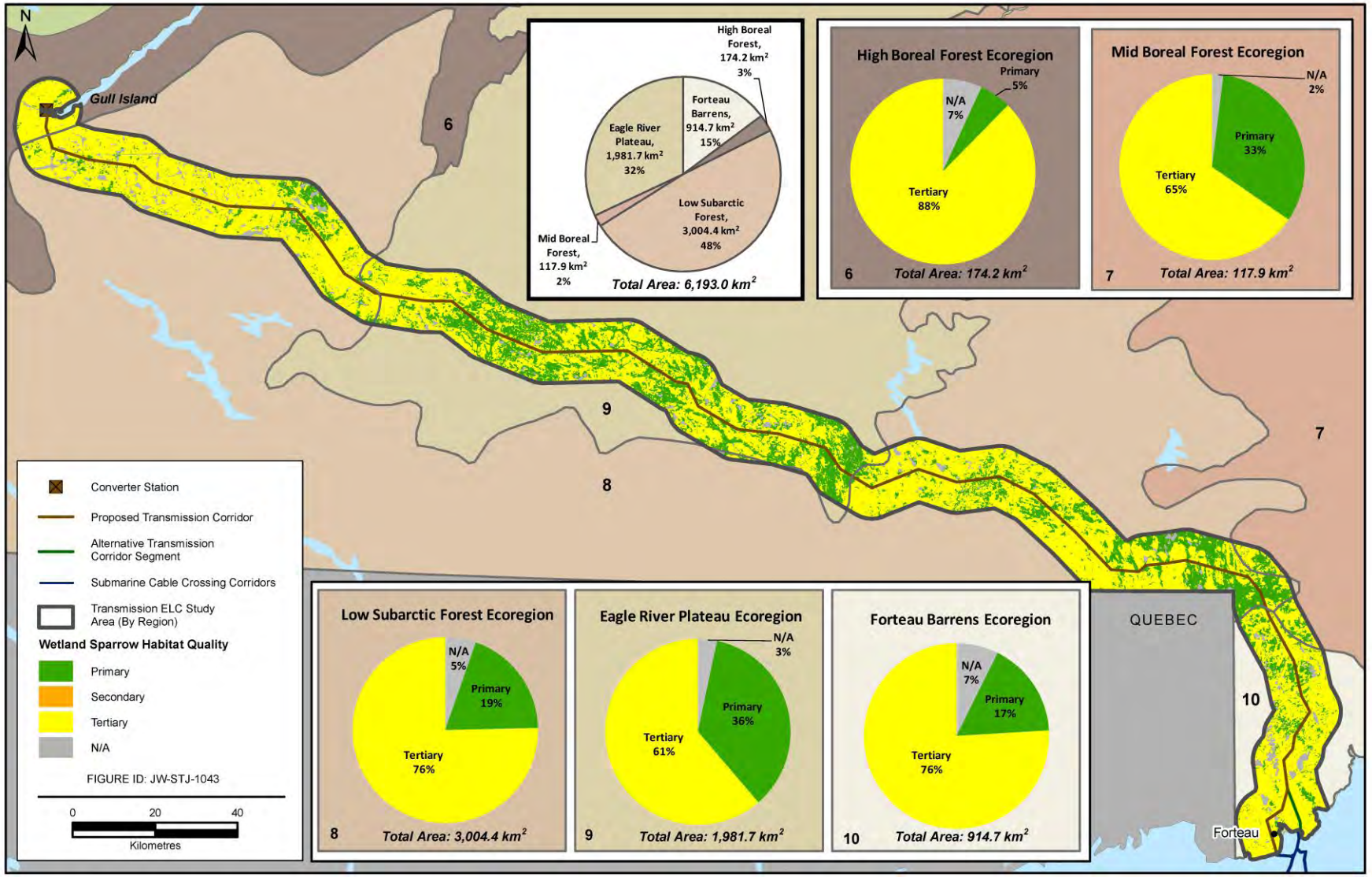


Figure 3-18 Wetland Sparrows Habitat Quality: Northern Peninsula

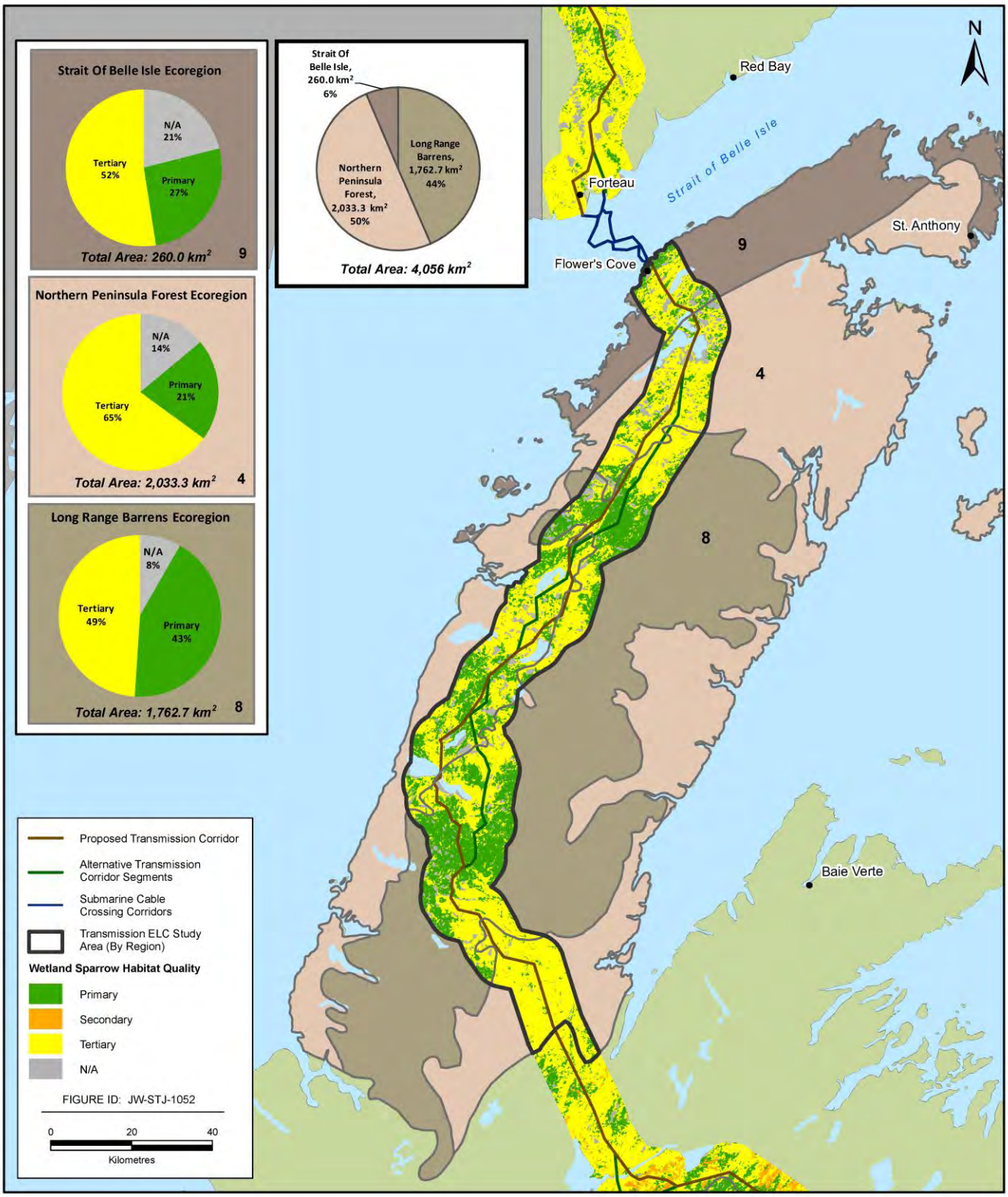
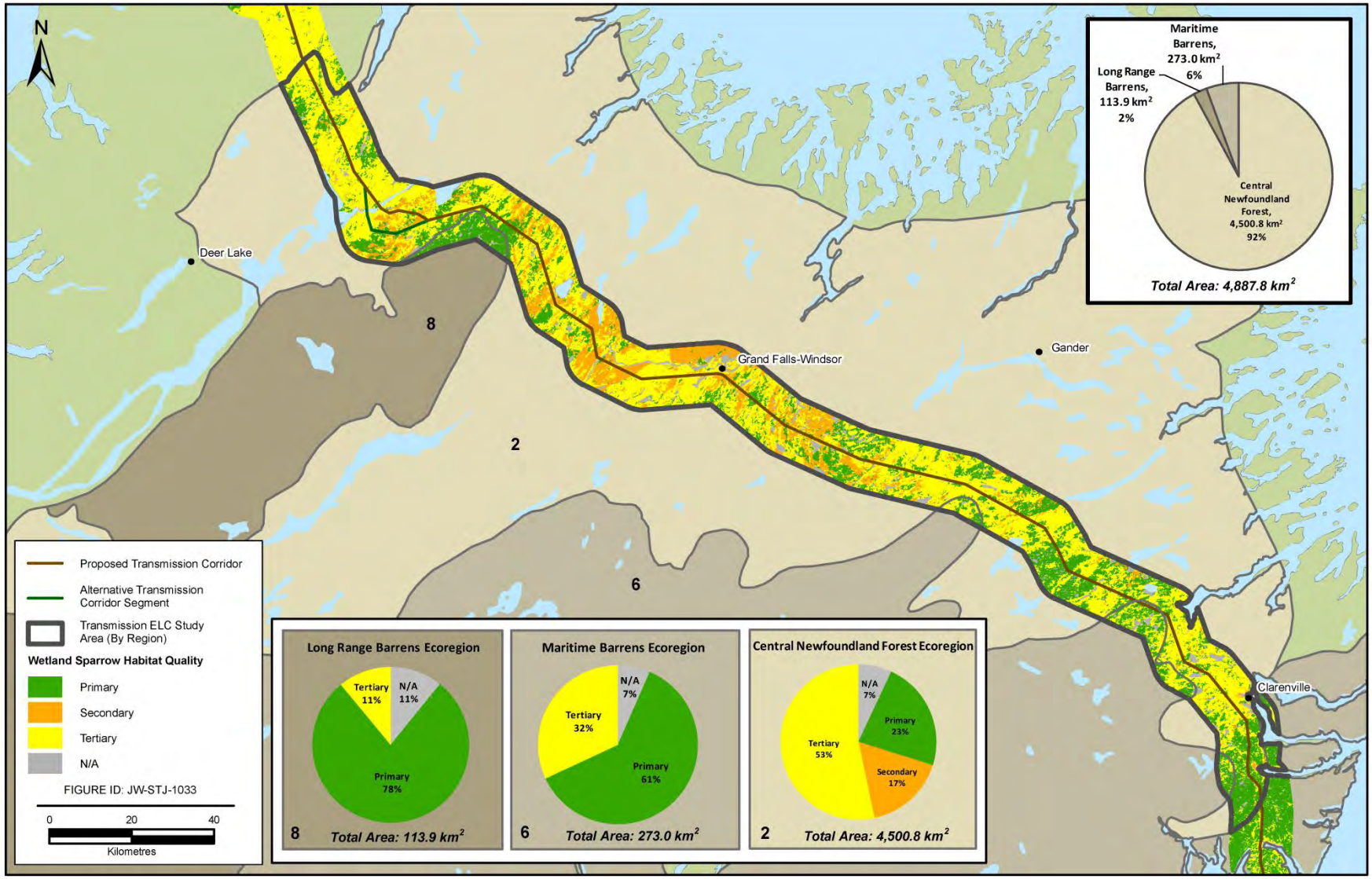


Figure 3-19 Wetland Sparrows Habititat Quality: Central and Eastern Newfoundland



Primary and tertiary habitat were distributed throughout the Avalon Peninsula region of the Study Area (Figure 3-20). Secondary habitat was not identified in this portion of the Study Area (Figure 3-20, Table 3-12).

Savannah (16), Swamp (23) and Song (3) Sparrow were recorded here in 2008, primarily in the Maritime Barrens Ecoregion. Lincoln's Sparrow was not recorded in the 2008 surveys, although this region is within the breeding range for this species (Warkentin and Newton 2009).

During the 2008 ELC surveys, six "Wetland Sparrows" were recorded (species not specified) in wetland (four) and kalmia lichen/heathland (two) habitats in this region.

Limiting Factors

Limiting factors for Wetland Sparrows include habitat loss, flooding, severe weather, parasites, competition for food and space, predation by dogs, cats, birds of prey and nest-predation by rodents (Mowbray 1997; Arcese et al. 2002). Excessive open water may be limiting for Savannah Sparrow (Ehrlich et al. 1988).

3.3 Birds of Prey

The term bird of prey is used to refer, literally, to birds that hunt and prey upon other animals. Generally, the term is reserved for birds that capture prey that are large in proportion to their own size – including reptiles, mammals, other birds, fish and amphibians – using large talons (versus bills) adapted to capture and kill such large prey (Burton 1998). Hawks, eagles, vultures, falcons and allies and owls are all considered birds of prey (Burton 1998). Hawks, eagles, vultures and falcons and their allies (day-active birds of prey) are grouped in the order Falconiformes, while owls, that are generally nocturnal, are grouped in the order Strigiformes (Burton 1998).

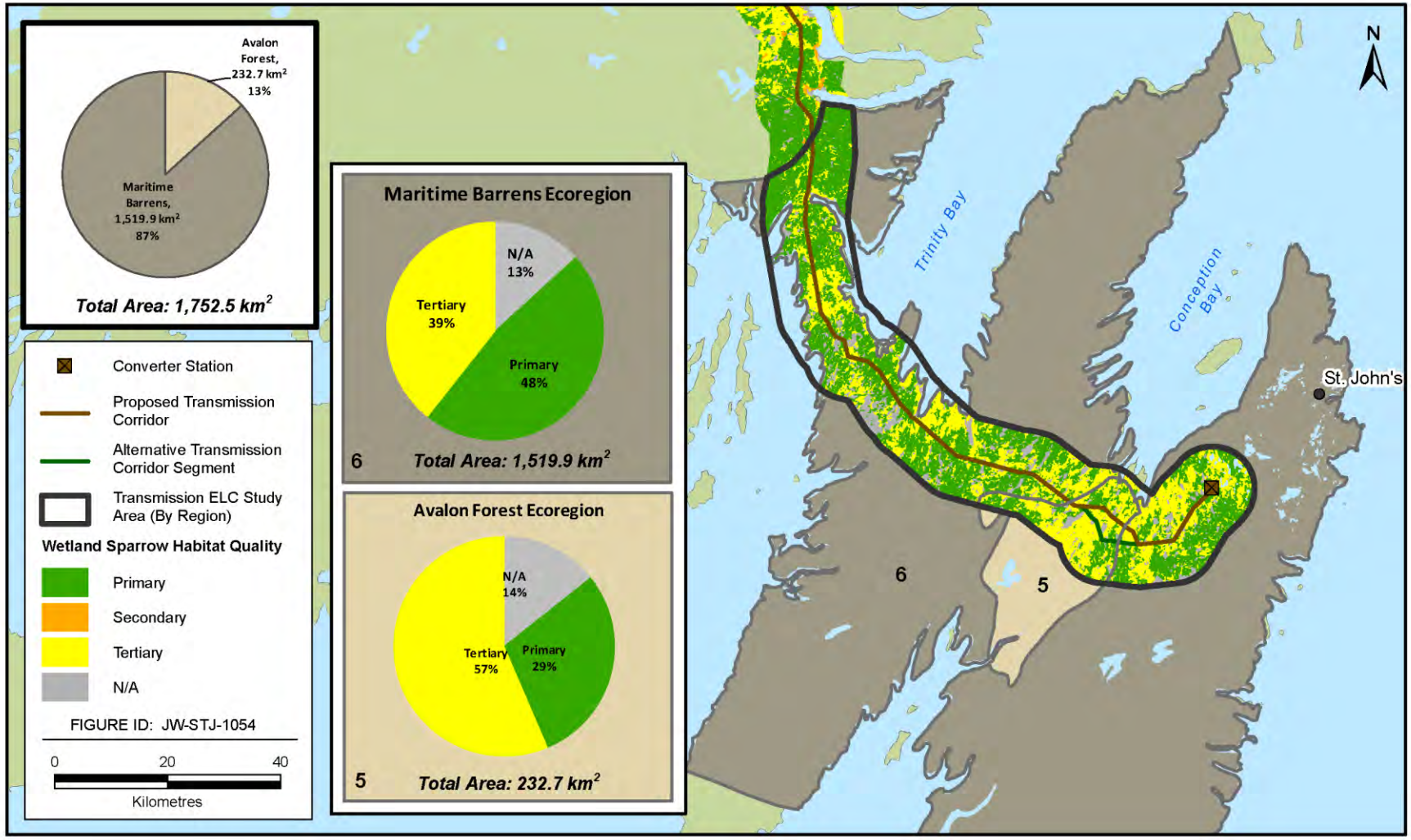
3.3.1 Regional Overviews

The following provides a general overview of the presence, abundance and distribution of birds of prey (Falconiformes and Strigiformes) in various geographic regions that comprise the Study Area.

3.3.1.1 Lower Churchill River and Lake Melville

Birds of prey that have been recorded along the Churchill River and Lake Melville areas include Northern Goshawk (*Accipiter gentilis*), American Kestrel (*Falco sparverius*), Merlin (*Falco columbarius*), Sharp-shinned Hawk (*Accipiter striatus*), Rough-legged Hawk (*Buteo lagopus*), Gyrfalcon (*Falco rusticolus*), Peregrine Falcon (Todd 1963; Northland Associates Limited 1980; DND 1994; Jacques Whitford 1996b, 1999a; AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999; LGL Limited 2008; Minaskuat Inc. 2008b) and nesting Osprey, Northern Harrier (*Circus cyaneus*), Golden Eagle, Bald Eagle and Red-tailed Hawk (*Buteo jamaicensis*) (Jacques Whitford 1999a). Todd (1963) described Osprey as a regular breeder along the lower Churchill River and more widely distributed than other species he had observed. Rough-legged Hawks are also relatively common breeders in the central Labrador region in general, while species such as Golden Eagle and Gyrfalcon are less common (LeDrew, Fudge and Associates 1991a).

Figure 3-20 Wetland Sparrows Habitat Quality: Avalon Peninsula



Owl species that are known to occur in central Labrador are Great-horned Owl (*Bubo virginianus*), Northern Hawk Owl (*Surnia ulula*), Snowy Owl (*Bubo scandiacus*), Short-eared Owl and Boreal Owl (*Aegolius funereus*), although species such as Snowy Owl would generally breed north of the Study Area (DND 1994).

The following points summarize relevant findings of studies conducted in this region of the Study Area:

- Two active Bald Eagle nests and 39 active Osprey nests were located in the Churchill River valley and Gull Island to Churchill Falls transmission corridor during 1998 surveys (Jacques Whitford 1999a). In terms of reproductive success across sampled Ecoregions in central Labrador, the Churchill River valley and existing transmission corridor exhibited above average reproductive success, with artificial platform nests producing a significantly greater number of young than natural platforms.
- A total of 16 active Osprey nests, four active Bald Eagle nests and two active Golden Eagle nests were identified along the lower Churchill River valley and its tributaries, including the proposed transmission lines between Muskrat Falls and Churchill Falls, in 2006. Osprey nesting activity (34.0 percent), success (56.3 percent) and productivity (0.81 young/active nest) were relatively low compared to other years in the Churchill River valley.
- Low densities of Bald and Golden Eagle are typical of this region of Labrador and may be related to prey availability and/or the availability of suitable nest sites (Minaskuat Inc. 2008b).
- Incidental birds of prey observations along the Churchill River during 1989 waterfowl surveys include Red-tailed Hawk, Osprey, Bald Eagle, Northern Harrier, Short-eared Owl, Merlin, Peregrine Falcon and Great-horned Owl (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999).
- During passerine surveys in 2006 and 2007, birds of prey were occasionally reported and included Bald Eagle, Osprey and Red-tailed Hawk (Minaskuat Inc. 2008a).
- LGL Limited (2008) incidentally reported Red-tailed Hawk, Bald Eagle, Merlin and Osprey along the main stem of the Churchill River during spring staging surveys in May 2007. Ospreys were also observed along the coastline of Goose Bay and inner Lake Melville.
- During the waterfowl breeding surveys in June 2007, LGL Limited (2008) observed Osprey, Sharp-shinned Hawk, Red-tailed Hawk and Bald Eagle, between Gull Island and Churchill Falls.
- Incidental bird of prey observations during waterfowl brood surveys in August 2006 included Bald Eagle, Osprey, Red-tailed Hawk, Northern Harrier and Great-horned Owl (LGL Limited 2008).

Much of the work on birds of prey in this region has focused on Osprey, Bald Eagle and Golden Eagle. The Lower Churchill River and Lake Melville region in general support relatively large numbers of Osprey during the breeding season, as well as Rough-legged Hawk, Red-tailed Hawk and likely other species; however, information on exact numbers of these other species that breed in the region are unknown. At least 16 other species of birds of prey are found in this region, although some species, such as Golden Eagle and Bald Eagle, would be expected in relatively low densities. Other species, such as Peregrine Falcon and Snowy Owl, generally nest further north and are primarily present during migration.

3.3.1.2 Southeastern Labrador

Generally, similar species would be found in Southeastern Labrador as in the Lower Churchill River and Lake Melville region, with the exception of those species that nest further north, including Golden Eagle, Gyrfalcon and Peregrine Falcon (Jacques Whitford 1996b, 2003c). Confirmed species in Southeastern Labrador include

Osprey, Bald Eagle, Northern Goshawk, Red-tailed Hawk, Northern Harrier, Merlin, American Kestrel, Great-horned Owl, Short-eared Owl and Boreal Owl (Jacques Whitford 2003c).

The following points summarize relevant findings of studies conducted in this region of the Study Area:

- Five active Osprey nests were found along the proposed transmission corridor from Gull Island to Soldiers Pond, with three of these occurring in the Southeastern Labrador region (Jacques Whitford 1999a). Two of the three were successful in producing young.
- Surveys of birds of prey in 1999 identified Rough-legged Hawk as "numerous" in the Southern Labrador portion of the Study Area (Jacques Whitford 1999a). There were 10 observations of this species, with one active (successful) nest identified.
- Other bird of prey species recorded in 1999 included Red-tailed Hawk, Merlin, Northern Hawk Owl and Short-eared Owl, with no associated nest or young (Jacques Whitford 1999a).
- During surveys in 1989, Osprey, Red-tailed Hawk, Merlin, and Northern Harrier were incidentally recorded in the Study Area (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999).
- Osprey was the most abundant bird of prey species recorded in 1998, with 10 active nests located, in addition to several individual or pairs of Osprey (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999).
- Jacques Whitford (2003c) similarly found Osprey in relatively high abundance in this region (33 of 35 bird of prey nests identified along the proposed Trans Labrador Highway route were Osprey).
- Other birds of prey species identified along the Trans Labrador Highway in Southeastern Labrador included Rough-legged Hawk, Short-eared Owl, Red-tailed Hawk, Northern Goshawk, Merlin and Bald Eagle (Jacques Whitford 1999a). Two active Rough-legged Hawk nests were identified and all other observations were of flying individuals with no associated nest.

Species diversity in Southeastern Labrador is, in general, similar to that of the Lower Churchill River and Lake Melville region, with the exception of Golden Eagle, Peregrine Falcon, Gyrfalcon and Snowy Owl that would typically be found further north. As in the central area, Osprey was relatively abundant and well studied in Southeastern Labrador. Other species that are similarly common include Rough-legged Hawk and Red-tailed Hawk. As well, observations of Short-eared Owl in this region were more common compared to observations elsewhere in Labrador, although overall numbers were low throughout the Labrador portion of the Study Area.

3.3.1.3 Island of Newfoundland

Birds of prey on the Island of Newfoundland include Osprey, Bald Eagle, Northern Harrier, Sharp-shinned Hawk, Northern Goshawk, Rough-legged Hawk, American Kestrel, Merlin and Gyrfalcon (Montevecchi 1993; Whitaker et al. 1996; Warkentin and Newton 2009). While Osprey are considered the most common of these, most species nest on and are widely distributed across the Island (Warkentin and Newton 2009). The exceptions to this are American Kestrel and Gyrfalcon that are considered very uncommon, the latter of which generally breeds further to the north (Warkentin and Newton 2009). Species of owls that breed on the Island of Newfoundland are Great-horned Owl, Northern Hawk Owl, Short-eared Owl and Boreal Owl (Warkentin and Newton 2009). All species are found throughout the Island; however, Northern Hawk Owl show a preference for colder, more northern areas and are considered relatively uncommon in the province (Warkentin and Newton 2009). The Snowy Owl is also found on the Island, although primarily during migration to more northern areas (Warkentin and Newton 2009).

Relevant observations from environmental field surveys in support of this Project include:

- American Kestrel, Bald Eagle and Osprey were the only three species of birds of prey documented during surveys along the proposed transmission corridor on the Island in 1998 (Jacques Whitford 1999a).
- Two active Osprey nests were identified along the proposed transmission line and both were successful in rearing young (Jacques Whitford 1999a).
- Along the proposed transmission corridor, AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) incidentally recorded Osprey, Great-horned Owl, Bald Eagle and Merlin during the waterfowl breeding surveys in June 1998.

In general, there are at least 12 bird of prey species that breed on the Island, though some, such as Northern Hawk Owl, would be relatively uncommon. As in Labrador, the Osprey is considered to be relatively abundant compared to other species on the Island. However, numbers of Osprey nesting on the Island are much lower than that of Labrador, suggesting that although other birds of prey species may be widely distributed, they are likely present in comparably low numbers.

3.3.2 Key and Representative Species of Birds of Prey

Key species of birds of prey identified were Osprey, Bald Eagle and Short-eared Owl. Osprey and Bald Eagle are both species at the top of the food chain and would therefore be an indicator of the status of lower trophic levels in the Study Area. These large birds of prey also have specific habitat requirements based on small-scale localized biophysical parameters. Short-eared Owl is listed as *Vulnerable* under *NLESA* and of Special Concern under *SARA*.

3.3.2.1 Osprey

Ospreys breed across North America from Alaska in the west to Labrador in the east, and extending into parts of the United States, particularly along the west coast (Poole et al. 2002). Throughout this range, they generally nest in trees (Poole et al. 2002), but are known to nest on large rocks within suitable waterbodies (Minaskuat Inc. 2008b). The majority of Ospreys are migratory (the exception being the southernmost populations) and winter in rain-forest rivers and seacoasts and lakes in Central and South America (Poole et al. 2002). Shallow waters are particularly favored for foraging, as Ospreys access only approximately the top metre of water as they dive feet first to catch prey (Poole et al. 2002).

Primary Sources of Information

Surveys were conducted along the Study Area in June and July of 1998, dedicated to Osprey (and Bald Eagle), in support of the lower Churchill River Power Project (Jacques Whitford 1999a). Observations of Osprey were also noted during ELC field surveys in support of the Project's EA in 2008.

Outside of the Study Area, aerial birds of prey surveys were carried out in 2006 for the DND and Nalcor Energy, as part of the environmental baseline work for the Lower Churchill Hydroelectric Generation Project (Minaskuat Inc. 2008b). Additional sources of information include an extensive, multi-year (1991 to 2007) study in central Labrador to document potential interactions between Osprey (and other birds of prey) and low-level flying activities (e.g., Jacques Whitford 1992a, 1992b, 1994a, 1994b, 1995a, 1996a, 1996b, 1997a, 1997c, 1998b, 1999b, 1999c, 2001a, 2001b; Trimper et al. 1998; Minaskuat Limited Partnership 2003, 2004b, 2004c, 2005b,

2008). A long-term monitoring program has also been in place since 1997 to allow monitoring of Osprey activity along existing transmission facilities in Labrador. On the Island of Newfoundland, Gosse and Montevecchi (2001) investigated the relative abundance and habitat associations of forest birds of prey, including Osprey.

In addition to these resources, Poole et al. (2002) provide a detailed account of this species in the Birds of North America series.

Existing Conditions and Status

While population numbers declined in the middle of the last century, conservation efforts have allowed for population recovery, and osprey populations in the boreal forest and the Atlantic provinces are reportedly doing well (CWS 2007a).

Habitat Association and Distribution in the Study Area

The species is tree nesting, preferring to nest and hunt near large reservoirs and lakes (with shallow water components) in several habitat types (Poole et al. 2002). Most nest on high structures, but some will also nest on large rock formations (Minaskuat Inc. 2008b). Trees for nesting can be of any species, but are generally higher than surrounding vegetation, allowing for a clear sightline over the nearby surroundings. Mixed white spruce forests are particularly favoured, especially when adjacent to rivers or lakes (Wetmore and Gillespie 1976; Jacques Whitford 1997c).

Within Labrador, Osprey tend to nest within 3 km from a waterbody (average of 435 m), at the top of dominant or co-dominant white or black spruce, and adjacent to smaller tributary streams or islands (Jacques Whitford 1995a). Nests are located 1 to 3 m from the tops of trees, in trees with an open aspect for easy access (Jacques Whitford 1999a). Artificial structures, such as transmission towers, are also used, where available.

Habitat suitability is different on the Island, where Ospreys tend to nest on the coast, where shallow bays provide abundant, easily seen groundfish (J. Brazil pers. comm., cited in Jacques Whitford 1999a). Goose and Montevecchi (2001) associated adult Osprey with young second growth and uncut old-growth balsam fir habitats near large waterbodies in western Newfoundland.

At the scale of this evaluation, important micro-habitat features, such as the presence of a suitable nest site and access to open water with available fish, are not distinguishable (Nalcor Energy 2009a). However, intensive studies since the early 1990s, particularly for Labrador, have resulted in an extensive inventory of nest locations that can provide insight on specific areas of primary habitat (Jacques Whitford 1992a, 1992b, 1994a, 1994b, 1995a, 1996a, 1996b, 1997a, 1997c, 1998b, 1999b, 1999c, 2001a, 2001b; Trimper et al. 1998; Minaskuat Limited Partnership 2003, 2004b, 2004c, 2005b, 2008; Minaskuat Inc. 2008b).

Lower Churchill River and Lake Melville and Southeastern Labrador

Earlier studies for the Lower Churchill Development Project in 1979 found Osprey to be moderately common along the Churchill River, with a total of nine active nests detected between Churchill Falls and Gull Rapids (Northland Associates Limited 1980). Approximately 20 years later, surveys for the Churchill River Power Project recorded 39 nests on artificial structures (i.e., transmission poles), 21 of which were potentially active (Jacques Whitford 1999a). Along the portion of the Study Area from Gull Island to Soldiers Pond, a total of 20 nests were identified, of which 17 were in Southeastern Labrador (Jacques Whitford 1999a).

Outside of the Study Area, up to 276 Osprey nests have been identified through the long-term monitoring programs associated with low-level military training programs in Labrador (1991 to 2007) (Jacques Whitford 1999c). An assessment of Osprey nest density and reproductive success by Ecoregion was carried out (Table 3-13) and indicated densities within the Low Subarctic Forest (Mecatina River) and Eagle River Plateau (Mecatina Plateau) Ecoregions were lowest (Jacques Whitford 1999c). Densities were highest in the Mid Boreal Forest (Paradise River) Ecoregion, although this Ecoregion constitutes only a small portion of this Project's Study Area.

Table 3-13 Osprey Nest Density and Reproductive Success by Ecoregion, 1998

Ecoregion	Area of Ecoregion (km^2)	Active/ Occupied Nests	Density per 100 km^2	Successful nests	Density per 100 km^2	Young per Active/Occupied Nest
Eagle River Plateau	9,487	60	0.632	44	0.464	1.64
Mid-Boreal Forest (Paradise River)	632	9	1.424	7	1.118	1.78
High Boreal Forest (Lake Melville)	9,539	26	0.273	19	0.199	1.69
Low Subarctic Forest	45,316	76	0.168	62	0.137	1.76
Total/Average	103,632	234	0.530	177	0.41	1.66

Notes:
1. From Jacques Whitford 1999c.
2. Ecoregions provided above are only those that overlap the Study Area under consideration for the *Avifauna Component Study*. A full list of values for Labrador regions examined in 1998 can be found in Jacques Whitford 1999c.

As of 2008, 159 active nesting sites were known by the Study Team within the lower Churchill River watershed and 26 along transmission line infrastructure (2006 numbers only) (Minaskuat Inc. 2008b). A separate study identified a total of 107 Osprey nests on hydroelectric structures in Labrador were identified; most were on the 230 kV line between Labrador City and Churchill Falls.

For Osprey nesting in central Labrador, it has been demonstrated that considerable variability in nest activity, nest success and productivity exists between years, whereby declines in overall reproductive success are observed approximately every 3 to 4 years, followed by 2 to 3 years of increased reproductive success, possibly linked to small mammal cycles in the region (Minaskuat Limited Partnership 2008).

Island of Newfoundland

The Island portion the province is considered to be of below-average quality for Osprey habitat (Jacques Whitford 1999a). Surveys in support of the Project in June and early July 1998 found a total of 20 nests in the Study Area, of which only three were on the Island (Jacques Whitford 1999a). Therefore, habitat quality mapping was not conducted for the Island for this species.

During passerine surveys in the Study Area in 2008, only one Osprey was recorded, in wetland habitat on the Northern Peninsula. One Osprey was also noted during the 2008 ELC surveys, flying over cutover habitat in the Central and Eastern Newfoundland region. Much of the proposed transmission corridor in central Newfoundland lies within open bog and barren areas or scrub forests that generally do not provide suitable nesting trees (Jacques Whitford 1999a).

Jacques Whitford (1999a) was fundamental to supplementing knowledge on birds of prey in Newfoundland, as information on their distribution in the general area crossed by the proposed transmission corridor did not exist before 1998.

Limiting Factors

In the 1970s, Osprey populations throughout North America experienced severe declines due to widespread use of pesticides, such as DDT. Bioaccumulation of these chemicals in the food chain resulted in reduced reproductive success, as adults were not able to breed successfully with hatch success greatly reduced due to effects on shell formation of young. Alternative pest control practices in the last 30 years has allowed for recovery of the species throughout its range.

Hunting pressure (Ewins and Houston 1992) and fish abundance and availability (Jacques Whitford 1999a) are critical factors in reproductive success. Regional crashes in small mammal and bird populations and inclement weather also affect productivity and influence population dynamics (Chubbs and Trimper 1998). The species may be on a 4 to 5 year cycle in terms of productivity (reproductive output per active nest); however, the number of young per successful nest appears relatively constant over time (Minaskuat Limited Partnership 2008).

3.3.2.2 Bald Eagle

Bald Eagles are found breeding in all provinces and territories in Canada, and generally winter within the lower 48 states, coastal Canada and Alaska (Millsap 1986, cited in Buehler 2000). Some individuals are year-round residents in areas as far north as Newfoundland and southern Alaska (Buehler 2000).

These large birds of prey are associated with ocean, coastal and freshwater habitats, where they feed primarily on live fish, as well as smaller birds, mammals and carrion. When available, Bald Eagle will scavenge prey items or pirate food from other species, capturing its own prey as a last resort (Buehler 2000).

Primary Sources of Information

Surveys were conducted along the transmission corridor and lower Churchill River valley in June and July of 1998, dedicated to Bald Eagle (and Osprey) (Jacques Whitford 1999a). Additional aerial surveys for birds of prey were carried out in 2006 for DND and for Nalcor Energy as part of the environmental baseline work for the Lower Churchill River Hydroelectric Generation Project (Minaskuat Inc. 2008b). Information on this species in the Churchill River valley is also available from Northland Associates Ltd. (1980).

Other sources of information include an extensive, multi-year (1991 to 2007) study in central Labrador to document potential interactions between birds of prey (primarily Osprey but also Bald Eagle and other birds of prey) and low-level flying (Jacques Whitford 1992a, 1992b, 1994a, 1994b, 1995a, 1996a, 1996b, 1997a, 1997c, 1998b, 1999b, 1999c, 2001a, 2001b; Trimper et al. 1998; Minaskuat Limited Partnership 2003, 2004b, 2004c, 2005b, 2008). Dedicated studies for Bald Eagle (Jacques Whitford 1999d, 2000b, 2006a, 2007, 2008b, 2009; Minaskuat Limited Partnership 2005c) were also conducted as part of this long-term monitoring program. On the Island of Newfoundland, locations of Bald Eagle nesting sites in Forest Management District 1 on the Avalon Peninsula are available through the Department of Forest Resources and Agrifoods (2002).

In addition to these sources, Buehler (2000) provides a detailed account of this species in the Birds of North America series.

Existing Conditions and Status

Populations of Bald Eagles have fluctuated greatly over the past two centuries (Buehler 2000). Since 1980, populations have increased dramatically, due to decreased levels of DDT and human persecution (Buehler 2000). The recovery of this species is considered one of the continent's conservation success stories (Warkentin and Newton 2009).

Habitat Association and Distribution in the Study Area

Bald Eagles typically nest in forested habitats, particularly mature and old-growth forests, that are generally close (<2 km) to large bodies of water (Buehler 2000). Within Labrador, Bald Eagle tend to nest in trees adjacent to smaller tributary streams, and in particular, large eastern larch (Larix laricina) or white birch (*Betula papyrifera*) (Minaskuat Limited Partnership 2005c). There are also several Bald Eagle nests on large rocks in the region, particularly east of the Smallwood Reservoir (Minaskuat Limited Partnership 2005c). In Newfoundland, nests are located high in deciduous or coniferous trees and occasionally on cliffs, along the seacoast or in forested areas near lakes and ponds (Warkentin and Newton 2009).

It is difficult to assign a rating for habitat quality for Bald Eagle at the scale necessary for this Project, as their habitat requirements are based on small-scale localized biophysical parameters, similar to Osprey. However, intensive studies since the early 1990s, particularly for Labrador, has resulted in an inventory of previously active nest locations that can provide insight on specific areas of primary habitat (Jacques Whitford 1992a, 1992b, 1994a, 1994b, 1995a, 1996a, 1996b, 1997a, 1997c, 1998b, 1999b, 1999c, 1999d, 2001a, 2001b, 2000b, 2000c, 2006a, 2007, 2008b, 2009; Trimper et al. 1998; Minaskuat Limited Partnership 2003, 2004b, 2005b, 2005c, 2006b, 2008; Minaskuat Inc. 2008b).

Central and Southeastern Labrador

Bald Eagle nests were not observed during surveys in the Study Area during surveys in 1998 (Jacques Whitford 1999a), although the breeding range for this species includes the area south of the treeline in Labrador (Todd 1963). One immature Bald Eagle was observed flying near the Trans Labrador Highway, east of the Study Area, in 1998 (Jacques Whitford 1998c).

Outside of the Study Area, 36 known Bald Eagle nest sites were surveyed in central Labrador in 2005 (Minaskuat Limited Partnership 2005c). Nine (25.0 percent) of these sites were active, eight were empty (22.2 percent), two (5.6 percent) were occupied by another species, two (5.6 percent) were collapsed, and no evidence of a nest structure could be located at 15 (41.7 percent) locations. Prior to this, the inventory of known Bald Eagle territories in 1998 identified 16 (48.4 percent) active nests of 33 investigated (Jacques Whitford 1999a).

Island of Newfoundland

Bald Eagle nests were not observed during surveys for birds of prey in the Study Area in 1998 (Jacques Whitford 1999a) or during passerine surveys in 2008. However, Bald Eagles are year-round residents on the Island and are found along many Newfoundland coasts and forested areas with lakes and ponds (Warkentin and Newton 2009). Relatively high numbers are observed in parts of Placentia Bay and Trinity Bay (Newfoundland and Labrador Tourism 2009a). On the Avalon Peninsula, relatively few nests are located inland (Department of Forest Resources and Agrifoods 2002).

Limiting Factors

Sources of mortality for these species include vehicle collisions, collisions with power lines or other structures, electrocution, lead poisoning, pesticide use, illegal shooting, egg-collecting and loss of habitat (Buehler 2000). Human disturbance at nesting sites (e.g., recreational and research activities) has also been shown to influence these species, with strongest responses involving their permanent displacement from otherwise suitable habitat (Buehler 2000 and references therein).

3.3.2.3 Short-eared Owl

Short-eared Owls are one of the most wildly distributed owls, with a range that encompasses almost the entirety of North America (Wiggins et al. 2006). This species is generally associated with open habitats, where they nest on the ground in marshes, grasslands and tundra throughout much of North America and Eurasia (Wiggins et al. 2006). They breed in South America, Iceland, the Hawaiian chain and the Galápagos (Wiggins et al. 2006). While many individuals remain year-round in portions of their range, Short-eared Owls in the province (and Canada in general) migrate in the fall to wintering grounds further south (Wiggins et al. 2006).

The Short-eared Owl is listed as a Species of Special Concern under *SARA* and as *Vulnerable* under the *NLESA*. Because this species tracks irruptions of their small mammal prey, habitat associations and population dynamics are poorly understood (Schmelzer 2005).

Primary Sources of Information

A management plan for Short-eared Owl was prepared in 2005 (Schmelzer 2005) that provides information on this species in Newfoundland and Labrador, based primarily on historical records and incidental sightings. Wiggins et al. (2006) provide a detailed account of this species in the Birds of North America series.

Existing Conditions and Status

Populations of Short-eared Owl have declined across Canada, though are believed to have been relatively stable in Newfoundland and Labrador over the past century (Schmelzer 2005). Exact numbers of Short-eared Owl in the province are unknown but are believed to be at a relatively low density (Inland Fish and Wildlife Division undated).

Habitat Association and Distribution in the Study Area

In Newfoundland and Labrador, Short-eared Owls are associated with tundra, coastal barrens, sand dunes and field and bog habitats (Schmelzer 2005). Throughout its range, this species prefers open fields for feeding and nesting (Warkentin and Newton 2009). They are nomadic, and wander throughout their range looking for prey consisting primarily of small mammals, insects and other birds (Schmelzer 2005). Nests are flattened depressions in the ground, typically hidden under low shrubs, reeds and grasses near water.

Table 3-14 summarizes primary, secondary and tertiary breeding habitat quality for Short-eared Owl. Primary habitat for this species includes alpine vegetated, kalmia lichen/heathland and lichen heathland habitats. Combined, priy habitat occupies 184 km^2 (less than 2 percent) of the Study Area in Newfoundland, and 352 km^2 (5 percent) in Labrador. Secondary habitat consists of open conifer forest, rocky barrens, scrub/heathland/wetland and wetland habitats (Table 3-14). Remaining habitats in Table 3-14 were classified as tertiary, based on limited foraging, nesting, protection, resting or feeding opportunities.

Table 3-14 ELC Habitat Types and Relative Quality for Short-eared Owl

ELC Habitat Type	Breeding Habitat Quality	Notes
Alpine Vegetated	primary	Open areas are preferred for feeding and nesting.
Black Spruce and Lichen Forest	tertiary	
Burn	tertiary	
Conifer Forest	tertiary	
Conifer Scrub	tertiary	
Cutover	tertiary	
Exposed Bedrock	tertiary	
Hardwood Forest	tertiary	
Kalmia Lichen/Heathland	primary	Open areas are preferred for feeding and nesting.
Lichen Heathland	primary	Open areas are preferred for feeding and nesting.
Mixedwood Forest	tertiary	
Open Conifer Forest	secondary	
Rocky Barrens	secondary	
Scrub/Heathland/Wetland	secondary	
Wetland	secondary	

Notes:
1. Habitat types are described in Table 2-6.
2. Habitat Quality is described in Section 2.2.4.

Lower Churchill River and Lake Melville

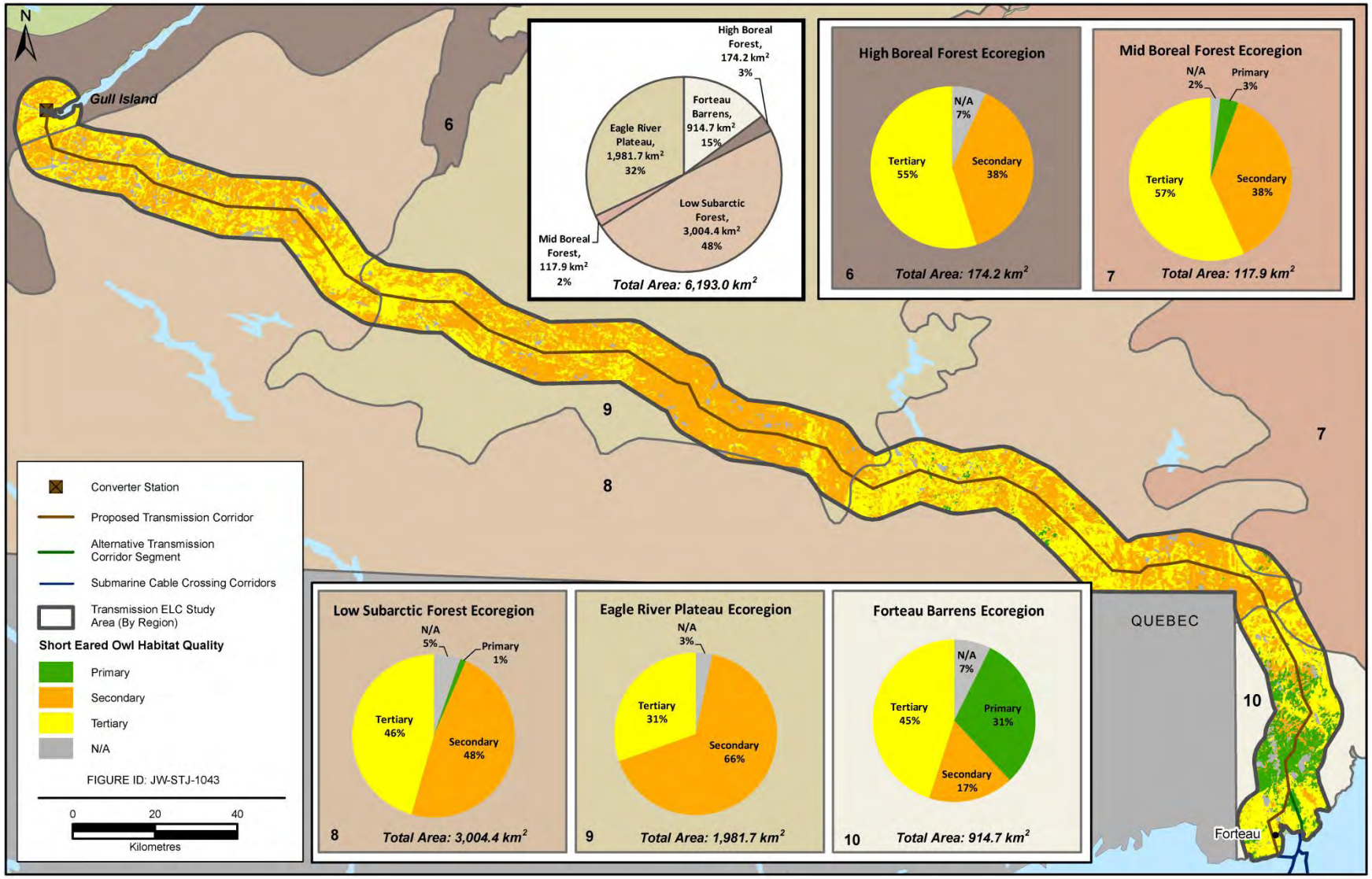
Schmelzer (2005) reported this species in this region, with multiple observations near the Goose River. AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) incidentally reported this species during waterfowl surveys along the Churchill River in 1998.

Southeastern Labrador

In this geographic region, primary habitat for this species is mainly found in the Forteau Barrens Ecoregion (Figure 3-21) and Short-eared Owls have been reported in habitats particularly abundant along coastal barrens in Labrador, as well as above the treeline and in central and western Labrador (Schmelzer 2005). In this area, two Short-eared Owl were incidentally recorded during waterfowl surveys in the Study Area in 1998 (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999), one during birds of prey surveys in 1998 (Jacques Whitford 1999a) and two during surveys along the Trans Labrador Highway, east of the Study Area (Jacques Whitford 1998c).

Observations of this species have also been made in large bogs within Labrador's open coniferous mid-subarctic forests, which contrasts with breeding information from Ontario and Quebec, where there are few nests located inland or in the boreal forests (Schmelzer 2005). Short-eared Owls are frequently reported in the coastal barrens between L'Anse-au-Clair and Red Bay (Schmelzer 2005), within or adjacent to the Study Area.

Figure 3-21 Short-eared Owl Habitat Quality: Southeastern Labrador



On the Island, habitat potential for this species is comprised largely of secondary quality habitat, with only marginal amounts (5 percent or less) of primary habitat available per region (Figures 3-22 to 3-24). Historical records and opportunistic observations recorded in Schmelzer (2005) have the species sighted in coastal Newfoundland (west, northeast and eastern) and throughout the Avalon Peninsula. Between 2000 and 2005, there were 10 reports of sightings between January and March on the Avalon Peninsula (Schmelzer 2005), and a total of three Christmas Bird Count sightings at St. John's, Cape Race and Stephenville. Observations compiled by Schmelzer (2005) do not include the Central and Eastern Newfoundland Areas.

Limiting Factors

Severe weather, predation, hunting, collisions with vehicles and stationary objects, accidental killing by farm machinery during roosting, competition for prey with other birds of prey, changes in prey populations and habitat alterations can affect nest productivity (Schmelzer 2005). Known predators of eggs and nestlings include Great-horned Owl, Snowy Owl, Peregrine Falcon, Herring Gull, red fox (*Vulpes vulpes*) feral dogs (*Canis familiaris*), and mustelids (Schmelzer 2005).

Destruction of marshes and native grasslands, coupled with increased intensive agricultural practices and wetland drainage for development are all limiting factors. Habitat degradation on the wintering grounds can affect population dynamics, irrespective of the amount of suitable habitat available in Newfoundland and Labrador (Schmelzer 2005).

3.4 Upland Game Birds

The term "Upland Game Bird" is used to refer to non-waterfowl species that are hunted for subsistence and include species such as grouse, ptarmigan (*Lagopus sp*.) and snipe (*Gallinago gallinago*). Within the province of Newfoundland and Labrador, the main species that are hunted include Ruffed Grouse, Spruce Grouse, Willow Ptarmigan (*L. lagopus*) and Rock Ptarmigan (*L. muta*) (DEC 2009). Both species of Grouse were introduced to the Island of Newfoundland in the 1960s and 1970s (Warkentin and Newton 2009).

3.4.1 Regional Overviews

The following provides a general overview of the presence, abundance and distribution of upland game species in the Study Area. In particular, this overview addresses three main species of upland game: Ruffed Grouse; Spruce Grouse; and Willow Ptarmigan. Rock Ptarmigan are generally limited to the west coast of Newfoundland (Warkentin and Newton 2009) and on the northern shores of the Labrador Peninsula, north of the 55th parallel (Todd 1963), and thus are usually found outside the Study Area.

3.4.1.1 Lower Churchill River and Lake Melville

Ruffed Grouse, Spruce Grouse and Willow Ptarmigan occur in this geographic region (Tuck 1968; Cade and Sousa 1985; AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999; Elson et al. 2007).

Figure 3-22 Short-eared Owl Habitat Quality: Northern Peninsula

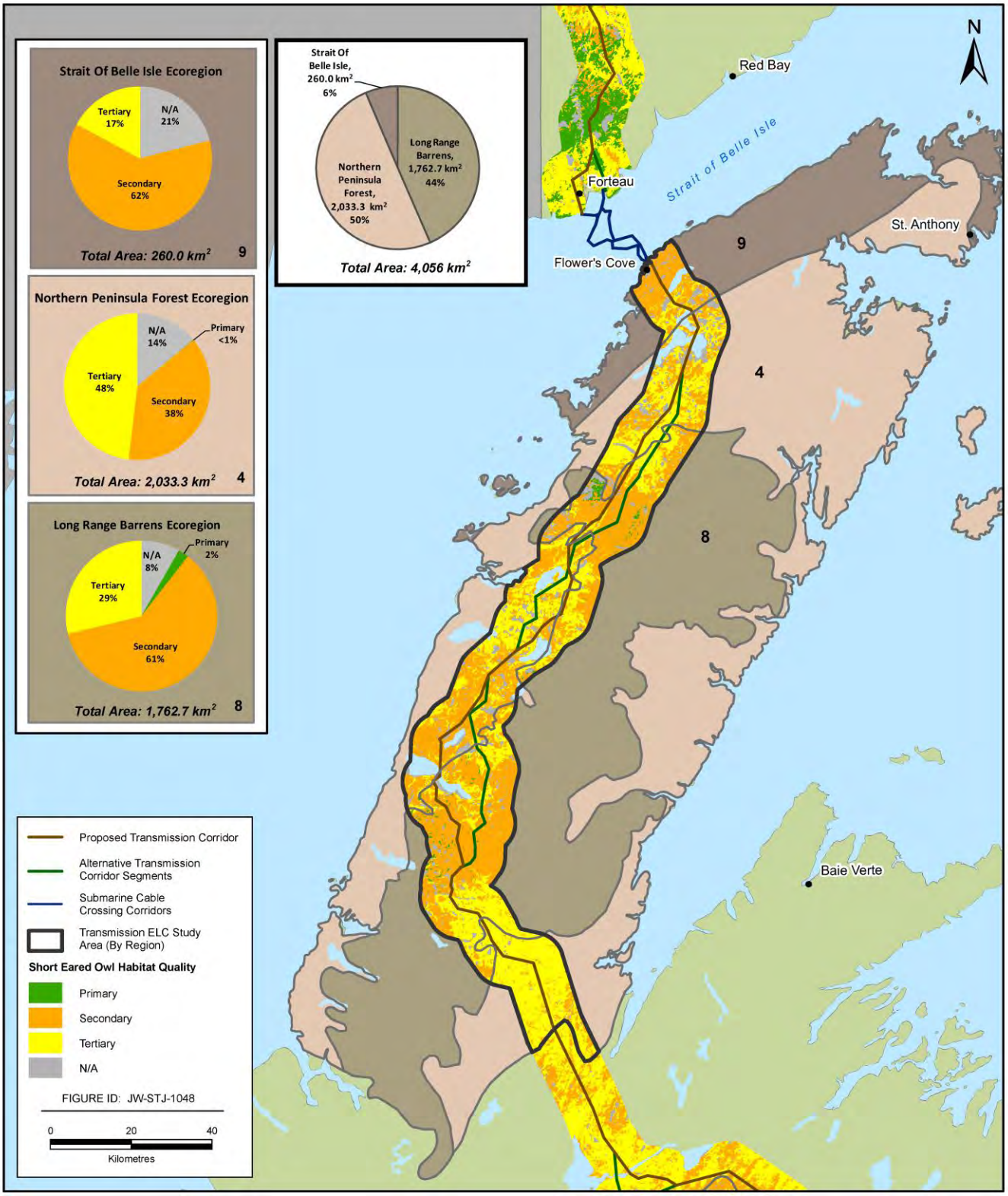


Figure 3-23 Short-eared Owl Habitat Quality: Centreal and Eastern Newfoundland

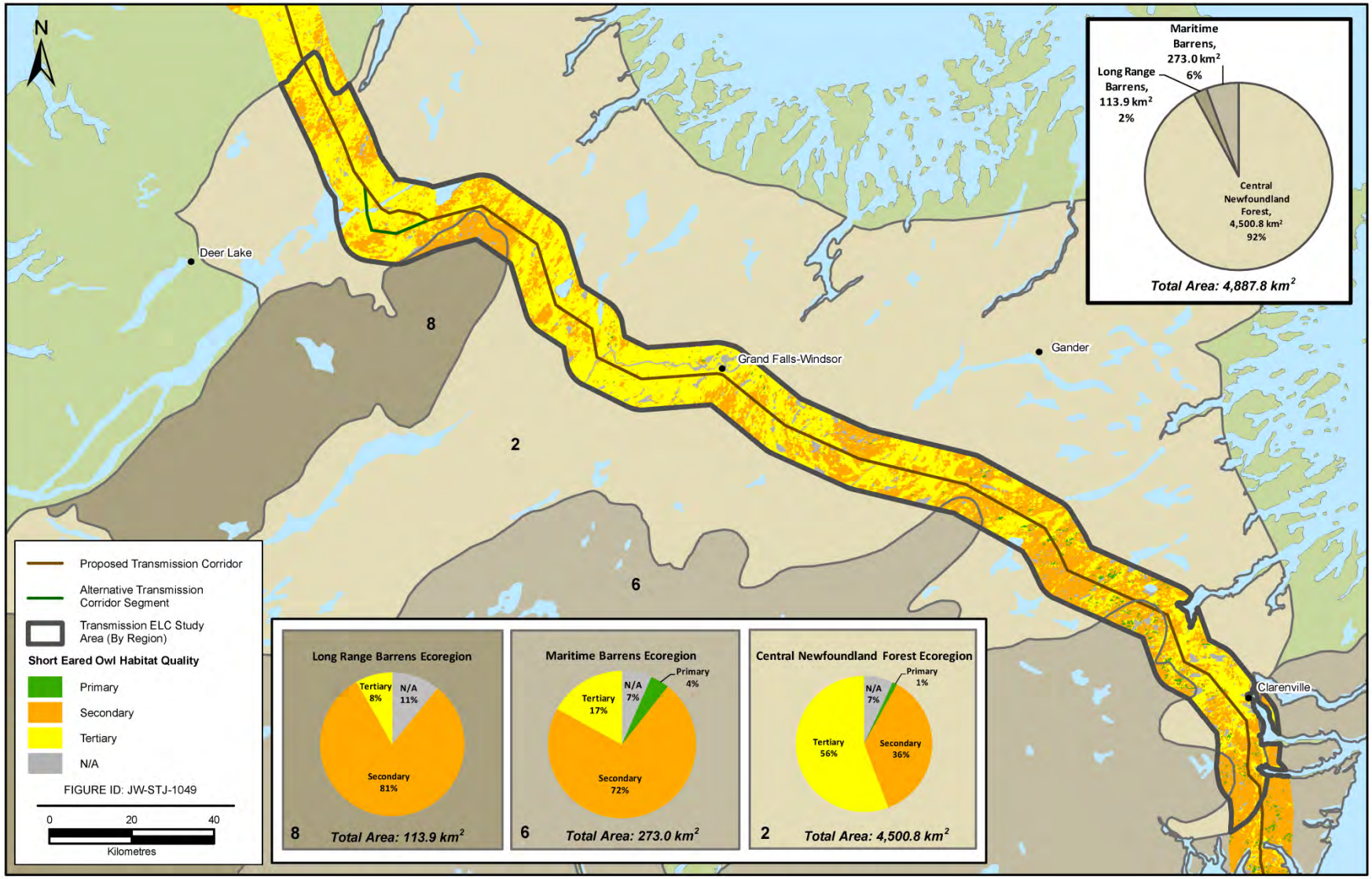
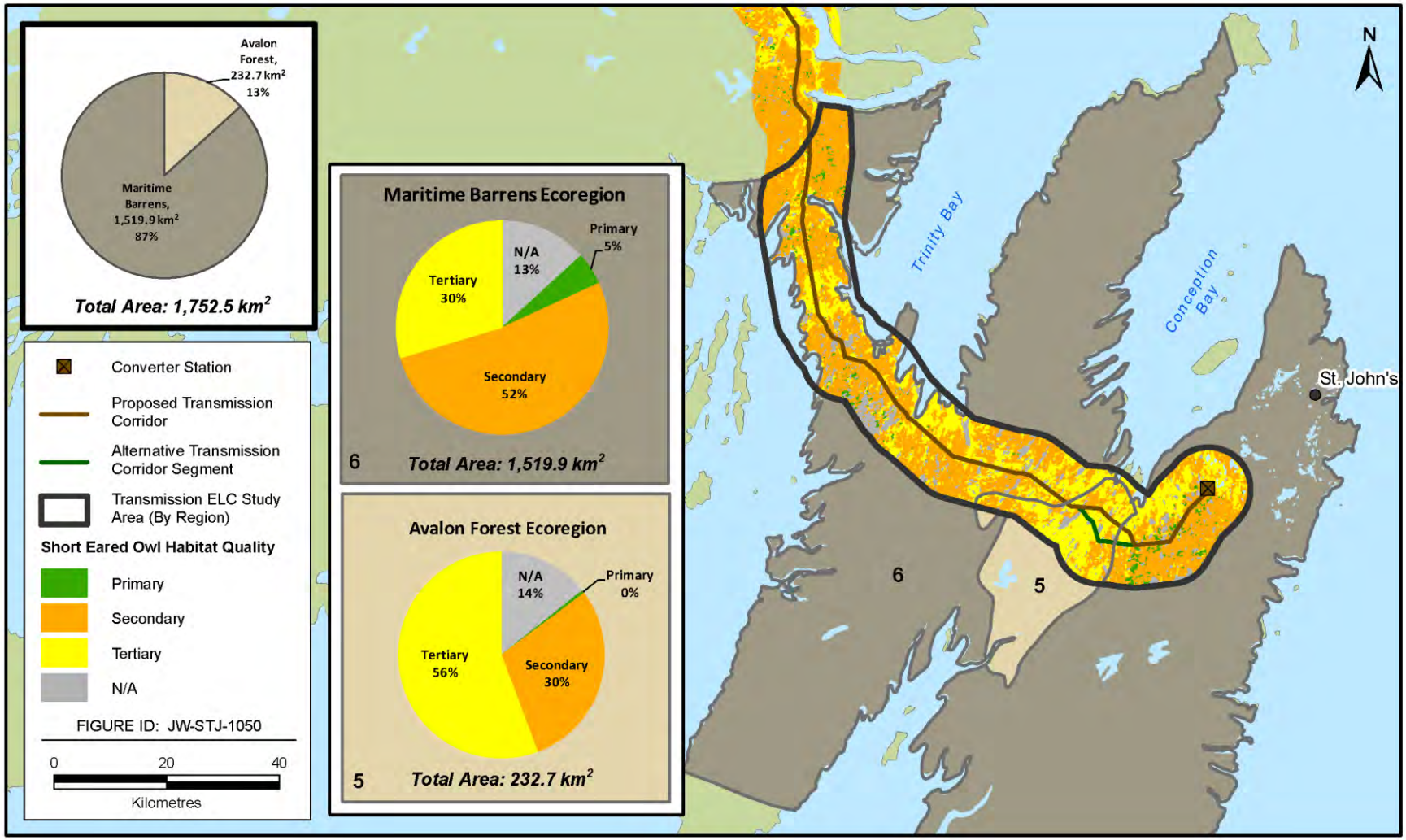


Figure 3-24 Short-eared Owl Habitat Quality: Avalon Peninsula



Of the species present in Labrador, Ruffed Grouse have the most limited distribution and likely the most specialized habitat requirements (Nalcor Energy 2009a). This species prefers early successional forests dominated by aspen (Tuck 1968), while Spruce Grouse are generally associated with more widely distributed coniferous and mixedwood forests (Godfrey 1986) and Willow Ptarmigan with willow (*Salix sp*.) (Elson et al. 2007). Todd (1963) reports one record of Rock Ptarmigan along the Churchill River during the non-breeding season, along Winokapau Lake.

Relevant results and observations from recent and past environmental baseline studies in support of this Project include:

- one Spruce Grouse observed during each of the waterfowl breeding and brood surveys in June and July of 1998 (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999); and
- three Ruffed Grouse recorded along the lower Churchill River during passerine surveys in support of the Lower Churchill Hydroelectric Generation Project during 2006-2007 (Minaskuat Inc. 2008a).

Overall, very few sightings of upland game species were recorded during surveys in this region. However, generally speaking, Spruce Grouse and Willow Ptarmigan are considered the most widely distributed species and would be found throughout the region. Ruffed Grouse occur primarily in areas of deciduous-dominated species, such as aspen.

3.4.1.2 Southeastern Labrador

Similar species of upland game birds occur in this region as in the Lower Churchill and Lake Melville region. Relevant observations from previous studies in Southeastern Labrador include:

- one Ruffed Grouse documented in the Low Subarctic Forest Ecoregion during passerine surveys in
- 2008;
- one Willow Ptarmigan recorded during each of the May and June waterfowl surveys in 1998 (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999);
- four Willow Ptarmigan incidentally recorded east of the Study Area during surveys along the Trans Labrador Highway in 1998 (Jacques Whitford 1998c); and
- both Spruce and Ruffed Grouse were detected in Southern Labrador (west of the study corridor) during the River Valley Ecosystem research in 2002 (IEMR 2003), along the Little Mecatina and St. Augustin River Valleys (west of the Study Area).

Overall, very few sightings of upland game species have been recorded during avifauna surveys in this region. Willow Ptarmigan and Spruce Grouse, in general, would be expected to occur in higher numbers compared to Ruffed Grouse, based on the habitat preferences of this species. While a relatively rare species in this area, Todd (1963) documented three records of Rock Ptarmigan on the south coast of Labrador (along the Strait of Belle Isle), within or adjacent to this Project's Study Area.

3.4.1.3 Island of Newfoundland

Ruffed Grouse, Spruce Grouse and Willow Ptarmigan are resident species on the Island of Newfoundland (Warkentin and Newton 2009). Spruce Grouse on the Island are particularly associated with coniferous forests in Central Newfoundland, where they were first introduced, but have expanded their range to include the Northern Peninsula (Warkentin and Newton 2009). Ruffed Grouse are resident throughout the Island, with the

exception of the South Coast (Warkentin and Newton 2009). Willow Ptarmigan are most common along the Maritime Barrens, near the tips of large peninsulas, and open upland sites (Warkentin and Newton 2009). During summer, they select areas with *Empetrim-Cladonia* vegetation (Bergerud and Huxter 1969). Rock Ptarmigan are restricted to high, barren rocky habitats along the south coast (Cape Ray to Fortune Bay), in the Long Range Mountains of the West Coast and on the highest plateaus of the interior uplands (Skinner and McGrath 1994). Observations for baseline studies for the Island portion of the Project found:

- grouse were rarely encountered during the 2008 passerine surveys along the transmission corridor, with only one record of a Ruffed Grouse (in the Central Newfoundland Ecoregion) reported; and
- neither species of Ptarmigan was recorded incidentally during ELC surveys in support of this Project. Ruffed Grouse, Spruce Grouse, Willow Ptarmigan and Rock Ptarmigan are found on the Island, with their distributions influenced in part by preferred habitats and where they were initially introduced (both Ruffed and Spruce Grouse were introduced in the 1960s to 1970s). The forested areas of central (and western) Newfoundland have sufficient numbers of Spruce and Ruffed Grouse to support concentrated hunting activities (Outdoor Canada 2008) and Willow Ptarmigan and Rock Ptarmigan are generally associated with the Avalon Peninsula and the South and West Coasts, respectively.

3.4.2 Key and Representative Species of Upland Game Birds

Ruffed Grouse was identified as a key species representing upland game birds. Ruffed Grouse in general have a relatively limited distribution and more specialized habitat requirements than other upland game species, being closely associated with aspen habitats that are comparatively limited in the Study Area.

3.4.2.1 Ruffed Grouse

Ruffed Grouse is the most commonly distributed game bird in North America. This species was introduced to Newfoundland beginning in the 1960s (Warkentin and Newton 2009) but is native to Labrador, where it exists within the northernmost portion of its range.

Primary Sources of Information

Incidental observations of Ruffed Grouse were noted in the Study Area during passerine and ELC-related surveys in support of this Project in 2008. Along the Churchill River, incidental observations were recorded during forest passerine surveys and general wildlife surveys in the lower Churchill River watershed in 2006 and 2007 (Minaskuat Inc. 2008a, 2008c).

Existing Conditions and Status

Baseline studies conducted as part of the Lower Churchill River Hydroelectric Generation Project identified lower densities (1 bird/km^2) compared to elsewhere throughout the range (10 birds/km^2) (Nalcor Energy 2009a). In areas with appropriate habitat in Labrador, numbers increased to 7.7 birds/km^2, suggesting that habitat availability and presence at the northernmost end of their range results in small population densities in Labrador (Nalcor Energy 2009a). They are considered common on the Island of Newfoundland (Warkentin and Newton 2009).

Habitat Association and Distribution in the Study Area

In Labrador, Ruffed Grouse are concentrated in deciduous forest, particularly aspen habitat (Nalcor Energy 2009a). Deep snow cover without a crust is critical in winter for shelter, as are small buds and flowers of deciduous groundcover for foraging. It has been estimated that appropriate habitat for Ruffed Grouse covers less than 1 percent of Labrador's land area (Northland Associates Limited 1980). The two records of this species in the Study Area in Southeastern Labrador during passerine and ELC surveys in 2008 were in hardwood and wetland habitats. The latter may contain willows and other shrubs that can provide an important supplementary food source (Nalcor Energy 2009a).

In Newfoundland, preferred habitat is identified as second-growth deciduous and mixed forests, particularly with abundant birch or aspen (Warkentin and Newton 2009). The one observation of this species in the Study Area in Newfoundland during passerine surveys in 2008 was associated with mixedwood habitat. Evidence of their presence was also documented in conifer forest habitat during ELC surveys.

Table 3-15 summarizes primary, secondary and tertiary breeding habitat quality for Ruffed Grouse. Primary hardwood forest habitat for this species occupies 9 km^2 (<1 percent) in Labrador and this habitat type was exclusive to the Labrador portion of the Study Area (Minaskuat Inc. 2009a). Secondary habitat consists of cutover, mixedwood forest, wetland and scrub/heathland/wetland habitats (Table 3-15). Remaining habitats in Table 3-15 were classified as tertiary, based on limited foraging, nesting, protection, resting or feeding opportunities.

Table 3-15 ELC Habitat Types and Relative Quality for Ruffed Grouse

ELC Habitat Type	Breeding Habitat Quality	Notes
Alpine Vegetated	tertiary	
Black Spruce and Lichen Forest	tertiary	
Burn	tertiary	
Conifer Forest	tertiary	
Conifer Scrub	tertiary	
Cutover	secondary	Refers to sites with regenerating hardwood component.
Exposed Bedrock	tertiary	
Hardwood Forest	primary	
Kalmia Lichen/Heathland	tertiary	
Lichen Heathland	tertiary	
Mixedwood Forest	secondary	
Open Conifer Forest	tertiary	
Rocky Barrens	tertiary	
Scrub/Heathland/Wetland	secondary	Willows and other shrubs can be an important supplementary food source.
Wetland	secondary	Willows and other shrubs can be an important supplementary food source.

Notes:
1. Habitat types are described in Table 2-6.
2. Habitat Quality is described in Section 2.2.4.
3. While not included in the ELC (Minaskuat Inc. 2009a), riparian habitat is considered secondary quality habitat for this species.
4. This species is present year-round in the province.

Ruffed Grouse are permanent residents in Labrador, but have a more localized distribution and are largely restricted to areas with high concentrations of hardwood forest, particularly aspen (Svoboda and Gullion 1972). Along the Churchill River, deciduous forest covers much of the area below the Minipi River (Nalcor Energy 2009a). Although present in this region, Ruffed Grouse are considered uncommon and localized, with few found upstream of Muskrat Falls (Nalcor Energy 2009a). As areas with abundant conifers are less attractive to Ruffed Grouse (Cade and Sousa 1985), the Lake Melville area would also likely support lower densities.

Southeastern Labrador

Preferred hardwood forest habitat occurs in less than 1 percent of the Study Area in Southeastern Labrador (Figure 3-25). During passerine surveys in the Study Area in 2008, one observation of Ruffed Grouse was made in wetland habitat in the Low Subarctic Forest Ecoregion. This species was also incidentally documented during ELC surveys (one record) in primary hardwood habitat in the Southeastern Labrador region of the Study Area.

Island of Newfoundland

Primary hardwood habitat does not occur in the Study Area in Newfoundland (Figures 3-26 to 3-28). However, this species is a year-round resident on most of the Island, the exception being the south coast (Warkentin and Newton 2009). Only one observation of Ruffed Grouse was recorded during passerine surveys in 2008, in mixedwood forest habitat in the Central Newfoundland Forest Ecoregion. One other Ruffed Grouse was documented in the Study Area, in conifer forest habitat, during the ELC field study.

Limiting Factors

Habitat requirements and limited mobility throughout all life stages result in very limited distribution in Labrador (Nalcor Energy 2009a). Shooting and trapping, habitat degradation, predation (primarily birds of prey) and pesticides and other contaminants have all been identified as limiting factors (Rusch et al. 2000). In addition, increased hunting pressure due to increased road access can reduce population numbers by 5 to 29 percent annually and practices such as fire control, opposition to harvesting practices (clear-cutting) and conifer management reduces the availability of early successional habitat required (Rusch et al. 2000)

3.5 Strait of Belle Isle

The following provides a summary of existing information on the presence, abundance and distribution of seabirds, shorebirds, waterfowl, passerines, birds of prey and upland game birds that stage, migrate and/or breed in the Strait of Belle Isle region of the Study Area.

3.5.1 Regional Overview

The Strait of Belle Isle is unique in the Study Area in terms of the marine and shoreline habitats in this region, as well as in terms of proposed infrastructure (i.e., submarine cable crossing). This 118 km (approximately) waterway separates the Labrador Peninsula from the Island of Newfoundland, and at its narrowest width is approximately 17 km wide (Nalcor Energy 2009b). Water currents and turbulence in the area result in an area nutrient rich waters and relatively high productivity (Nalcor Energy 2009b).

Figure 3-25 Ruffed Grouse Habitat Quality: Southeastern labrador

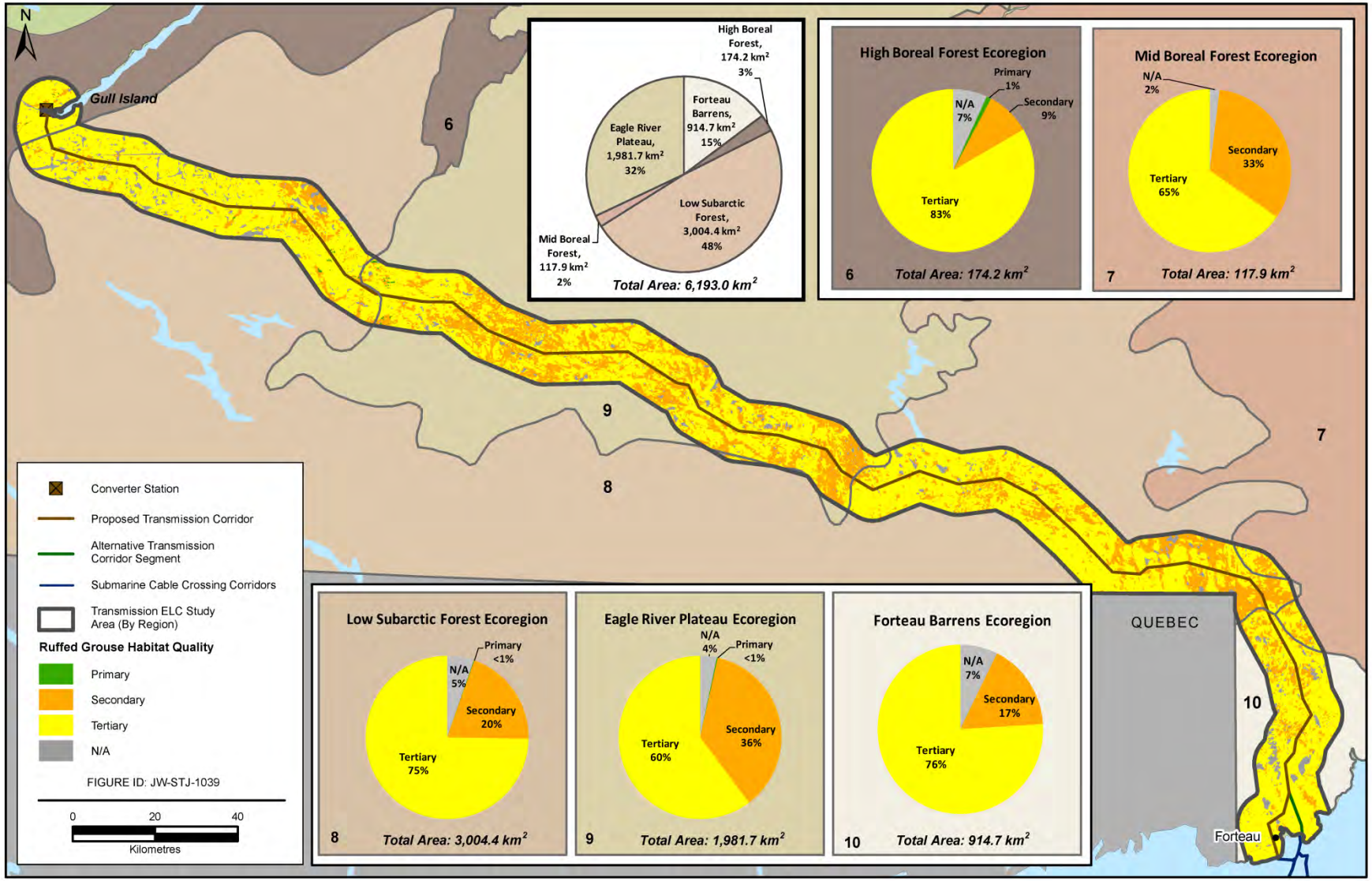


Figure 3-26 Ruffed Grouse Habitat Quality: Northern Peninsula

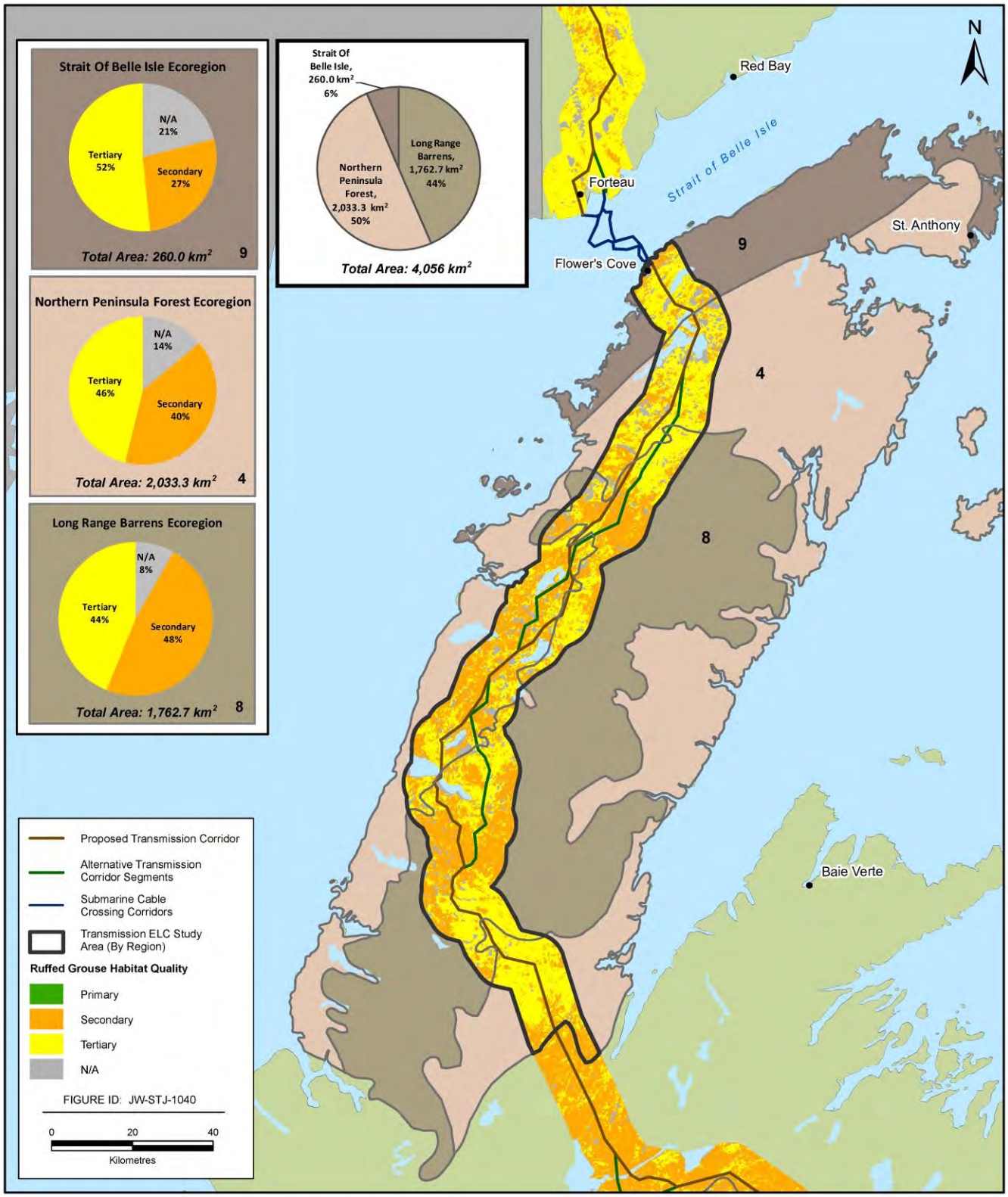


Figure 3-27 Ruffed Grouse Habitat Quality: Central and Eastern Newfoundland

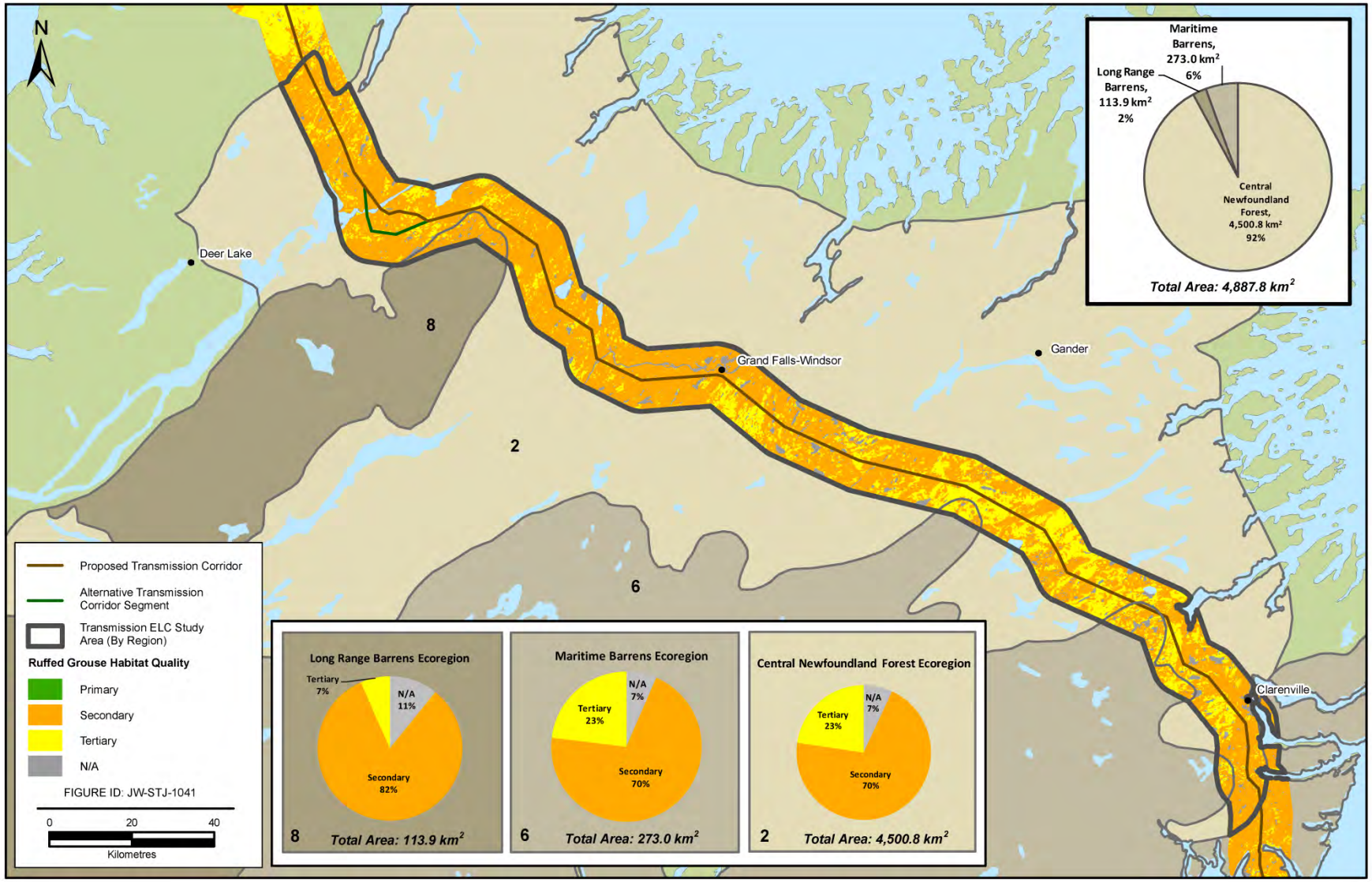
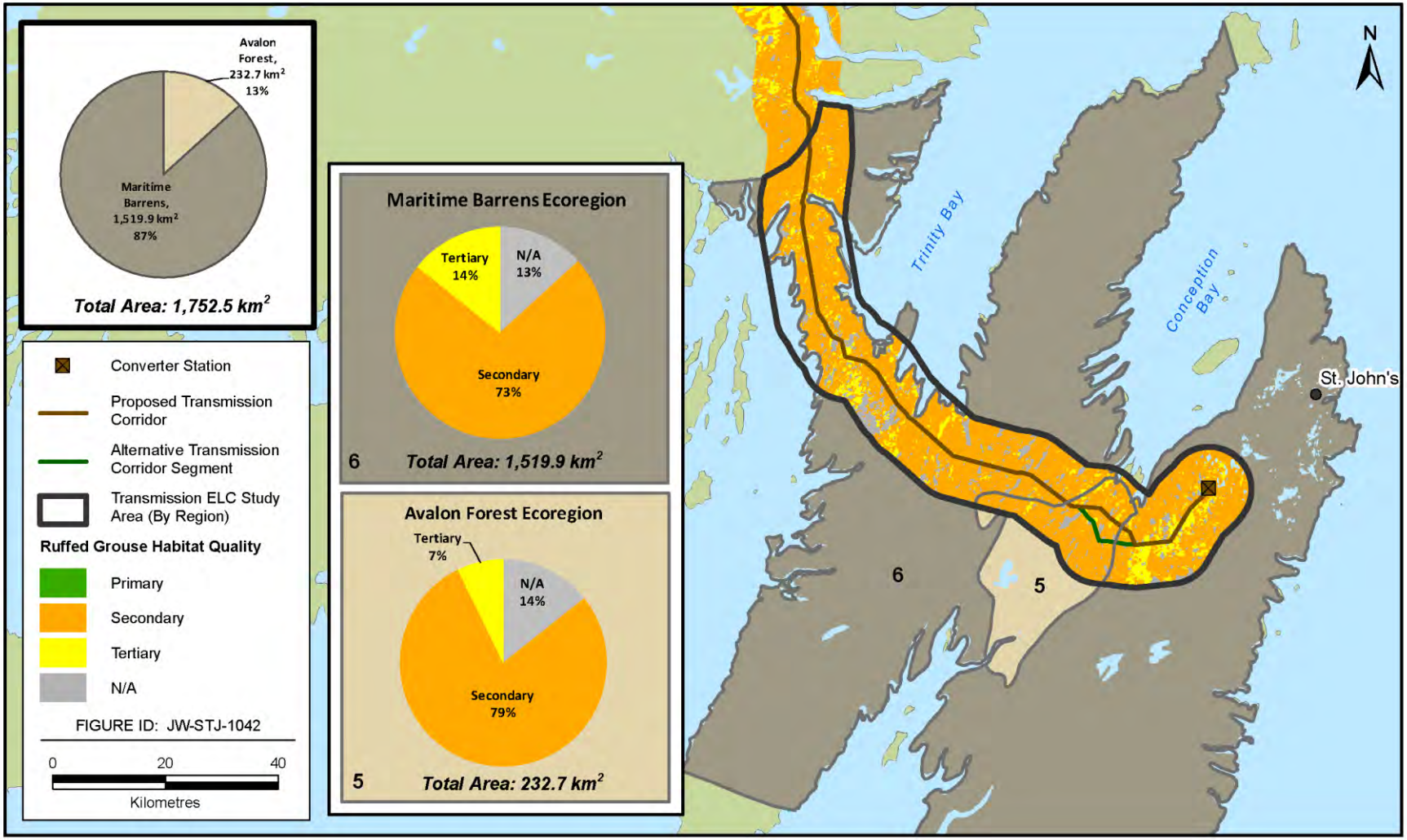


Figure 3-28 Ruffed Grouse Habitat Quality:Avalon Peninsula



Within the Strait of Belle Isle, Point Amour and Forteau Point, rounded headlands located on the Labrador side, act to concentrate a variety of species that migrate along the coast (Russell and Fifield 2001). Point Amour has been identified as particularly important (designated a Marine Bird Important Bird Area (IBA)) and serves as a location to monitor avifauna use and migration through the Strait (Russell and Fifield 2001; CWS unpublished data).

3.5.2 Avifauna Species

A variety of species of seabirds, shorebirds, waterfowl and other groups such as passerines are found in the Strait of Belle Isle at different points of the year. Many species are known to migrate through the area, with relatively few actually stopping for any length of time (Russell and Fifield 2001). However, several species do breed in the area, including some species of gulls and alcids, and many other species are fairly common in the Strait of Belle Isle during all periods of open water, including Northern Fulmar, Sooty Shearwater, Leach's Storm-Petrel and Northern Gannet (Jacques Whitford 2000a).

Seabirds and Shorebirds

Discussion of seabirds and shorebirds in the Study Area, for the purpose of this Component Study, have been limited to the Strait of Belle Isle region and consider breeding and migrating species that have been documented by Jacques Whitford (2000a), Russell and Fifield (2001), McKinnon et al. (2009) and/or through data provided by the CWS (CWS unpublished data) that is presented in the *Marine Mammals, Sea Turtles and Sea Birds in the Strait of Belle Isle Component Study* (Sikumiut 2010) prepared for this Project. Relevant observations from these studies include:

- Over 100,000 migrating birds were recorded during spring migration through the Strait in 1996, comprised largely of migrating Common Eider (as previously indicated) and alcid species (43,578) (Russell and Fifield 2001). Other species or species groups identified by Russell and Fifield (2001) include an additional 5,465 Black Guillemots (*Cepphus grylle*) and 195 Common Loon (*Gavia immer*). However, the total number of migrating birds is likely greater, as only the earlier portion of the spring migration was monitored that year (Russell and Fifield 2001).
- Gull species were relatively common in the Strait of Belle Isle in 1996, with 1,500 Greater Black-backed Gull, 141 Glaucous Gull, 2,899 Herring Gull, six Lesser Black-backed Gull (*Larus fuscus*), 639 Iceland Gull, 386 Ring-billed Gull (*Larus delawarensis*) and two Black-legged Kittiwake observed at Point Amour during spring migration in 1996 (CWS unpublished data).
- Other species recorded during spring migration in 1996 were: three American Golden Plover (*Pluvialis dominica*); five Greater Yellowlegs (*Tringa melanoleuca*); five Purple Sandpiper (*Calidris maritima*); five Double-crested Cormorant (*Phalacrocorax auritus*); and five Northern Gannet. Unconfirmed observations included one unidentified sandpiper and one whimbrel/curlew (CWS unpublished data).
- A series of boat-based seabird surveys were conducted in the Strait of Belle Isle during late August, mid-September, and early and late October of 1998 (Jacques Whitford 2000a). Observations during the course of these surveys included eight Common Loon, 13 Red-throated Loon (*Gavia stellata*), 414 Northern Fulmar, eight Manx Shearwater (*Puffinus puffinus*), 2,507 Sooty Shearwater, four Leach's Storm-Petrel (*Oceanodroma leucorhoa*), two Parasitic Jaeger, 37 Pomarine Jaeger (*Stercorarius pomarinus*), 13 unidentified jaeger species, 125 Northern Gannet, 449 Greater Black-backed Gull, 1,320 Herring Gull, five Iceland Gull, 4,774 Black-legged Kittiwake, 13 Common Tern (*Sterna hirundo*), 28 Arctic Tern (*Sterna paradisea*), 25 unidentified tern species, 54 Black Guillemot,

2,554 Atlantic Puffin, 176 Razorbill, 385 Common Murre, 31 Thick-billed Murre (*Uria lomvia*), 414 unidentified razorbill/murre species, 1,331 Dovekie, 11 Red Phalarope (*Phalaropus fulicarius*), one Sanderling (Calidris alba) and two Greater Yellowlegs.

- Northern Fulmar is common in the Strait of Belle Isle during all periods of open water (Jacques Whitford 2000a).
- Sooty Shearwater is common in the Strait of Belle Isle from June to September and less common in
- October (Jacques Whitford 2000a).
- Leach's Storm-Petrel is present in small numbers in the Strait of Belle Isle from June to September
- (Jacques Whitford 2000a).
- Northern Gannet are common in the Strait of Belle Isle from June to October (Jacques Whitford
- 2000a).
- Common Eider is a common migrant in spring (April and May) and fall (October to December) (Jacques Whitford 2000a, Sikumiut 2010).
- Pomarine Jaeger is typically present in the Strait of Belle Isle only during migration, and are generally far less abundant than their prey species (e.g., Black-legged Kittiwake) (Jacques Whitford 2000a).
- Black-legged Kittiwake commonly feed and migrate in the Strait of Belle Isle (Jacques Whitford 2000a). This species tends to congregate when food is brought to the surface by tidal action.
- Dovekie are the most numerous alcid in the Atlantic Ocean; however, their presence in the Strait of Belle Isle is generally as a migrant (Jacques Whitford 2000a).
- Common Murre are common in the Strait of Belle Isle during summer and fall (Jacques Whitford 2000a). There is a breeding colony near Blanc Sablon.
- Thick-billed Murre are uncommon in the Strait of Belle Isle during summer, but may be common in the winter (Jacques Whitford 2000a).
- Razorbill are present in small numbers in the Strait of Belle Isle during summer and many migrate through, heading south during fall (Jacques Whitford 2000a).
- Black Guillemot is common near the shoreline year-round in the Strait of Belle Isle (Jacques Whitford 2000a).
- Atlantic Puffin are regularly seen in the Strait of Belle Isle between May and October, as there is a breeding colony of over 7,200 breeding pairs near Blanc Sablon (Jacques Whitford 2000a). Migrants to and from the coast of Labrador during spring and fall also pass through the area.
- Ship-based surveys undertaken in October 2005 along the Labrador Coast and Strait of Belle Isle (between 60°09'N, 68°17'W and 51°11'N, 57°20'W) identified 644 individual marine birds of eight species, with a mean number of 10.2 ± 1.8 birds/km^2 (McKinnon et al. 2009). Birds that were observed on the sea include Northern Fulmar (two), Dovekie (36), Thick-billed Murre (17), unidentified alcid (seven) and Black-legged Kittiwake (one). Birds documented while in flight were Northern Fulmar (435), Dovekie (25), Thick-billed Murre (42), Black-legged Kittiwake (25), Glaucous Gull (17), unidentified alcid (17), Herring Gull (two), Northern Gannet (one), Common Eider (14) and three other unidentified species (Sikumiut 2010).
- Incidental shorebird observations were made along the Labrador and Newfoundland shores of the Strait of Belle Isle on one day in June 2008, as part of the 2008 passerine surveys. In Newfoundland, three species of shorebirds recorded at Anchor Point: Greater Yellowlegs; Spotted Sandpiper (*Actitis macularius*); and an unidentified Dowitcher (*Limnodromus sp*.) species. In Labrador, habitat was

assessed at two locations (L'Anse Amour and L'Anse-au-Clair) and found to provide suitable nesting and/or feeding substrate. The only shorebirds observed were a group of Whimbrel (Numenius phaeopus) on the beach in L'Anse-au-Clair.

Waterfowl

The Strait of Belle Isle is an important area for waterfowl during migration, in terms of the variety of species that are found in this area. Waterfowl species observed in this region are similar to other areas in Newfoundland and Labrador, and include species of special conservation status (i.e., migrating Harlequin Duck and Barrow's Goldeneye). The various information sources and surveys relevant to the Study Area indicate that:

- A large number of waterfowl pass through this relatively small area during migration, few actually stop for an extended period of time (Russell and Fifield 2001).
- Common Eider was the dominant species migrating through the Strait of Belle Isle, with 62,275 birds recorded (Russell and Fifield 2001).
- Other species observed during the 1996 spring migration survey included American Black Duck (129), Red-breasted Merganser (374), Common Merganser (25), Ring-necked Duck (one), Green-wing Teal (39), Common Goldeneye (41), Surf Scoter (258), Black Scoter (85), White-winged Scoter (19), Greater Scaup (23), Harlequin Duck (seven), Mallard (four), American Wigeon (two), Long-tailed Duck (321), King Eider (*Somateria mollissima*; two) and Barrow's Goldeneye (one) (CWS unpublished data). Unconfirmed observations included goldeneye/bufflehead (two), unidentified scaup (63), unidentified scoter (50) and unidentified species of duck (seven) (CWS unpublished data).
- Along the Strait of Belle Isle, species of scoter are generally recorded during migration. In 1996, 398 scoters were recorded during early spring migration at Point Amour (Russell and Fifield 2001). Of these observations, 258 were confirmed Surf Scoter, with an additional 50 unconfirmed scoter species (CWS unpublished data). The remainder of the observations were comprised of White-winged and Black Scoters.
- Observations of Canada Goose migrating through the Strait of Belle Isle during spring migration in 1996 were relatively low, with 66 birds recorded during the main survey and an additional six birds recorded incidentally (CWS unpublished).
- Species of special conservation status that migrate through the Strait of Belle Isle include Harlequin Duck (seven records in 1996) and Barrow's Goldeneye (one record in 1996) (CWS unpublished data).
- While some suitable breeding habitat for Harlequin Duck exists in the Strait of Belle Isle area of southeastern Labrador, aerial surveys have not identified any evidence of the species during the breeding season (Trimper et al. 2008). Only seven Harlequin Ducks were observed during monitoring at the Point Amour IBA in 1996 (Russell and Fifield 2001).
- During surveys in the fall of 1998, 33 Surf Scoter, two White-winged Scoter, nine Long-tailed Duck and 245 Common Eider were recorded in the Strait of Belle Isle during seabird surveys (Jacques Whitford 2000a).
- Species that breed in other areas along the Quebec North Shore likely feed in the Strait of Belle Isle (Jacques Whitford 2000a).

Passerines

Passerines in the Strait of Belle Isle area are considered here in the context of incidental sightings recorded during seabird surveys led by the CWS at Point Amour in 1996 (CWS unpublished data). Species recorded during early spring migration and their abundance in this region were: American Robin (20); American Tree Sparrow (*Spizella arborea*; one); Common Redpoll (*Carduelis flammea*; 36); Dark-eyed Junco (one); unidentified waxwings (13); Fox Sparrow (two); Yellow-rumped Warbler (three); Pine Siskin (Carduelis pinus; one); Lapland Longspur (*Calcarius lapponicus*; 72); Snow Bunting (Plectrophenax nivalis; 15); White-crowned Sparrow (Zonotrichia leucophrys; one); White-throated Sparrow (four); American Pipit (*Anthus rubescens*; five); and Horned Lark *(Eremophila alpestris*; 195) (CWS unpublished data). Other codes were indicated in the dataset that may or may not have included species of passerines and accounted for approximately 100 individual sightings. In addition to these observations, 62 Boreal Chickadee (*Poecile hudsonicus*) were recorded during seabird surveys in October 1998 (Jacques Whitford 2000a).

Birds of Prey

Birds of prey in the Strait of Belle Isle region are considered here in the context of incidental sightings recorded during seabird surveys lead by the CWS at Point Amour in 1996 (CWS unpublished data). Observations of birds of prey during early spring migration were: American Kestrel (four); Bald Eagle (one); Merlin (seven); Northern Hawk Owl (two); Northern Harrier (16); Peregrine Falcon (one); Rough-legged Hawk (56); Short-eared Owl (four); Snowy Owl (one); and Sharp-shinned Hawk (three) (CWS unpublished data).

Upland Game Birds

No incidental sightings of upland game birds were recorded during migration monitoring surveys in the spring of 1996 (CWS unpublished data) or during seabird surveys in 2000 (Jacques Whitford 2000a).

3.6 Other Avifauna Species of Special Conservation Status in Newfoundland and Labrador

COSEWIC is responsible for status assessments of wildlife species in Canada that are, in turn, taken into consideration by the Government of Canada when establishing the Legal List of Species at Risk under *SARA* (on Schedule 1) (Government of Canada 2009). Wildlife species that are listed on Schedules 2 and 3 must be assessed by COSEWIC within a given timeframe but are not considered legally listed. Once a species becomes legally listed, the measures to protect and recover a listed wildlife species are implemented.

Eight additional avian species that are legally listed under relevant provincial and/or federal legislation are documented to occur in Newfoundland and Labrador (Table 3-16): Barrow's Goldeneye; Eskimo Curlew; Piping Plover; Red Knot; Chimney Swift; Ivory Gull; Peregrine Falcon; and Common Nighthawk. Most of these species are considered uncommon or rare (if occurring at all) in the Study Area. Only the Common Nighthawk is regularly found in the Study Area, although its distribution is limited to Labrador. Similar to other key species identified, more detailed information has been provided for Common Nighthawk.

Table 3-16 Other Avifauna Species of Special Conservation Status in Newfoundland and Labrador

Species	COSEWIC Status	*SARA* Schedule	*SARA* Status	*NLESA* Status	Presence in the Study Area during Breeding	
					Southeastern Labrador	Island of Newfoundland
Barrow's Goldeneye	Special Concern	Schedule 1	Special Concern	*Vulnerable*	No recent records	No recent records on the island; few may winter along coastal areas
Eskimo Curlew	*Endangered*	Schedule 1	*Endangered*	*Endangered*	No recent records	No recent records
Piping Plover	*Endangered*	Schedule 1	*Endangered*	*Endangered*	No records	Outside of the Study Area
Red Knot (*rufa* subspecies)	*Endangered*	No schedule	No Status	*Endangered*	No records	No records
Chimney Swift	Threatened	Schedule 1	Threatened	Threatened	No records	No records
Ivory Gull	*Endangered*	Schedule 1	*Endangered*	*Vulnerable*	No records	No records
Peregrine Falcon (*anatum* subspecies)	Non-active	Schedule 1	Threatened	Threatened	No records	No records
Common Nighthawk	Threatened	No schedule	No Status	Threatened	Present	No records

Notes:
Schedule 1 is the official list of species that are classified as extirpated, *Endangered*, threatened, and of special concern.

3.6.1 Barrow's Goldeneye

The majority of the eastern population of Barrow's Goldeneye (approximately 4,500 birds) winters in the St. Lawrence estuary, with small numbers (approximately 400) seen throughout Atlantic Canada and Maine (Environment Canada 2009; Schmelzer 2006). Numerous sightings have been made in northern Labrador during the molting season (Schmelzer 2006). Historical breeding records date back to the late 1800s and, more recently, several authors have suggested breeding in northern Labrador and on the Island, but these reports remain unconfirmed (Eadie et al. 2000). One report suggests that "if breeding does occur in Newfoundland, it is probably sporadic or infrequent" (Schmelzer 2006). Recent incidental observations of this species in southwestern Labrador and on the Northern Peninsula may suggest that Barrow's Goldeneye occur at low densities and have simply not been detected (CWS unpublished data). The winter range of Barrow's Goldeneye includes coastal areas of the Island of Newfoundland, where they winter primarily in marine habitats; however, they are considered uncommon, with <15 individuals observed near Terra Nova National Park (Eadie et al. 2000).

3.6.2 Eskimo Curlew

Historically, Eskimo Curlew bred in the Northwest Territories but passed along coastal barrens of Labrador and the Island of Newfoundland during fall migration (Inland Fish and Wildlife Division, undated; Gill et al. 1998). This species had arrived in large numbers on the south Labrador coast during the first week of August, concentrated along 300 km of coastline, where they fed primarily on Empetrum (Gill et al. 1998). Records show

this species from Hamilton Harbour in the north (54°15') to Red Bay in the south (51°44') (NPWRC 2006). However, a sharp decline in numbers was noted prior to 1888-1890 (Godfrey 1986). In more recent years, sightings of this species have been rare and there is some belief that this species may actually be extinct (Inland Fish and Wildlife Division, undated). The last confirmed nest in Canada was found over a century ago (Environment Canada 2009) and the last confirmed sighting in the world was in 1960 (Environment Canada 2007). The last "possible sightings" in Canada occurred outside of Newfoundland and Labrador (Environment Canada 2007).

3.6.3 Piping Plover

There are no known records of Piping Plover in Labrador. Plovers have not been recorded breeding on the northeast coast since 1987 Piping Plover have been observed in the area, but there has been no evidence of breeding. They are considered annual breeders on the west coast of Newfoundland on beaches ranging from Shallow Bay Beach in Gros Morne National Park in the north to Burgeo in the south. Approximately 25-30 pairs breed annually in the province (CWS unpublished data). Although there are no known breeding sites for this species within the Study Area (Goossen et al. 2002), potential habitat is present along the coast.

3.6.4 Red Knot

The rufa subspecies breeds in the Arctic and winters in South America, but passes along Newfoundland and Labrador during migration. Migratory stopovers are generally sandflats and occasionally mudflats, and they are very faithful to their sites (COSEWIC 2007b). The most important areas for this subspecies during migration in eastern Canada are along the north shore of the St. Lawrence in Quebec (COSEWIC 2007b). While there are no known important areas for Red Knot in Labrador or on the Island of Newfoundland, they may still occur in small numbers in the Study Area. Red Knots have been reported in relatively large numbers on the beaches of the Northern Peninsula in recent years (CWS unpublished data).

3.6.5 Chimney Swift

Chimney Swift have been documented in southwestern Newfoundland, near the Codroy Valley, but breeding has not been confirmed (Godfrey 1986). If breeding does occur, it is likely sporadic (J. Brazil, pers. comm.; cited in COSEWIC 2007c). This species is not known to breed in Labrador (Cink and Collins 2002).

3.6.6 Ivory Gull

The Ivory Gull is a coastal bird that occurs inland only accidentally for brief periods during migration (Haney and MacDonald 1995). In Canada, the Ivory Gull breeds exclusively in Nunavut, but often winters among the pack ice of the Davis Strait, Labrador Sea, Strait of Belle Isle and the Gulf of St. Lawrence (Stenhouse 2004). It is occasionally seen on shore along the east coast of Newfoundland and Labrador, particularly the Northern Peninsula (Stenhouse 2004; Warkentin and Newton 2009). The Canadian breeding range has contracted since the 1980s, such that the species status was elevated to *Endangered* by COSEWIC. In March 2006, there were sightings of an individual Ivory Gull, potentially the same bird, at three locations in central Labrador (North West River, Happy Valley-Goose Bay and the Trans Labrador Highway at Metchin River) over a two-week period; another individual was reported from the Metchin River area in March 2003 (B. Mactavish, pers. comm.). In 2009, an "invasion" of Ivory Gulls was reported in Newfoundland, with up to 12 observed in one day along the

coast in Gros Morne National Park (Birders World 2009). Generally speaking, records of Ivory Gull are rare and irregular.

3.6.7 Peregrine Falcon

The *tundrius* subspecies is limited to northern tundra areas and is therefore outside of the current Study Area. The *anatum* subspecies nests along the coast of Labrador, from Table Bay in the south to Cape Chidley in the north, as well as along rivers that provide suitable nesting habitat, but does not breed on the Island (Inland Fish and Wildlife Division, undated). In Labrador, Peregrine Falcon nests on rocky cliffs, often under a protective overhang (Jacques Whitford 1997a, 1997c). Extensive searches have been conducted in central Labrador for this species (Jacques Whitford 1997a, 1997c and references therein). The nearest known breeding location is >100 km from the transmission corridor, near Cartwright (P. Trimper, pers. comm.).

3.6.8 Common Nighthawk

Earlier studies did not observe Common Nighthawk in Newfoundland (Todd 1963) and it is considered only a rare visitor to the Island (COSEWIC 2007d). As such, the discussion below focuses on information related to its occurrence in the Labrador portion of the Study Area.

Primary Sources of Information

Forest passerine surveys were conducted in support of the Lower Churchill Hydroelectric Generation Project in 2006 that confirmed this species in the lower Churchill River valley and in Happy Valley-Goose Bay (Nalcor Energy 2009a).

Existing Conditions and Status

The species breeds in Labrador, but is extremely rare, if present at all, on the Island of Newfoundland (Environment Canada 2009). The population numbers approximate 400,000 nationally; numbers are not known for the eastern populations specifically. The national population is estimated to have decreased 49.5 percent from 1995 to 2005, resulting in placement on national and provincial species at risk lists (COSEWIC 2007).

Habitat Association and Distribution in the Study Area

The Common Nighthawk prefers open, vegetation-free habitats, including dunes, beaches, recently harvested or burned forests, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores and river banks (Poulin et al. 1996), as well as mixed and coniferous forests (Environment Canada 2009). The Common Nighthawk is an aerial insectivore, feeding at dusk and dawn on flying ants and Coleoptera (Environment Canada 2009).

Primary habitat is that which provides shelter and food sources for all stages of the lifecycle. Dry black spruce/lichen habitat was identified as particularly important habitat for this species in Labrador (Nalcor Energy 2009a). Secondary habitat includes some combination of feeding, protection, nesting and resting sites. For the Common Nighthawk in Labrador, this includes riparian shoreline vegetation and wetlands, including marshes, fens and bogs. Tertiary habitat provides marginal foraging, protection or resting opportunities, and is used only during transit. In Labrador, this includes wet black spruce/moss, white spruce/mixed wood, fir-spruce, balsam fir/mixedwood, black spruce/mixedwood and hardwood.

Table 3-17 summarizes primary, secondary and tertiary breeding habitat quality for Common Nighthawk. Primary habitat consists of cutover, burn, open conifer and black spruce lichen habitats. Combined, these habitats comprise 1,875 km^2 (29 percent) of the Study Area in Labrador and a theoretical 2,441 km^2 (22 percent) of the Study Area in Newfoundland (as this species is extremely rare, if present at all, on the Island). Note that the actual amount of primary habitat would be lower as only certain cutover and burn habitats (i.e., with regenerating forests) would be preferred.

Table 3-17 ELC Habitat Types and Relative Quality for Common Nighthawk

ELC Habitat Type	Breeding Habitat Quality	Notes
Alpine Vegetated	tertiary	
Black Spruce and Lichen Forest	primary	
Burn	primary	Refers to sites with regenerating forest.
Conifer Forest	tertiary	
Conifer Scrub	tertiary	
Cutover	primary	Refers to sites with regenerating forest.
Exposed Bedrock	tertiary	
Hardwood Forest	tertiary	
Kalmia Lichen/Heathland	tertiary	
Lichen Heathland	tertiary	
Mixedwood Forest	tertiary	
Open Conifer Forest	primary	
Rocky Barrens	tertiary	
Scrub/Heathland/Wetland	secondary	
Wetland	secondary	

Notes:
1. Habitat types are described in Table 2-6.
2. Habitat Quality is described in Section 2.2.4.
3. While not included in the ELC (Minaskuat Inc. 2009a), riparian habitat is considered secondary quality habitat for this species.
4. This species is believed to occur only in Labrador.

Secondary habitat includes wetland and scrub/heathland/wetland habitats. Remaining habitats in Table 3-17 were classified as tertiary, based on limited foraging, nesting, protection, resting or feeding opportunities.

Lower Churchill River and Lake Melville

The breeding population of Common Nighthawk extends into forested areas of central Labrador, based on isolated observations of this species in this region during summer (Todd 1963). One observation of this species was incidentally made (while walking between point count locations) during 2006 passerine surveys in this area as part of the Lower Churchill Hydroelectric Generation Project EA (Minaskuat Inc. 2008a).

Southeastern Labrador

The breeding population extends into forested areas of central and southeastern Labrador, based on isolated observations of this species in this region during summer (Todd 1963). Primary habitat for this species is virtually absent from the Forteau Barrens Ecoregion (0.25 percent), but comprises between 33 percent and 39 percent of the other two much larger Ecoregions in the Study Area in Southeastern Labrador. Primary habitat is also relatively high (38 percent) in the High Boreal Forest Ecoregion, but this (as well as the Mid-Boreal Forest

Ecoregion where 6 percent of the area is considered primary habitat) overlaps less than 3 percent of the Study Area (Figure 3-29).

Common Nighthawk were not observed during field surveys in support of the current Project. This species was also not recorded during 13 years of the operation of the Happy Valley Breeding Bird Survey route (Sauer et al. 2007).

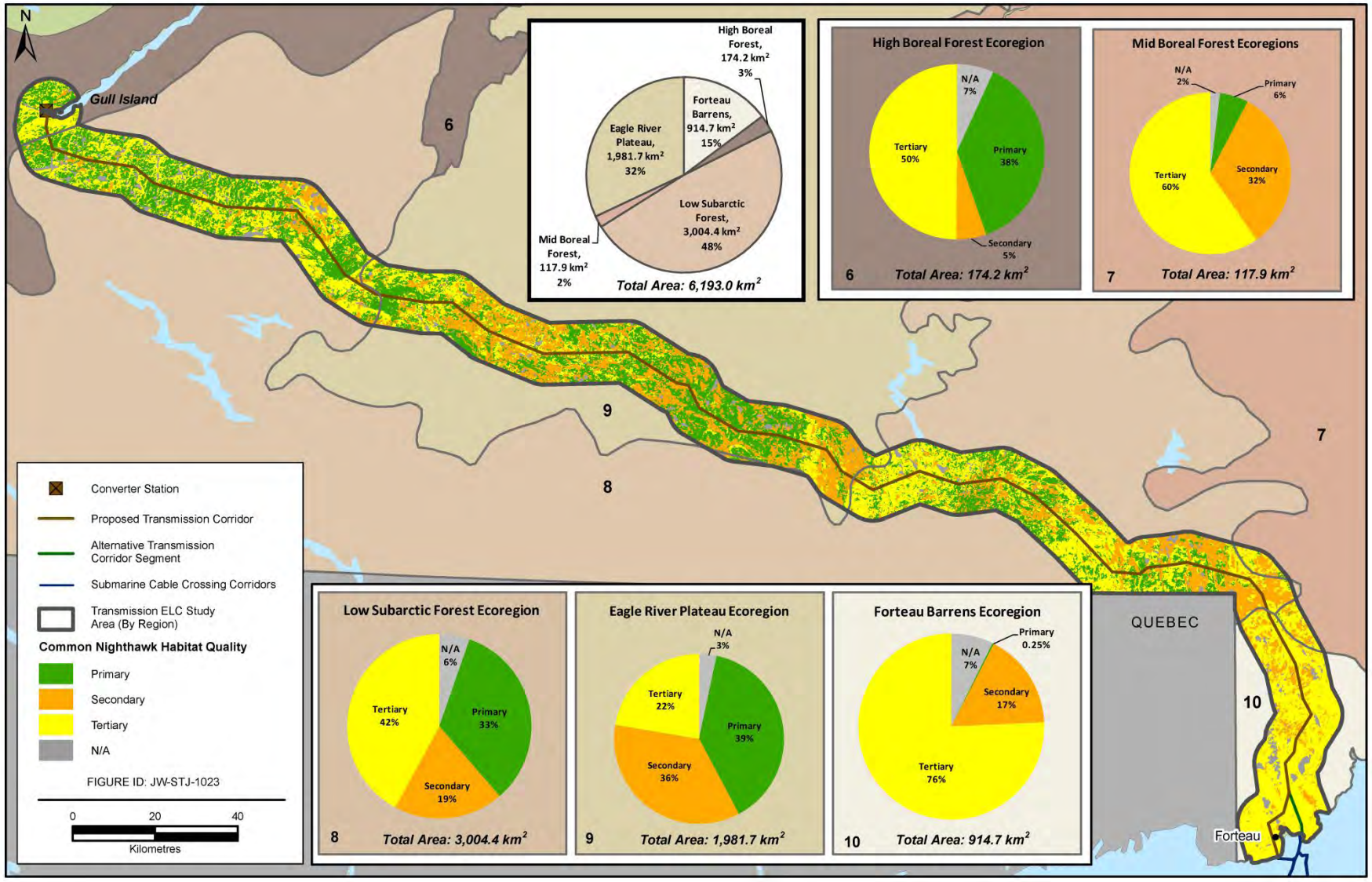
Island of Newfoundland

Common Nighthawk are extremely rare, if present at all, on the Island of Newfoundland (Environment Canada 2009).

Limiting Factors

Decline in insect populations, predation (particularly nest predation), habitat loss/modification (including reforestation), collision with motor vehicles, loss of nesting sites and climate change (Environment Canada 2009) are potential limiting factors for this species. Potential predators include domestic cats, American Kestrels and Peregrine Falcon; nest predation by American Crows, Common Ravens and gulls is also a limiting factor (Environment Canada 2009).

Figure 3-29 Common Nighthawk Habitat Quality:Southeastern Labrador



4.0 DISCUSSION AND SUMMARY

Nalcor Energy is proposing to develop the Labrador-Island Transmission Link, a HVdc transmission system extending from Gull Island in central Labrador to Soldiers Pond on the Island of Newfoundland's Avalon Peninsula. The EA of the Project is ongoing, with an EIS currently being completed by Nalcor Energy.

In preparation for and support of the Project's EA, this *Avifauna Component Study* was completed in order to identify, compile, summarize and present information on avifauna species in the area of, and which may interact with, the proposed Project for use in the EIS.

Species of avifauna included in this Component Study represented several important groups of birds, including waterfowl, birds of prey, passerines and upland game birds that breed in the Study Area, as well as other species (seabirds, shorebirds) that are present in the Strait of Belle Isle during migration and/or breeding. Some species designated by COSEWIC, and/or listed under *SARA* and/or *NLESA* were included in these key groups, and others were assessed in a separate section.

The objective of this component study was to provide information on the terrestrial environment, in particular avifauna, for the eventual EA for the proposed Project. This Component Study identifies and describes the occurrence and distribution of avifaunal species or species groups within the Study Area and mapping preferred breeding habitats of representative species based on field observations, literary sources and habitat mapping provided by Minaskuat Inc. (2009a).

An overview of some of the key results of this Component Study is provided below:

- An extensive literature search has been completed, providing a comprehensive listing of the primary sources of information relevant to the proposed Project. The annotated bibliography (Appendix A) is an important resource that can be accessed for future and/or additional components of this and other projects. In addition to the baseline information presented in this document, literature related to potential Project-related effects on avifauna has also been identified and retained to support the EA.
- The habitats identified throughout the Study Area represent a variety of different guilds and niches important to avifauna. A variety of key avifauna species and/or species groups were selected for this review that are believed to represent the diversity of habitats.
- Details on the presence of waterfowl, birds of prey, passerines and upland game birds in the Study Area, and information on their distribution and relative abundance, has been presented based on the available literature and on observations from baseline studies in support of the proposed Project, including Minaskuat Inc. (2009a; and results of the 2007-2008 surveys along the Transmission Line) and earlier investigations in the Study Area by AGRA Earth and Environmental Ltd. and Harlequin Enterprises (1999) and Jacques Whitford (1999a).

  For eight key species/species group, the distribution and abundance of preferred (primary, secondary and tertiary quality) habitats in the 15 km wide Study Area along the proposed transmission corridor were mapped, including Canada Goose, Blackpoll Warbler, Wetland Sparrows and Ruffed Grouse. Habitat quality for species of special conservation status mapped as part of thisreview included Rusty Blackbird, Common Nighthawk (Labrador only), Gray-cheeked Thrush and Short-eared Owl.

Key outcomes of this Component Study are the detailed regional overviews for species/species groups in the Study Area and the habitat quality mapping products indicating areas of primary, secondary and tertiary habitat for key species in the Study Area.

4.1 Regional Overviews of Avifauna in the Transmission Study Area

Overviews of avifauna species in the Study Area were compiled according to waterfowl, passerines, birds of prey, upland game birds and other species of special conservation status. The following sections summarize the combined results of these regional overviews.

4.1.1 Lower Churchill River and Lake Melville

A variety of waterfowl species are found along the Churchill River and associated tributaries during staging, breeding and molting. Thousands of waterfowl are found along the main stem of the Churchill River during spring staging (when open water is typically limited elsewhere in Labrador), comprised largely of Surf Scoter. Waterfowl that are common breeders in this region include Canada Goose, American Black Duck, Common Goldeneye and Common and Red-breasted Merganser. At least 18 species of waterfowl occur in the area, including staging and breeding Harlequin Duck, a species of special conservation status.

A total of 42 and 50 species of passerines were identified in the Lower Churchill and Lake Melville region during baseline investigations in 2006 and 2007, respectively. The diversity of species observed reflects the higher diversity and abundance of deciduous tree species found in the High Boreal Forest-Lake Melville Ecoregion compared to other areas in Labrador. Species such as Swainson's Thrush and White-throated Sparrow were widespread across habitats, while other common species included Yellow Warbler, Dark-eyed Junco and Tennessee Warbler. Species of special conservation status also breed in this region and include Rusty Blackbird, Olive-sided Flycatcher and Gray-cheeked Thrush.

Birds of prey have been recorded (breeding or migrating) along the Churchill River and Lake Melville areas and include Northern Goshawk, American Kestrel, Merlin, Sharp-shinned Hawk, Rough-legged Hawk, Gyrfalcon, Peregrine Falcon, Osprey, Northern Harrier, Golden Eagle, Bald Eagle, Red-tailed Hawk, Great-horned Owl, Northern Hawk Owl, Snowy Owl, Boreal Owl and Short-eared Owl (a species of special conservation status). The Churchill River and Lake Melville region in general support relatively large numbers of Osprey during the breeding season, as well as Rough-legged Hawk, Red-tailed Hawk and likely other species; however, information on exact numbers of these other species that breed in the region are unknown. Species such as Peregrine Falcon, Gyrfalcon and Snowy Owl typically nest further north.

Ruffed Grouse, Spruce Grouse and Willow Ptarmigan are found along the Churchill River and Lake Melville areas. Ruffed Grouse have the most limited distribution and likely the most specialized habitat requirements, preferring deciduous species such as aspen, while Spruce Grouse are generally associated with more widely distributed coniferous and mixedwood forests.

4.1.2 Southeastern Labrador

A greater variety of waterfowl species are found in Southeastern Labrador (compared to Newfoundland) during staging, molting and for breeding and include species of dabbling ducks, diving ducks and geese, although generally at low densities. Local areas such as the Eagle River Plateau and the St. Paul watershed likely have relatively high breeding densities of several species of waterfowl (CWS unpublished data). Relatively high concentrations of waterfowl similar to that observed along the Lower Churchill River and Lake Melville area during staging are typically not observed, as many of the rivers in this area are ice-covered when birds first arrive in spring. Harlequin Duck occur in Southeastern Labrador; however, in low numbers compared to the availability of apparently suitable habitat.

Passerine diversity in this region of Labrador is similar to other areas of Labrador previously surveyed (including the lower Churchill River). Fox Sparrow was indicated to be particularly abundant along the transmission corridor in this region, and the Forteau Barrens Ecoregion was found to support both the highest diversity and abundance of passerine species in the Southeastern Labrador region of the Study Area. Species of special conservation status including Rusty Blackbird, Gray-cheeked Thrush and Olive-sided Flycatcher are known to or likely breed in Southeastern Labrador.

Similarly, bird of prey (breeding or migration) diversity in Southeastern Labrador is similar to the Lower Churchill River and Lake Melville region, with the exception of Golden Eagle, Peregrine Falcon, Gyrfalcon and Snowy Owl that would typically nest further north. Osprey was again relatively more abundant in this region. Other species that are relatively common include Rough-legged Hawk and Red-tailed Hawk. Short-eared Owl, a species of special conservation status, is also found in this region of the Study Area.

Few sightings of upland game birds were recorded during surveys in this region; however, Willow Ptarmigan and Spruce Grouse would be expected to occur in higher numbers compared to Ruffed Grouse, based on habitat preferences of this species. While a relatively rare species in this area, three records of Rock Ptarmigan have been recorded for the south coast of Labrador.

4.1.3 Strait of Belle Isle

A variety of species of seabirds, shorebirds and other groups such as passerines and birds of prey are found in the Strait of Belle Isle at different points of the year. Many species migrate through the area, with few actually stopping for any length of time. Other species breed along the Strait of Belle Isle and some species are found year-round.

The Strait of Belle Isle is an important area for seabirds in general during migration, in terms of the variety of species that are found (Sikumiut 2010). Over 100,000 seabirds migrate through this area during spring, comprised largely of Common Eider and alcid species. Harlequin Duck and Barrow's Goldeneye, species of special conservation status, were observed during spring migration in 1996, though in low numbers. Species that breed in the area include gulls (e.g., Black-legged Kittiwakes) and alcids (e.g., Atlantic Puffin) and residents during all periods of open water include Northern Fulmar, Sooty Shearwater, Leach's Storm-Petrel and Northern Gannet.

Shorebird species are found during migration and breeding along the Strait of Belle Isle. Species recorded during migration include American Golden Plover, Greater Yellowlegs, Purple Sandpiper, Sanderling and Red Phalarope (CWS unpublished data).

Low numbers of passerines and birds of prey are also observed in the Strait of Belle Isle during annual migrations. Species documented and discussed in this report include Short-eared Owl, Blackpoll Warbler and Rough-legged Hawk, amongst others.

4.1.4 Northern Peninsula

A variety of waterfowl species occur along the Northern Peninsula during staging and breeding, including Canada Goose, American Wigeon, American Black Duck, Mallard, Northern Pintail, Green-wing Teal, Harlequin Duck, Common Goldeneye, Common Merganser, Red-breasted Merganser and Ring-necked Duck; Harlequin Duck are restricted to insular Newfoundland during the breeding season.

A variety of passerine species are found along the Northern Peninsula during the breeding season. A total of 47 passerine species were identified in the Northern Peninsula Forest Ecoregion and 28 in the Long Range Barrens Ecoregion in 2008. Among the most abundant species were White-throated Sparrow, Yellow-bellied Flycatcher, Ruby-crowned Kinglet, American Robin, Blackpoll Warbler, Fox Sparrow, Swainson's Thrush, Lincoln's Sparrow and Northern Waterthrush. The Long Range Barrens Ecoregion was found to be particularly important for Lincoln's Sparrow and Savannah Sparrow. Red Crossbill, Olive-sided Flycatcher, Gray-cheeked Thrush and Rusty Blackbird are known to or may occur on the Northern Peninsula.

Birds of prey found breeding or migrating on the Northern Peninsula include Osprey, Bald Eagle, Northern Harrier, Sharp-shinned Hawk, Northern Goshawk, Rough-legged Hawk, American Kestrel, Merlin, Gyrfalcon, Great-horned Owl, Northern Hawk Owl, Boreal Owl and Short-eared Owl. While Osprey is considered most common of these, they occur at much lower densities than observed in Labrador. American Kestrel, Gyrfalcon and Northern Hawk Owl are considered uncommon, with the latter two species typically found further north. Snowy Owl is also found on the Island of Newfoundland, though primarily during migration.

Ruffed Grouse, Spruce Grouse and Willow Ptarmigan are resident species on the Island of Newfoundland. Spruce Grouse on the Island are particularly associated with coniferous forests in Central Newfoundland, where they were first introduced, but have expanded their range to include the Northern Peninsula. Rock Ptarmigan are restricted to high, barren rocky habitats and may occur in this region of the Study Area.

4.1.5 Central and Eastern Newfoundland

A similar variety of waterfowl species are found in the Central and Eastern Newfoundland region (and throughout insular Newfoundland) during staging and breeding compared to other regions of the Study Area. Observations in the Central Newfoundland Forest Ecoregion included Green-wing Teal, American Black Duck, Ring-necked Duck, Common Goldeneye, Common and Red-breasted Merganser and Canada Goose.

A variety of passerine species are found in the Central and Eastern Newfoundland region. Some of the most common species include White-throated Sparrow, American Robin, Yellow-bellied Flycatcher, Yellow Warbler and Northern Waterthrush. The Central Newfoundland Forest Ecoregion has the highest total number of species recorded in 2008, compared to all other Ecoregions investigated on the Island (although both the mean number of species and mean number of individuals per point count were below the overall average). Red Crossbill, Olive-sided Flycatcher, Gray-cheeked Thrush and Rusty Blackbird are known to or may occur in Central and Eastern Newfoundland.

Birds of prey found breeding or migrating in this region are typical of Newfoundland and are as described for the Northern Peninsula. These include Osprey, Bald Eagle, Northern Harrier, Sharp-shinned Hawk, Northern Goshawk, Rough-legged Hawk, American Kestrel, Merlin, Gyrfalcon, Great-horned Owl, Northern Hawk Owl and Boreal Owl, with Osprey relatively most abundant.

Ruffed Grouse, Spruce Grouse and Willow Ptarmigan are all found in Central and Eastern Newfoundland. As this is where both Ruffed and Spruce Grouse were initially introduced to the Island in the 1960s and 1970s, this represents the core of their distribution on the Island.

4.1.6 Avalon Peninsula

A similar small number of waterfowl species are found on the Avalon Peninsula during staging and breeding, compared to other areas on the island of Newfoundland. Known species include American Black Duck, Green-winged Teal, Ring-necked Duck, Common Goldeneye, Northern Pintail, Canada Goose, Mallard, American Wigeon and Common and Red-breasted Merganser. While waterfowl numbers are apparently low, the Avalon Peninsula provides habitat for breeding Greater Scaup and migrating Surf and Black Scoters that are generally only found in this region of the Island.

A wide variety of passerine species are found on the Avalon Peninsula. The Avalon Forest Ecoregion in particular appears to support a slightly higher diversity and abundance, although this is based on only one series of point counts. Yellow-bellied Flycatcher, Northern Waterthrush, American Robin, Yellow-rumped Warbler, White-throated Sparrow and Blackpoll Warbler were among the more common species identified on the Avalon Peninsula. Red Crossbill, Olive-sided Flycatcher, Gray-cheeked Thrush and Rusty Blackbird are known to breed in this region of the Study Area.

Birds of prey found breeding or migrating in this region are typical of Newfoundland and are as described for the Northern Peninsula. These include Osprey, Bald Eagle, Northern Harrier, Sharp-shinned Hawk, Northern Goshawk, Rough-legged Hawk, American Kestrel, Merlin, Gyrfalcon, Great-horned Owl, Northern Hawk Owl, Boreal Owl and Short-eared Owl, with Osprey the most abundant of these.

Ruffed Grouse, Spruce Grouse and Willow Ptarmigan are residents on the Avalon Peninsula. In relation to the rest of the Island, Willow Ptarmigan are most common along the Maritime Barrens, near the tips of large peninsulas, and open upland sites.

4.2 Avifauna Habitat Quality Mapping

Species of avifauna included in this Component Study represent several important groups of birds, including waterfowl, birds of prey, passerines, upland game and species of special conservation status (i.e., designated by COSEWIC or legally listed under *SARA* and/or *NLESA*. A total of 14 avifauna species were selected for detailed review and the habitat quality mapping exercise that have special protection, exhibit affinities for a particular habitat type and are representative of a particular avifauna group (e.g., early versus late nesting species):

- Harlequin Duck – A listed species of special conservation status with characteristics that make them particularly *Vulnerable* to development, including a preference for rocky, fast-flowing sections of rivers and/or their tributaries, as well as high fidelity of females to breeding areas.

- Canada Goose – This early nesting waterfowl species occurs throughout the province, has a very distinct habitat association with ribbed fens and fen-marsh complexes and is of cultural importance to aboriginal and other residents within the province.
- Surf Scoter – This species is representative of the late-nesting waterfowl group and has distinct habitat associations (preferring shallow and rocky lakes).
- Rusty Blackbird – A listed species of special conservation status that is relatively uncommon throughout the Study Area.
- Red Crossbill – A listed species of special conservation status of which the *percna* subspecies is found only in Newfoundland.
- Gray-cheeked Thrush – A listed species of special conservation status.
- Olive-sided Flycatcher – A species of special conservation status federally protected under *SARA*(*Threatened*) and listed as *Threatened* under the *NLESA*.
- Blackpoll Warbler – This species is ubiquitous throughout the province but has a specific habitat preference for coniferous forests.
- Wetland Sparrows (Swamp Sparrow, Song Sparrow, Lincoln's Sparrow and Savannah Sparrow) – These species have a preference for riparian marsh habitat that is relatively limited in the Study Area.
- Osprey – This species is an indicator of the status of lower trophic levels and has specific habitat requirements.
- Bald Eagle – This species an indicator of the status of lower trophic levels and has specific habitat requirements based on small-scale localized biophysical parameters.
- Short-eared Owl – A listed species of special conservation status.
- Ruffed Grouse – This species has a relatively limited distribution and more specialized habitat requirements than other upland game species.
- Common Nighthawk – A listed species of special conservation status (under *NLESA*) and federally protected under *SARA* (Threatened).

The specific and highly localized habitat requirements of some species (e.g., Harlequin Duck and Osprey) meant that primary, secondary and tertiary habitats could not be determined (or categorized) at the scale of the Project and regional ELC. For eight other avifauna species, the distribution of primary, secondary and tertiary habitats were mapped along the Study Area (i.e., the 15 km wide ELC study area along the proposed and alternative transmission corridors) from Gull Island in central Labrador to Soldiers Pond on the Island of Newfoundland's Avalon Peninsula.

4.2.1 Canada Goose

Primary wetland habitat for Canada Goose occupies 1,088 km^2 (10 percent) of the Study Area in Newfoundland, and 1,512 km^2 (23 percent) in Labrador. Primary habitat is found throughout the Study Area; however, it is most abundant in Southeastern Labrador, particularly in the Eagle River Plateau Ecoregion, where it represents 36 percent of that 1,981.7 km^2 section. In Central and Eastern Newfoundland, primary habitat was high (74 percent) in the Long Range Barrens Ecoregion but the total area of this Ecoregion along this section of the corridor is only 113.9 km^2. Nonetheless, there appears to be a small concentration of preferred habitat for this species in that area (east of Deer Lake).

Secondary habitat for this species is scrub/heathland/wetland habitat, a portion of which is attractive for breeding. Secondary habitat only occurs on the Island. Here, it is most abundant along the Northern Peninsula and Avalon Peninsula regions. Smaller amounts were found in the Central and Eastern Newfoundland region, specifically in the area south of Clarenville. The Maritime Barrens Ecoregion in general has the highest availability of secondary habitat.

Tertiary habitat contributed to the highest percentages of available habitat in all Ecoregions throughout the Study Area, with the exception of the Maritime Barrens Ecoregion, and a small portion of the Long Range Barrens Ecoregion that lies in Central and Eastern Newfoundland. However, in general, the Central and Eastern Newfoundland region is comprised largely of tertiary habitat.

While their association with wetland habitats is widely documented (e.g., Mowbray et al. 2000 and references therein), there are also concentrations of this species in apparent tertiary habitat, including the Main River that is known as an important area for staging, breeding and pre-molting aggregations (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). The Central Newfoundland Forest Ecoregion has 70 percent tertiary habitat, and there was little evidence of Canada Goose found during baseline investigations in support of the Project.

4.2.2 Rusty Blackbird

Primary wetland and scrub/heathland/wetland habitat for this species occupies 3,330 km^2 (30 percent) of the Study Area in Newfoundland, and 1,512 km^2 (23 percent) in Labrador. Eighteen observations of Rusty Blackbird were recorded during forest passerine surveys in the Eagle River Plateau Ecoregion in Southeastern Labrador in 2008, where primary habitat forms 35 percent of the Ecoregion. Four other observations were recorded in the Low Subarctic Forest Ecoregion, where primary habitat forms only 19 percent of the Ecoregion. Although primary habitat for Rusty Blackbird is generally between 20 and 50 percent on the Island (and as high as 78 percent relatively minor Ecoregions by area in the regions), this species is considered uncommon on the Island and often transient (Warkentin and Newton 2009). Only one Rusty Blackbird was recorded during forest passerine surveys in the Study Area in 2008, in the Maritime Barrens Ecoregion on the Avalon Peninsula.

Secondary habitat identified for Rusty Blackbird includes conifer scrub and open conifer, mixedwood and hardwood forests and was found in proportions between 20 and 46 percent in all of the major Ecoregions of the Study Area. Tertiary habitat was similarly distributed throughout the Study Area, with highest concentrations in general in Southeastern Labrador.

4.2.3 Gray-cheeked Thrush

Primary habitat for this species includes conifer forest, conifer scrub and mixedwood forest habitats that occupy 3,730 km^2 (33 percent) of the Study Area in Newfoundland, and 2,284 km^2 (35 percent) in Labrador. Primary habitat for this species is found in all Ecoregions in the Study Area, with the highest percentages found in the Forteau Barrens (45 percent), Low Subarctic Forest (41 percent), Northern Peninsula Forest (43 percent), Central Newfoundland Forest (39 percent) and Avalon Forest (44 percent) Ecoregions. Five of 20 observations of Gray-cheeked Thrush in the Study Area were in primary habitat.

Secondary habitat includes hardwood forest, wetland and scrub/heathland/wetland habitats. Secondary habitat is common and widespread, although particularly concentrated in localized areas within the Long Range Barrens

Ecoregion on the Northern Peninsula as well as in Central and Eastern Newfoundland (78 percent of this 113.9 km^2 Ecoregion in this region), and in the area south of Clarenville, along the boundary of the Central and Eastern Newfoundland and Avalon Peninsula regions. During passerine surveys in the Study Area, 12 observations were made in secondary habitat.

Tertiary habitat is found throughout the Study Area but in proportions less than 39 percent across all Ecoregions. Three observations of Gray-cheeked Thrush were made in tertiary habitat, including lichen heathland and kalmia lichen/heathland habitats.

Gray-cheeked Thrush are found throughout the Study Area, but are most common on the Northern Peninsula and the northeast coast, and less common on the west coast and in the interior (Peters and Burleigh 1951, cited in Dalley et al. 2005). During surveys in the Study Area, 20 Gray-cheeked Thrush were observed, including four in Labrador, 14 on the Northern Peninsula (primarily in wetland and scrub/heathland/wetland habitats) and two in Central and Eastern Newfoundland. One additional bird was documented in Central and Eastern Newfoundland during ELC surveys, in cutover habitat.

4.2.4 Blackpoll Warbler

Primary habitat for this species includes conifer scrub, cutover and open conifer forest, as well as wetland and scrub/heathland/wetland habitat in some Ecoregions that are widely distributed throughout the Study Area. Primary habitat for Blackpoll Warbler occupies 2,671 to 6,001 km^2 (24 to 53 percent) of the Study Area in Newfoundland, and 2,576 km^2 (39 percent) in Labrador. Twenty-one percent of Blackpoll Warbler observations were in primary wetland habitat, nearly half of which were in the Northern Peninsula Forest Ecoregion. An additional 31 percent of observations were associated with primary scrub/heathland/wetland habitat, of which 80 percent were found in the Long Range Barrens and Maritime Barrens Ecoregions.

Secondary habitat includes black spruce and lichen forest (dry habitat), conifer forest and mixedwood forest, as well as wetland and scrub/heathland/wetland habitats in some Ecoregions. Secondary habitat is also widely distributed throughout the province, generally in proportions greater than 50 percent of the major Ecoregion in each region. Overall, few records of this species were in secondary habitat. Of those associated with secondary mixedwood forest, the highest number was located on the Avalon Peninsula.

Small amounts of tertiary habitat were identified for this species throughout the Study Area. Tertiary habitat comprised 10 percent or less of Ecoregions, with the exception of the Forteau Barrens Ecoregion, where it formed 31 percent of that Ecoregion.

4.2.5 Wetland Sparrows

Four common sparrow species comprise the classification Wetland Sparrows: Swamp Sparrow; Song Sparrow; Lincoln's Sparrow; and Savannah Sparrow.

Primary wetland and scrub/heathland/wetland habitat for this species occupies 3,330 km^2 (30 percent) of the Study Area in Newfoundland, and 1,512 km^2 (23 percent) in Labrador. In 2008, 100 percent of Song Sparrow, 46 percent of Lincoln's Sparrow, 41 percent of Savannah Sparrow and 42 percent of Swamp Sparrow observations were in primary scrub/heathland/wetland habitat. An additional 21 percent of Lincoln's Sparrow, 29 percent of Savannah Sparrow and 13 percent of Swamp Sparrow were associated with primary wetland habitat.

The only secondary habitat identified for this group of species was cutover habitat associated with the Central Newfoundland Forest Ecoregion, based on numerous observations during the 2008 surveys.

Tertiary habitat for wetland sparrows is widely distributed throughout the Study Area, with highest percentages found in Southeastern Labrador. Of the 35 observations in this region, 20 were associated with tertiary habitat, as well as 33 present of all observations on the Island.

4.2.5 Short-eared Owl

Primary habitat for this species includes alpine vegetated, kalmia lichen/heathland and lichen heathland habitats. Combined, primary habitat occupies 184 km^2 (<2 percent) of the Study Area in Newfoundland, and 352 km^2 (5 percent) in Labrador. Overall, primary habitat for this species was limited (5 percent or less of Ecoregions), but relatively concentrated in the Forteau Barrens Ecoregion along the Southeastern Labrador Study Area, where it comprised 31 percent of that Ecoregion. In this area, two Short-eared owl were incidentally recorded during waterfowl surveys in the Study Area in 1998 (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999), one during birds of prey surveys in 1998 (Jacques Whitford 1999a) and two during surveys along the Trans Labrador Highway, east of the Study Area (Jacques Whitford 1998c). Schmelzer (2005) noted that Short-eared Owls are frequently reported in the coastal barrens between L'Anse-au-Clair and Red Bay.

Secondary habitat consists of open conifer forest, rocky barrens, scrub/heathland/wetland and wetland habitats. Both secondary and tertiary habitats were widely distributed and abundant in the Study Area. Historical records and opportunistic observations recorded by Schmelzer (2005) have the species sighted in coastal Newfoundland (west, northeast and eastern) and throughout the Avalon Peninsula, but not within the Central and Eastern Newfoundland region. Between 2000 and 2005, there were 10 reports of sightings between January and March on the Avalon Peninsula (Schmelzer 2005), and a total of three Christmas Bird Count sightings at St. John's, Cape Race and Stephenville.

4.2.6 Ruffed Grouse

Primary hardwood forest habitat for this species occupies only 9 km^2 (less than 1 percent of the Study Area) in Labrador and is not found at all on the Island portion of the Study Area (Minaskuat Inc. 2009a). Secondary habitat consists of cutover, mixedwood forest, wetland and scrub/heathland/wetland habitats, where regenerating species and willows and other shrubs can be an important supplementary food source. While not included in the ELC (Minaskuat Inc. 2009a), riparian habitat is considered secondary quality habitat for this species.

Ruffed Grouse, though a resident species throughout the Study Area, have a relatively limited distribution reflective of the low levels of preferred habitat in the province in general. Observations of this species during baseline studies in support of the Project were few and consisted of one observation in a wetland habitat in the Low Subarctic Forest Ecoregion and one in mixedwood forest habitat in the Central Newfoundland Forest Ecoregion during passerine surveys, as well as one record in primary hardwood habitat (Southeastern Labrador, Ecoregion unknown) and one other in conifer forest habitat on the Island (Ecoregion unknown).

4.2.7 Common Nighthawk

Common Nighthawk breed in Labrador, but are extremely rare, if present, on the Island of Newfoundland (Environment Canada 2009). Primary habitat for this species consists of cutover, burn, open conifer and black spruce lichen habitats. Combined, these habitats comprise 1,875 km^2 (29 percent) of the Study Area in Labrador. Primary habitat for this species is virtually absent from the Forteau Barrens Ecoregion (0.25 percent), but comprises between 33 percent and 39 percent of the other two main Ecoregions in the Study Area in Southeastern Labrador. Primary habitat is also relatively high (38 percent) in the High Boreal Forest Ecoregion, but this (as well as the Mid-Boreal Forest Ecoregion, where 6 percent of the area is considered primary habitat) overlaps less than 3 percent of the Study Area.

Common Nighthawks were not observed during baseline surveys in support of this Project and this species was also not recorded during 13 years of the operation of the Happy Valley Breeding Bird Survey (Sauer et al. 2007). Members of the Study Team that are resident in Happy Valley-Goose Bay regularly observe this species within the community during summer months.

4.3 Summary

The information provided in this *Avifauna Component Study* has identified key species and their habitats that occur in the Study Area and has provided detailed information on the existing conditions and status of these species, based on original field work, a review of relevant literature and associated habitat potential mapping.

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Wiggins, D.A., D.W. Holt and S.M. Leasure. 2006. Short-eared Owl (*Asio flammeus*). In: A. Poole (ed.). The Birds of North America Online, Cornell Lab of Ornithology, Ithaca. Retrieved from the Birds of North America Online: *http://bna.birds.cornell.edu/bna/species/062*

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APPENDIX A

Select Annotated Bibliography

APPENDIX A

Existing and available information on avifauna was compiled through library and internet searches and through meetings with government departments and other organizations. The results of these efforts is an annotated bibliography that lists and describes relevant large mammal studies completed in Newfoundland and Labrador during the past approximately 20 years. Documents related to avifauna are presented separately, below. For a complete list of references and literature cited in this *Avifauna Component Study,* please refer to Section 5.0.

WATERFOWL

Adams, P.A. 1999. Time-activity Budgets of Harlequin Ducks (*Histrionicus histrionicus*) Molting at the Gannet Islands, Labrador. B.Sc dissertation, MUN.

Time-activity budgets were calculated for molting Harlequin Ducks on the Gannet Islands of Labrador (north of the Strait of Belle Isle and outside the transmission ELC study area), since little is known about their molting behavioural ecology. A comparison of males during body and wing molt was carried out. Female time-activity budgets were compared during wing molt only.

Adams, P.A., G.J. Robertson and I.L. Jones. 2000. Time-activity budgets of Harlequin Ducks mounting in the Gannet Islands, Labrador. *The Condor* 102: 703-708.

The time-activity budgets of molting Harlequin Ducks were calculated during the summer of 1998 (north of the Strait of Belle Isle and outside the transmission ELC study area). These ducks do not appear to increase their food intake to meet the nutritional requirement of molt. Instead, they may try to reduce thermoregulatory and maintenance costs by engaging in activities that do not consume much energy. They may deliberately lose body mass while molting to regain the ability to fly at an earlier stage of wing molt.

AGRA Earth & Environmental Ltd. and Harlequin Enterprises. 1999. Churchill River Power Project: LHP98-01 Waterfowl, Final Report. Unpublished report prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Both aerial and ground waterfowl surveys were conducted May through July 1998 at mouths of major rivers and along the Transmission Corridor throughout Labrador and Newfoundland. These surveys covered staging, breeding and brood rearing periods for waterfowl. Concentrations of waterfowl were noted in several locations and potential sensitive habitat was identified. Review of previous (historical records) was also included.

Bateman, M.C. 1992. Harlequin Duck Survey on Selected Rivers on the Lower Churchill River Watershed - June 1992. Unpublished report, Canadian Wildlife Service, Atlantic Region, Sackville, NB.

Results of cooperative surveys by the CWS for the Lower Churchill Development Corporation are presented for 11 rivers or brooks in 1992 (included the Southeastern Labrador Region). Harlequin Duck was recorded at Beaver Brook (four pairs) and Fig River (single male) and sites where they had not been previously recorded (nine individuals). These ducks displayed site tenacity suggesting they were on breeding territory.

Bateman, M.C. and Hicks, A.H. 1995. Waterfowl populations in Labrador. A data compilation and analysis. Canadian Wildlife Service, Environment Canada.

The authors reviewed a compilation of data pertinent to the low-level military training avoidance monitoring program for waterfowl in Labrador (includes Southeastern Labrador Region). Staging, breeding and molting area data are presented for Canada Goose and other species of waterfowl, with emphasis on Harlequin Duck. Recommendations for avoidance during critical time periods are also presented.

Bateman, M.C. and Hicks, A.H. 1999. Waterfowl Populations in the Low-level Training Area of Labrador - A Data Compilation and Analysis. Unpublished report commissioned by Department of National Defence, Goose Bay Office, Ottawa, ON. Canadian Wildlife Service, Atlantic Region, Sackville, NB.

This compilation of data came from a variety of surveys carried out by the CWS and consultants from 1995 to 1998 in the low-level training area in Labrador. It includes data on breeding, molting and staging waterfowl (includes the Southeastern Labrador Region).

Brodeur. S. 1997. Étude des déplacements du Arlequin plongeur á l'aide de radio-émetteurs (*Histrionicus histrionicus*). Report presented to the Canadian Wildlife Service, Québec Region, Sainte-Foy, Québec.

The dispersion of male Harlequin Duck migrating at Forillon National Park was examined and breeding and molting areas were located. A description of the breeding areas, as well as an estimation of pair densities and a documentation of habitat use and movements, was undertaken. Three males were equipped with satellite transmitters to monitor their movements. Probable molting areas and migratory stopover sites were identified (included Southeastern Labrador Region). Wintering areas (in Greenland) were identified for two of the Harlequin Duck. Three rivers in Quebec were surveyed and results indicate that pair densities were low. Three nests were discovered, representing the first nesting records for the eastern North American Harlequin Duck population.

Brodeur, S., J-P.L. Savard, M. Robert, P. Laporte, P. Lamothe, R.D. Titman, S. Marchand, S. Gilliland and G. Fitzgerald, 2002. Harlequin Duck (*Histrionicus histrionicus*) population structure in eastern Nearctic. *Journal of Avian Biology* 33(2): 127-137.

Twenty-five male Harlequin Duck from Forillon National Park, Quebec, Hudson Bay, Ungava Bay and Labrador (north of Southeastern Labrador Region) were fitted with satellite transmitters. The objective was to determine relationships between breeding, molting and wintering areas. Results suggest presence of two demographically distinct population segments in eastern North America.

Chaulk, K. and B. Turner. 2007. The timing of waterfowl arrival and dispersion during spring migration in Labrador. *Northeastern Naturalist* 14(3): 375-386.

Weekly aerial surveys of waterfowl were conducted during 27 April and 29 May, 2000 (included Southeastern Labrador Region). Relative abundance varied by date and location. This report was suggested to possibly serve as baseline data to document effects of climate change or for management of the aboriginal spring waterfowl hunt.

Chubbs , T.E., B. MacTavish, and P.G. Trimper. 2000. Site characteristics of a repetitively used Harlequin Duck (*Histrionicus histrionicus*) nest in northern Labrador. *Canadian Field-Naturalist* 114(2): 324-326.

The first Harlequin Duck nest for Labrador was discovered during ground brood surveys in 1997 along the north coast (Voisey's Bay Mine EA baseline data) (north of Southeastern Labrador Region). Ground brood surveys in the following two years found repeated nesting on this site in 1998.

Chubbs, T.E., B. MacTavish, K. Oram, P.G. Trimper, K. Knox and R.I. Goudie. 2001. Unusual Harlequin Duck, *Histrionicus histrionicus*, nest site discovered in central Labrador. *Canadian Field-Naturalist* 115: 177-179.

A female Harlequin Duck was found nesting 108 m from the nearest river in open spruce-lichen boreal forest during aerial telemetry surveys of adult Harlequin Duck in 1999 (west of the Southeastern Labrador Region). At the time this was only the third nest reported for this species in Labrador.

Chubbs, T.E., P.G. Trimper, G.W. Humphries, P.W. Thomas, L.T. Elson, and D.W. Laing. 2008. Tracking seasonal movements of adult male Harlequin Ducks from central Labrador using satellite telemetry. *Waterbirds* 31 (Special Publication 2): 173-182.

Satellite telemetry was used to determine the migration patterns between breeding, staging and molting areas of adult males in central Labrador (north of Southeastern Labrador Region). Males remained near their May capture locations for an average of 19-20 days before spending an average of 18 and 34 days on the Labrador coast (2001 and 2002, respectively). Thereafter, 7 of the 11 males migrated from the Labrador Coast to three distinct molting areas in Greenland. All signals failed thereafter, but it was suggested that some Harlequin Duck breeding in Labrador may also winter in Greenland.

Erskine, A.J. (Editor). 1987. Waterfowl breeding population surveys, Atlantic Provinces. Occasional Paper No. 60. Canadian Wildlife Service.

Although completed prior to 1989, this compendium of papers presents the state of knowledge regarding waterfowl surveys completed in different regions of Atlantic Canada (includes all corridors associated with this project). Many of these surveys were used to derive density and population estimates including those for Newfoundland and in Labrador.

Fletcher, C. and H. Breeze. 2000. Ashkui Sites in the Low-level Flight Training Area, Labrador. Report prepared for the Institute for Environmental Monitoring and Research, Happy Valley-Goose Bay, NL.

Ashkui (areas of temporary or permanent open water during winter) are described, as well as temporal and geographic overlap of ashkui and the Low-level Training Area of Labrador (includes the Southeastern Labrador Region). Of relevance is the description of wildlife that use ashkui – that includes many waterfowl and mammalian species.

Gilliland, S.G., G.J. Robertson, M. Robert, J-P.L. Savard, D. Amirault, P. Laporte and P. Lamothe. 2002. Abundance and distribution of Harlequin Ducks molting in eastern Canada. *Waterbirds* 25: 333-339.

Aerial, boat and ground surveys were completed over a 10-year period (1989 to 1999) in coastal areas of Quebec, Labrador and Newfoundland to locate molting areas of Harlequin Duck. Coastal areas of southern Labrador (including within the Strait of Belle Isle and north of the Study Area), Grey Islands in northern Newfoundland, and Bonaventure and Anticosti Islands in southern Québec were surveyed. With the identification of these sites, monitoring and protection of them, if necessary, can be considered.

Gilliland, S., C. Lepage, J-P.L. Savard, D. Bordage and G. Robertson. 2008. An Assessment of Distribution and Abundance of Surf and Black Scoters Breeding within the Eastern Section of Labrador Low-level Flight Training Area 732. Prepared for the Institute for Environmental Monitoring and Research, Happy Valley-Goose Bay, NL.

Systematic sampling with aerial surveys was carried out: 1) to assess the breeding distribution and abundance of Scoters as central Labrador (includes Southeastern Labrador Region) is core for these species in eastern Canada; 2) to assess habitat use of Scoters; and 3) to determine breeding distributions for Lesser and Greater Scaup and Ring-necked Duck. Scoters were the most widely distributed waterfowl. Greater Scaup was observed in more plots than Lesser Scaup but in fewer numbers. Green-winged Teal was most widely distributed dabbling duck. Common Goldeneye was the most numerous diving duck.

Goudie, R.I., D. Lemon and J. Brazil. 1994. Observations of Harlequin Ducks, other waterfowl and raptors in Labrador, 1987-1992. Technical Report Series No. 207. Canadian Wildlife Service, Atlantic Region, Environmental Conservation Branch, Newfoundland

Extensive helicopter surveys during 1987 to 1989 and 1991 examined the distribution of Harlequin Duck and Peregrine Falcon, in particular, throughout coastal and areas of potential interior habitat in Labrador. The breeding distribution of the Harlequin Duck appeared centered from the Makkovik area north to Ramah Bay and on tributaries of the Churchill River. Peregrine Falcon was documented throughout most of coastal Labrador (north of the Southeastern Labrador Region). Considerable data were collected on other waterfowl and raptor species.

Goudie, R.I. and S. Gilliland. 2008. Aspects of distribution and ecology of Harlequin ducks on the Torrent River, Newfoundland. *Waterbirds* 31: 92-103.

As a result of proposed hydroelectric development on the Torrent River watershed (within the Northern Peninsula Region) Harlequin Duck were studied from 1993 to 2000. Researchers identified arrival times, locations of spring-pair activity, nesting sites and brood rearing sites. Time-activity budgets were calculated based on behavioural observations. The population growth rate of these birds was comparable with this species at other locations in insular Newfoundland. A high rate (compared to other watersheds) of brood production in 1997 and 1998 suggests that the birds in the Torrent River system may serve as a source population for the general region of northern Newfoundland.

Goudie, R.I. 1989. Historical status of Harlequin Duck wintering in eastern North America - A reappraisal. *Wilson Bulletin* 101: 112-114.

After closer examination of historical data, the author concludes that Harlequin Duck may never have been as numerous as other sea ducks wintering in eastern North America (including areas within Newfoundland and Labrador). The population may be at or near minimum viable population size with present population less than 1,000 individuals.

Goudie, R.I. 1991. Harlequin Duck and Other Waterfowl Surveys of the Lower Churchill River Watershed, 3-5 June 1991. Unpublished Report, Canadian Wildlife Service, St. John's, NL.

Aerial surveys (in association with the generation project) were conducted along seven tributaries of the lower Churchill River (included Southeastern Labrador Region) because: 1) this river valley had previously not been identified as an important waterfowl area; and 2) due to the *Endangered* status of this species being proclaimed in 1990. A total of 13 Harlequin Duck and a variety of other waterfowl were recorded. Habitat was assessed and raptor and mammal observations recorded. Recommendations were made regarding timing of waterfowl surveys and areas to be surveyed.

Goudie, R.I. 1991. Status Report of the Harlequin Duck (eastern population) *(Histrionicus histrionicus)*. Committee on the Status of *Endangered* Wildlife in Canada, Ottawa, ON.

Summarizes the distribution, breeding and wintering ranges of various Harlequin Duck populations (including those that occur within Newfoundland and Labrador). Recommendations and management options are presented as the author suggests the possible extinction of the eastern North American population that was considered low (less than 1,000 individuals).

Goudie, R.I. and I.L. Jones. 2005. Feeding behaviour of Harlequin Duck (*Histrionicus histrionicus*) breeding in Newfoundland and Labrador: A test of the food limitation hypothesis. *Bird Behavior* 17: 1056-1383

Foraging behavior and productivity of Harlequin Duck are compared in Newfoundland in 1997 and 1998, and central Labrador 1997 to 2002 (includes Southeastern and Northern Peninsula Regions). The analysis tested predictions that productivity of this species is limited by available food. There was no support for the paradigm that females were constrained by lack of sufficient food on their breeding habitat and deferred breeding, although it is suggested this sea duck may defer breeding in some years.

Goudie, R.I. and W.R. Whitman. 1987. Waterfowl populations in Labrador, 1980-82. Pp. 45-60. In: A.J. Erskine (ed.). Waterfowl Breeding Population Surveys, Atlantic Provinces, Canadian Wildlife Service Occasional Paper No. 60.

Extensive aerial and ground surveys were conducted by CWS in 1980 to 1982 in southern Labrador (includes Southeastern Labrador Region). The objective was to estimate species composition and populations and flyway contributions. Results confirmed that the Smallwood Reservoir Ecoregion is the most productive waterfowl breeding area in southern Labrador. Findings support general population trends in that Canada Goose populations are increasing and American Black Duck are decreasing. Labrador was estimated to contribute 40 percent of the North Atlantic flyway stock.

Heath, J.P. 2001. Factors Influencing Breeding Distributions of Harlequin Ducks *Histrionicus histrionicus* in Northern Labrador: A Multi-scale Approach. Draft thesis submission, MUN.

The aim of this research was to evaluate the importance of predation, intraspecific competition, biophysical features and prey abundance in determining the distribution of Harlequin Ducks breeding in northern Labrador.

Jacques Whitford. 2002. Demonstration Windpower Project St. Lawrence Bird Surveys. Report prepared for Newind Group. Montreal, QC.

No previous bird surveys were known for the St. Lawrence area; therefore, these surveys served as qualitative and quantitative baseline data (south of the Central and Eastern Newfoundland and Avalon Regions). The survey also documented information on migration timing and routes. Spring, fall and resident bird surveys were conducted to help determine exact placement location of wind turbines. Operational monitoring was completed to gather information on birds in the St. Lawrence area regarding bird-turbine interactions.

Jacques Whitford. 2001. Military Low-Level Flying Residual Effects Monitoring Study. Report prepared for Goose Bay Office, National Defence Headquarters, Ottawa, ON.

This study examined the possible population-based effects of low-level military training on sensitive wildlife (includes Southern Labrador Region). Known nest sites were surveyed. Based on results from surveys in 1997 and 2000, there has been no demonstrable change in the level of raptor nesting activity that differs from that observed in the adjacent control area since the period of low-level flight training during 1993-1995. Harlequin Duck numbers also remained consistent with the values reported previously, with no suggestion of previous effects of low-level flying regarding the number of breeding pairs in the study area.

Jacques Whitford. 1999. Distribution of Harlequin Ducks within the Military Training Area of Labrador and Northeastern Quebec, 1998. Report prepared for Goose Bay Office, National Defence Headquarters, Ottawa, ON.

This study continued surveys for breeding pairs of Harlequin Duck in central Labrador. A cooperative agreement was reached between Department of National Defence (DND) and the Labrador Hydro Project (LHP) to share data since there was an overlap in the area of interest (i.e., the lower Churchill River watershed, which therefore includes Southeastern Labrador Region). A total of 26 breeding pairs, seven lone males and two lone females on 11 rivers were observed during DND surveys and 89 individuals on 10 rivers were found during the LHP surveys. The study confirmed that pairs are highly mobile until late May. Additional surveys for this species were recommended to avoid potential disturbance by low-level flight training.

Jacques Whitford. 1995. 1994 Avoidance Monitoring Program Raptor/Harlequin Duck GB 475 01. Report prepared for the Goose Bay Office, National Defence Headquarters. Ottawa, ON.

The annual monitoring of the Low-level Training Area (includes Southeastern Labrador Region) that began in 1991 was expanded in 1994. In this year, a higher level (than in previous years) of nesting activity was detected, with 5,246 linear km of habitat surveyed and 125 active raptor nests recorded. The number of Harlequin Duck observed was greater than in previous years, with 47 sightings totaling 104 individuals. Also in this year, a Phase III set of surveys to assess number of nestlings in control and experimental areas was undertaken. Nest success and number of young to fledge was also determined.

Jacques Whitford.1995-1998. Distribution of Breeding Harlequin Duck within the Low-level Training Area of Labrador and Northeastern Quebec. Final Reports # 840 and # 1158-1479 prepared for PMO Goose Bay, National Defence Headquarters, Ottawa, ON.

This research was a continuation of annual surveys for this species started in 1992. The emphasis in 1995 and 1996 was on rivers not previously flown and believed to be of lower potential for Harlequin Duck. Approximately 905 linear km of habitat was surveyed during the breeding pair period in 1996 and presence was confirmed on six rivers. No sightings were recorded on river surveys south of the Churchill River drainage area (includes Southeastern Labrador Region). However, this species have now been observed at low densities on 11 rivers within the existing Low-level Training Area. In 1998, surveys for breeding pairs of Harlequin Duck on the Ungava Peninsula were completed within the Low-level Training Area and focused on higher quality breeding habitat during late May to early June. The emphasis was on rivers and tributaries located in the southern portion of the Low-level Training Area. Approximately 888 km of the most productive river valley habitat was examined, with 61 individuals located on 11 rivers.

Jacques Whitford. 1995. Migratory Birds Component Study for the Star Lake Hydroelectric Project Environmental Impact Statement. Report prepared in St. John's, NL.

This baseline program involved several methods to determine waterfowl habitat potential in the vicinity of a proposed hydroelectric project in central Newfoundland (south of the Central and Eastern Newfoundland Region). Aerial and ground surveys in 1995, a literature review and an ELC were completed to create a habitat classification map. The fen-dominated wetland was the most attractive habitat for Canada Goose. Ring-necked Duck and were also common in wetlands; Common Goldeneye and Common Merganser were common in waterbodies surrounded by forest. Other species of avifauna were noted when encountered during aerial surveys.

Jacques Whitford. 1996. Environmental Baseline Technical Data Report Terrestrial Program. Prepared for the Voisey's Bay Mine/Mill Project EIS, St. John's, NL.

A series of baseline programs including ELC, waterfowl, seabird, raptor and other wildlife surveys and programs were completed over different seasonal periods during 1995-1996. The work was completed in support of a proposed nickel mine at Voisey's Bay in northern Labrador (north of the Southeastern Labrador Region). Important areas of concentration during staging and breeding were identified and considered in the design of the project and subsequent effects assessment.

Jacques Whitford. 1996. 1995 Raptor/Harlequin Duck Monitoring Program. Jacques Whitford Environment Limited Final Report prepared for PMO Goose Bay, National Defence Headquarters, Ottawa, ON.

This research was a continuation of nest research that began in 1991 (includes Southeastern Labrador). In 1995, 214 active raptor nests were found along 6,026 linear km of habitat. This is higher nesting activity than in previous years. Harlequin Duck sightings were lower in this year, with 49 individuals found in 18 sightings. Other species' nests and sightings were also recorded.

Jacques Whitford. 1998. Trans Labrador Highway (Red Bay to Cartwright) Environmental Assessment. Report # 1152 prepared for the Department of Works, Services and Transportation, St. John's, NL.

This EA examined a 325 km highway along the south coast of Labrador (includes Southeastern Labrador). Several component studies for wildlife including waterfowl, passerines and birds of prey were completed using a combination or aerial and ground surveys. Areas expected to be used by waterfowl for breeding, molting or staging were of particular importance. No location of particular sensitivity or importance at a population level for waterfowl was found within the study area. No Harlequin Duck were observed on the surveyed rivers. Small numbers of molting American Black Duck and Canada Goose were observed. The proposed highway will be inland from fall staging areas. There was little suitable tree nesting habitat for birds of prey found in the study area. As well, sub-optimal foraging opportunities for Bald Eagle and Osprey was detected. It was suggested that low densities of other raptor species occur in the study area.

Jacques Whitford. 1999. Baseline Monitoring Study: CFB Goose Bay, Labrador. Prepared for Defence Construction Canada, Ottawa, ON.

Examined areas within and adjacent to the Low-level Training Area through aerial surveys in 1997 and 1998. Moose, birds of prey and waterfowl were compared in terms of habitat potential and occurrence in an area east of the Military Training Area (includes Southeastern Labrador Region).

Jones, C. and R.I. Goudie. 2008. Surveys for Monitoring Trends of Harlequin Duck in Labrador and Newfoundland, 2008: Final Report. Report No. SA933. Report by LGL, Happy Valley-Goose Bay, NL, prepared for the Institute of Environmental Monitoring and Research, Happy Valley-Goose Bay, NL.

This was the third year (2008) of a large-scale monitoring program to detect possible changes in Harlequin Duck numbers as a possible result of lifted military aircraft closures within the Low-level Training Area (includes Southeastern Labrador Region) in 2004. Aerial surveys were conducted in both study and control areas covering a total of 43 rivers in Labrador and Newfoundland (includes Northern Peninsula Region). The 2008 surveys resulted in higher estimates of indicated breeding pairs than located on previous surveys. Overall densities were higher in central Labrador outside the Low-level Training Area, and higher in the southern and northern control areas than inside the Low-level Training Area. Interpretations were limited by high inter-year variation and by only three years of survey data to date.

LGL Limited. 2007. Barrow's Goldeneye Habitat Identification and Population Survey. Prepared for the Institute for Environmental Monitoring and Research, Happy Valley-Goose Bay, NL.

Aerial surveys were conducted in June 2007 on 14 sample plots of greatest habitat potential in central Labrador (north of the Southeastern Labrador Region). No observations of Barrow's Goldeneye were recorded. Other species observed included Surf Scoter, White-winged Scoter and Harlequin Duck. Rusty Blackbird, a species of special concern, was found at half of the plots.

LGL Limited. 2008. Waterfowl in the Lower Churchill River Area. Prepared for Minaskuat Inc. and Newfoundland and Labrador Hydro, Lower Churchill Hydroelectric Generation Project. St. John's, NL.

Spring staging, early nesting and late-nesting breeding pair and brood surveys were completed within the lower Churchill River watershed during 2006-2007 (includes Southeastern Labrador Region). Surveys were completed by helicopter, boat and ground, with observations linked to habitat type and location in association with this baseline research for the EA of the proposed Lower Churchill Hydroelectric Generation Project. Canada Goose, scoters, American Black Duck and other species of waterfowl were recorded.

Lock, A.R. [No Date-since 1980]. A Census of Common Eiders Breeding in Labrador and the Maritime Provinces. [No publication]. Pg. 30-38.

This was the first census of the Labrador-breeding Common Eider population. Two careful colony counts were carried out to test the accuracy of aerial counts. In two areas of Labrador, a total of 4864 nests were found (ground surveys). During the aerial surveys, 5,419 adult males were counted in the same areas.

Minaskuat Limited Partnership. 2005. Jet, Rotary and Fixed-wing Propeller-driven Aircraft Effects on Nesting Canada Geese (*Branata canadensis*). Final Report prepared for the Institute of Environmental Monitoring and Research, Happy Valley-Goose Bay, NL.

An examination of behavioural reactions of nesting (incubating) Canada Goose to noise and visual disturbances associated with low-flying aircraft was completed in central Labrador (includes Southeastern Labrador). The objective was to investigate whether maximum sound pressure levels resulting from directed military jet aircraft activities interferes with the reproductive activities or nest attendance by Canada Goose. There were 133 overflight/noise events observed around active nests. The response to helicopter approaches were also investigated and found to cause more extreme reactions by attending adult geese. Various responses measured included flushing, exposure of eggs, time away from nest and response to avian and mammalian predators.

Robert, M. and J-P.L. Savard. 2008. Survey of Barrow's Goldeneye in Southern Labrador and on the Quebec North Shore (Spring 2008). Prepared for Institute for Environmental Monitoring and Research, Happy Valley-Goose Bay, NL.

Aerial surveys were completed over areas of highest potential based on habitat relationships from observations elsewhere in eastern Canada. The objective was to determine if Barrow's Goldeneye was present in Labrador and along the Quebec north shore. This species is associated with high altitude and fishless lakes. No observations of breeding were recorded for this species in Southeastern Labrador Region, although 12 other species of waterfowl and Common Loon were noted.

Robert, M., D. Bordage, J-P.L. Savard, G. Fitzgerald and F. Morneau. 2000. The breeding range of the Barrow's Goldeneye in eastern North America. *Wilson Bulletin* 112(1), pp 1-7.

This large-scale study provided insight into Barrow's Goldeneye and their breeding in eastern North America. Barrow's Goldeneye was found on 137 lakes and five rivers in the Quebec Laurentian Highlands that were surveyed from 1990 to 1998. Most of these locations were on small lakes (<10 ha) at greater than 500 m elevation. Over 96 percent of these lakes were within 100 km of the St. Lawrence River and 49 percent were headwater lakes. Four broods observed were the first documentation of breeding Barrow's Goldeneye in

eastern North America. The authors suggest that the north shore of the estuary and gulf may be the core breeding area for Barrow's Goldeneye wintering along the St. Lawrence River.

Robertson, G.J., G. Mittelhauser, T.E. Chubbs, P.G. Trimper, R.I. Goudie, P.W. Thomas, S. Brodeur, M. Robert, S.G. Gilliland and J-P.L Savard. 2008. Morphological variation among Harlequin Ducks in the Northwest Atlantic. *Waterbirds* 31 (Special Publication 2): 194-203.

Harlequin Duck were captured and measured at a variety of staging, breeding, molting and wintering sites across their Northwest Atlantic range from 1996 to 2002 (west of the Southeastern Labrador Region). Major differences among sites were not apparent. Morphological data support satellite and banding data that these sites are linked.

Rodway, M.S. 1998. Habitat use by Harlequin Ducks breeding in Hebron Fiord, Labrador. *Canadian Journal of Zoology* 76: 897-901

This study was conducted on the lower 10 km of all larger streams emptying into Hebron Fiord, Labrador (north of the Southeastern Labrador Region) from June to August 1996. After observations to determine which streams were used and unused by Harlequin Duck, used streams were selected in the same part of the fiord as unused streams for study purposes. Habitat characteristics were noted for each and bottom kick samples were carried out to sample invertebrates. Used streams were narrower, had higher pH and temperature, a larger substrate, steeper shorelines, and greater vegetation cover on islands and shorelines than unused streams. Greater numbers of invertebrates were recovered from kick samples. Certain larvae were more frequent in used streams than others.

Rodway, M.S., J.W. Gosse, I. Fong and W.A. Montevecchi. 1998. Discovery of a Harlequin Duck nest in Eastern North America. *Wilson Bulletin* 110: 282-285.

Continuous observations of Harlequin Ducks on Harlequin Brook in Hebron Fiord (north of Southeastern Labrador Region) during summer of 1996 revealed higher numbers of females than males, which is contrary to reported data in other locations. Also, nesting Harlequin Duck were confirmed by presence of nest with eggs and downy chicks. Hatching occurred the last week of July, which is similar to dates reported for Iceland but two to four weeks behind other hatching dates reported in various locations around North America. This information suggests that pair count surveys in northern Labrador should be conducted mid-June and brood counts in early August.

S. Fudge and Associates Limited. 1989. Identification of Spring Staging Areas Utilized by Waterfowl on the Ungava Peninsula. Report F-209 prepared for Department of National Defence, Ottawa, ON.

This waterfowl survey was conducted to identify locations and timing of spring staging concentration of waterfowl within the present and proposed Low-level Flight Training Areas (includes Southeastern Labrador Region). Recommendations indicated that concentrations of waterfowl be avoided by 3.0 km to minimize the disruption to waterfowl at this time of year.

Soulliere, C.E. and P.W. Thomas. 2009. Harlequin Duck Threat Assessment: Eastern Population. Environment Canada Technical Report Series # 491.

Potential and plausible threats to Harlequin Duck in eastern Canada (includes areas throughout Newfoundland and Labrador) were evaluated. Recommendations for threat management and avenues for threat mitigation are discussed within the provincial analyses. This document is intended to be used as a resource and guide for those with a practical interest in the minimization of threats to this species.

Species at Risk Act* Public Registry (*SARA*). 2008. Harlequin Duck Eastern population Species Profile. Available at: *http://www.SARAregistry.gc.ca/species/speciesDetails_e.cfm?sid=22#ot12.

The COSEWIC designation and all aspects of this species covered here (description, distribution and population, life history, range, habitat, biology and threats). The recovery progress of this species and activities are also outlined here.

Tecsult Inc. 1998. Raptors/Harlequin Ducks Residual Impacts Monitoring Study. Prepared for the Department of National Defence, Ottawa, ON. DCC Project # GB 675 02.

Breeding population data from aerial surveys were compared to previous results from the same area that were obtained during low-level flying (north of Southeastern Labrador Region). The objective was to assess the usefulness of establishing exclusion zones for active raptor nests and Harlequin Duck sightings to reduce potential effects on reproductive success. A total 102 and 134 raptor nest structures were checked in the experimental area and in a northern control block, respectively. Conclusions included that the usefulness of exclusion zones was not clearly demonstrated during this research. The most critical period for cliff nesting raptors may be earlier during courtship and nest initiation.

Thomas, P.W. 2008. Harlequin Ducks in Newfoundland. *Waterbirds 31* (Special Publication 2): 44-49.

Relatively low numbers are present year-round. Breeding is largely restricted to the Northern Peninsula. Molting areas occur near the Grey Islands and wintering areas are along the south coast. Numbers have been increasing since the 1990s, although reduced from historic periods.

Trimper, P.G., P. Thomas and T.E. Chubbs. 2008. Harlequin Ducks in Labrador. *Waterbirds 31* (Special Publication 2): 32-43.

Reviews over 800 helicopter survey hours on at least 111 river systems/sections and during late May-early June (July in most northern areas) from 1987 to 2008 (includes Southeastern Labrador Region). Presence of the species was widespread and confirmed on approximately 67 percent of the areas examined. It is estimated that 395 breeding pairs occur on rivers where presence has been confirmed. Harlequin Duck are common in Labrador, and the population appears to be stable or increasing.

Turner, B. and A. Hicks. 2003. Breeding population trends in Black Ducks and Canada Geese in the low level flight training area of Labrador. Pp. 29-36 In: M. Baker and G. Belliveau (eds.). Proceedings of Waterfowl Conference 2002, Goose Bay, Labrador. Terra Borealis, 3.

Waterfowl breeding population levels and changes were monitored over several years on a number of study plots within treatments (overflight activity) and control areas (includes Southeastern Labrador Region). The densities of American Black Duck and Canada Goose were highly variable within and across treatments, reflecting both diversity of sampled habitat and the habitat preference of the species. Findings suggested the

current level of low-level jet flight activity had not adversely affected the breeding population trends for these two species. However reduced reproductive success at treatment sites may be a possibility.

Turner, B. and K. Chaulk. 2000. Waterfowl Use of Spring Staging Areas in the Eastern Portion of the Low-level Flight Training Area of Labrador. Unpublished Report prepared for Goose Bay Office, Department of National Defence, Ottawa, ON.

Study sites were selected from south, central and northern areas of the Low-level Training Area. Weekly aerial surveys were flown from 27 April–27 May 2000 (includes Southeastern Labrador Region). The authors looked at the spatial distribution of spring staging areas in Labrador and the temporal distribution of waterfowl use at these sites. As well, the relative importance of these areas to migrant waterfowl was assessed. Ashkui sites and potential areas for avoidance were noted.

Voisey's Bay Nickel Company. 2000. 1999 Harlequin Duck Monitoring Report: Breeding Pairs Survey and Brood Survey. St. John's, NL.

Helicopter surveys were conducted to examine population size and distribution, as well as habitat use within the vicinity of the mine under construction (north of Southeastern Labrador Region). The breeding pairs survey conducted in June revealed a total of 29 breeding pairs and five single males and three single females. Seven Harlequin Duck broods were located throughout a subsequent aerial survey in July. All other wildlife observations were also recorded.

PASSERINES

Dalley, K., K. Powell, and D. Whitaker. 2005. The Status of Grey-cheeked Thrush (*Catharus minimus*) in Newfoundland and Labrador. Prepared for the Newfoundland and Labrador Species Status Advisory Committee.

This status report presents the known breeding distribution and biology of this species in the province, as well as provides information on population size and trends, habitat preferences, and threats and limiting factors. This species has been protected since 1916 under the *Migratory Birds Convention Act*; some authors believe Grey-cheeked Thrush breeding on insular Newfoundland and the lower north shore of the Gulf of St. Lawrence are a distinct subspecies known as Newfoundland Grey-cheeked Thrush (*Catharus minimus*) with birds in the remainder of the species' range classified as Northern Grey-cheeked Thrush (*Catharus aliciae*).

Gosse, J., W. Montevecchi, M. Setterington and D. Whitaker. 1994. Birds as Bio-Indicators in Western Newfoundland Forests. Report 2-205-005 prepared for Western Newfoundland Model Forest, Corner Brook, NL.

The authors summarize three research projects. Findings were: raptor numbers are low in homogeneous balsam fir forests of Western Newfoundland (includes a portion of the Central and Eastern Newfoundland Region); habitat destruction and fragmentation causes raptor declines; the distribution of insect infested trees may be important for the rare Three-toed Woodpecker; and bird communities in clearcuts are different than those found in woodlands.

Jacques Whitford. 2002. Demonstration Windpower Project St. Lawrence Bird Surveys. Report prepared for Newind Group. Montreal, QC.

No previous bird surveys were known for the St. Lawrence area; therefore, these surveys served as qualitative and quantitative baseline data (south of the Central and Eastern Newfoundland and Avalon Regions). The survey also documented information on migration timing and routes. Spring, fall and resident bird surveys were conducted to help determine exact placement location of wind turbines. Operational monitoring was completed to gather information on birds in the St. Lawrence area regarding bird-turbine interactions.

Jacques Whitford. 1996. Environmental Baseline Technical Data Report Terrestrial Program. Prepared for the Voisey's Bay Mine/Mill Project EIS, St. John's, NL.

A series of baseline programs including ELC, waterfowl, seabird, raptor and other wildlife surveys and programs were completed over different seasonal periods during 1995-1996. The work was completed in support of a proposed nickel mine at Voisey's Bay in northern Labrador (north of the Southeastern Labrador Region). Important areas of concentration during staging and breeding were identified and considered in the design of the project and subsequent effects assessment.

Jacques Whitford. 1996. Avifauna Inventory Terra Nova National Park 1995-1996. Prepared for Terra Nova National Park. Glovertown, NL.

Sightings from large (7 to 7.5 ha) breeding bird plots, point sample transects, trails, aerial waterfowl, shorebird and coastal boat surveys were combined with incidental observations during 1995 in this National Park (includes Central and Eastern Newfoundland Region) inventory. Species of avifauna in the Park were described by abundance and associated habitat type. Recommendations for future monitoring of species and species groups particular in association in areas of natural or other disturbance.

Jacques Whitford. 2003. Songbird Inventory: Central Labrador. Data Report prepared for Department of Works, Services and Transportation, St. John's, NL.

Forest passerine surveys were conducted in selected plots representative of the Ecoregions traversed by the proposed highway route (includes Southeastern Labrador Region) for the purposes of documenting species diversity and their relative abundance within a defined area. Thirty-nine avifauna species were identified at the Lake Melville Block, 45 species at the Mecatina River block, 51 species in the Eagle Plateau block, and 41 species in the Paradise River block. Fourteen of 71 species were confirmed breeding, 23 were considered probably breeding and the remainder was considered possibly breeding.

Minaskuat Inc. 2009. Labrador-Island Transmission Link: Forest Songbird Surveys. Draft Report prepared for Nalcor Energy, St. John's, NL.

A large-scale study of forest passerines carried out from 19 June to 2 July, 2008, along the entire length of the 15 km wide Study Area (includes all Regions). Songbird surveys were completed along 33 transects within nine major Ecoregions and 14 habitat types transected by the Study Area. A total of 4,308 birds representing 87 species were recorded at 321 point counts. This included 57 species of passerines, 19 species of water birds, five species of woodpeckers, four species of birds of prey, and two species classified as 'other'. Warblers (18 species) and sparrows (nine species) were the most diverse families. The most abundant species were White-throated Sparrow, Yellow-bellied Flycatcher, American Robin, Fox Sparrow, and Northern Waterthrush. Songbird species diversity ranged from 6.6 species per survey point in the Long Range Barrens to 10.4 in the Forteau Barrens, and mean abundance from 9.4 individuals per point in the Maritime Barrens to 19.5 in the Forteau Barrens. Overall species richness ranges from 25 species in the Avalon Forest to 58 in the Central Newfoundland Forest (this may be indicative of sampling effort – 11 points on the Avalon Peninsula, and 104 in Central and eastern Newfoundland).

Minaskuat Inc. 2008. Forest Songbird Surveys. Prepared for the Lower Churchill Hydroelectric Generation Project, Newfoundland and Labrador Hydro, St. John's, NL.

This report presents the most detailed study to date on breeding passerines in the lower Churchill River valley (includes Southeastern Labrador). Songbird point plot surveys carried out 24 June to 4 July 2006 and 11 to 28 June 2007 along the Churchill River valley and Goose River of Labrador. In 2006, 2,265 individuals representing 42 species of breeding passerines were recorded. In 2007, 5,174 individuals representing 50 species of breeding passerines were recorded. There was considerable variation in distribution of birds by habitat, which was assessed in terms of species richness, abundance and an index of density.

Schwab, F.E., N.P.P. Simon, S.W. Stryde and G.J. Forbes. 2006. Effects of Postfire Snag removal on breeding birds of western Labrador. *Journal of Wildlife Management* 70(5): 1464-1469.

Avifauna surveys were conducted before and after three intensities of snag removal in western Labrador (west of Southeastern Labrador Region). The 100 percent snag removal treatment reduced total bird abundance by 50 percent, but total bird abundance was similar between years on other treatments. Little treatment effect on species richness was observed. The objective was to provide forest managers with opening-size thresholds for specific bird species to help guide salvage logging in snag-forests. The results suggest that on a site-specific basis, all salvage logging is detrimental to bird species conservation. Conserved areas must be large enough to maintain viable populations of these species on the landscape.

Simon, N.P.P., F.E. Schwab and A.W. Diamond. 2000. Patterns of breeding bird abundance in relation to logging in western Labrador. *Canadian Journal of Forestry Research* 30: 257-263.

Songbird studies occurred in western Labrador (west of Southeastern Labrador Region) where there is little productive forest. Research found that logging that conserved 71 percent of the total volume increased bird densities by increasing some early succession bird densities without reducing forest bird densities. Low intensity selective logging was suggested to conserve forest bird species only if volume is retained around this level in perpetuity.

Simon, N.P.P., F.E. Schwab and R.D. Otto. 2002. Songbird abundance in clear-cut and burned stands: A comparison of natural disturbance and forest management. *Canadian Journal of Forestry Research* 32: 1343-1350.

Songbird abundance was compared between burned and clear-cut former black spruce sites after varying years of succession. The importance of natural early succession forests for birds was demonstrated with bird densities and species richness peaking in 14-year-old burn sites. The results indicated that logging does not precisely mimic fire and it was suggested that forest managers allow some forests to burn naturally.

Whitaker, D.M. and W.A. Montevecchi. 1997. Breeding bird assemblages associated with riparian, interior forest, and nonriparian edge habitats in a balsam fir ecosystem. *Canadian Journal of Forest Research* 27: 1159-1167.

Surveys in boreal forest of Western Newfoundland (within and/or immediately adjacent to Northern Peninsula and Central and Eastern Newfoundland Regions) revealed distinct avian assemblages in three different habitat types: riparian edge; nonriparian edge; and interior habitat in balsam fir. A total of 34 species was identified during 117 transect surveys. Total species richness and avian abundance were significantly higher along non-riparian edges. It was noted that the protection of interior birds is warranted and was listed as a management implication resulting from this research.

Whitaker, D.M. and W.A. Montevecchi. 1999. Breeding bird assemblages inhabiting riparian buffer strips in Newfoundland, Canada. *Journal of Wildlife Management* 63: 167-179.

Research to quantify the extent to which buffer strips are used by passerines was carried out in five watersheds in western Newfoundland (within and/or immediately adjacent to Northern Peninsula and Central and Eastern Newfoundland Regions) in 1994 and 1995. Data were compared by species richness and abundance across different habitats. Low numbers of riparian birds were observed and may be due to factors such as low abundance and linear shoreline territories. The authors suggested distinct and separate conservation strategies.

BIRDS OF PREY

Burzynski, M., T. Knight, S. Gerrow, J. Hoffman, R. Thompson, P. Deering, D. Major, S. Taylor, C. Wentzell, A. Simpson and W. Burdett. 2005. State of the Park Report, Gros Morne National Park of Canada. An Assessment of Ecological Integrity.

The Park's ecological health is described, to assess the effectiveness of management actions aimed at preserving the Park's ecological integrity, and to identify serious gaps in knowledge of the Park. It was found that the condition and trend of the forest ecosystem is poor and declining, respectively, due to the over-population of moose within the park. The extreme moose density is affecting regeneration of vegetation.

Chubbs, T.E. and P.G. Trimper. 1998. The diet of nesting Osprey, *Pandion haliaetus*, in Labrador. *Canadian Field-Naturalist* 112(3): 502-505.

Nesting Osprey along the Naskapi River, Labrador (north of Southeastern Labrador Region) were observed for identifiable prey during summers of 1995 and 1996 for the purposes of gleaning information about available food sources during this time for this population. A noticeable drop in mammals and birds was observed in the

delivery of food from 1995 to 1996, which may be a factor of: 1) a regional crash in small mammal population in the second year; and 2) inclement weather in 1996, which may have lowered productivity.

Ewins, P.J. and C.S. Houston. 1992. Recovery patterns of Ospreys, *Pandion haliaetus*, banded in Canada up to 1989. *Canadian Field-Naturalist* 106(3): 361-365

An overall recovery rate of 3.7 percent of banded Osprey from records from 1951 up to the end of 1989 was calculated (does not include Newfoundland and Labrador although it does provide relevant insight for the province). This rate is much lower than for same species banded in Europe and United States and may be explained by the difficulty of finding a banded bird on Canadian breeding grounds, or geographical differences in hunting pressure. Migration routes and wintering areas of juveniles appeared to be broadly similar to those of US Ospreys. It was found that only a small number of birds cross into adjacent flyways.

Gosse, J.W., D. Whitaker, W.A. Montevecchi and J. Brazil. 1993. Population, Tropic and Habitat Relationships of Birds of Prey in the Western Newfoundland Model Forest. Report 2-205-002 prepared for the WNMF, Corner Brook, NL.

A portion of the Western Newfoundland Model Forest lies within Ecoregions that are represented by the Project and thus similar avifauna species would be expected. Eight species of birds of prey were found in the Western Newfoundland Model Forest the use of vocalization playback. Raptor diversity, abundance and distribution were investigated through research on habitat and feeding ecology (e.g., small mammal trapping and dietary analysis). It was found that actions and events that change the forest composition will also directly change the populations and community assemblages of birds of prey within it.

Gosse, J.W. 1994. Distribution, feeding and habitat relationships of birds of prey in the Western Newfoundland Model Forest. Report 2-205-003 prepared for the Western Newfoundland Model Forest.

This progress report outlines how the researcher investigated birds of prey within the Western Newfoundland Model Forest (relevant based on common Ecoregions within the Western Newfoundland Model Forest and the Project Study Area). Habitat requirements, prey availability, spatial and temporal distributions, species diversity and abundance were outcomes. As well, the researcher developed census techniques for birds of prey. Findings suggest some raptor species select mature and old growth forests.

Gosse, J.W. and W.A. Montevecchi. 1994. Distribution and relative abundances of birds of prey in different habitat in the Western Newfoundland Model Forest. Report 2-205-004 prepared for the WNMF, Corner Brook, NL.

This is a final report of research presented in Report 2-205-003 (above). The broadcast census technique effectiveness is summarized here. Raptor diversity and abundance, habitat requirements and prey availability and feeding ecology is discussed in detail (relevant based on common Ecoregions within the Western Newfoundland Model Forest and the Project Study Area).

Gosse, J., W. Montevecchi, M. Setterington and D. Whitaker. 1994. Birds as Bio-Indicators in Western Newfoundland Forests. Report 2-205-005 prepared for Western Newfoundland Model Forest, Corner Brook, NL.

The authors summarize three research projects in the Western Newfoundland Model Forest (that are relevant based on common Ecoregions within the Western Newfoundland Model Forest and the Project Study Area). Raptor numbers were low in homogeneous balsam fir forests of Western Newfoundland. Habitat destruction and fragmentation caused raptor declines. The distribution of insect infested trees may be important for the rare Three-toed Woodpecker. Bird communities in clearcuts were different than those found in woodlands.

Jacques Whitford. 2002. Demonstration Windpower Project St. Lawrence Bird Surveys. Report prepared for Newind Group. Montreal, PQ.

No previous bird surveys were known for the St. Lawrence area; therefore, these surveys served as qualitative and quantitative baseline data (south of the Central and Eastern Newfoundland and Avalon Regions). The survey also documented information on migration timing and routes. Spring, fall and resident bird surveys were conducted to help determine exact placement location of wind turbines. Operational monitoring was completed to gather information on birds in the St. Lawrence area regarding bird-turbine interactions.

Jacques Whitford. 2000. Bald Eagle Nest Surveys in Labrador and North Eastern Quebec 1999. Report prepared for Goose Bay Office, National Defence Headquarters, Ottawa, ON.

The identification of active nests in and adjacent to the military training area (includes Southeastern Labrador Region) has been ongoing since 1991. Bald Eagle represent a small proportion of the raptor nests found in this area, with eight active nests producing 1.25 young fledged per active nest in 1999. Their reproductive success in this year appeared consistent with previous years.

Jacques Whitford. 2001. Military Low-level Flying Residual Effects Monitoring Study. Report prepared for Goose Bay Office, National Defence Headquarters, Ottawa, ON.

This study examined the possible population-based effects of low-level military training on sensitive wildlife (includes Southern Labrador Region). Known nest sites were surveyed. Based on results from surveys in 1997 and 2000, there has been no demonstrable change in the level of raptor nesting activity that differs from that observed in the adjacent control area since the period of low level flight training during 1993 to 1995. Harlequin Duck numbers also remained consistent with the values reported previously, with no suggestion of previous effects of low-level flying regarding the number of breeding pairs in the Study Area.

Jacques Whitford. 1992. 1991 Raptor Monitoring Program Goose Bay EIS. LeDrew, Fudge and Associates Ltd Report prepared for PMO Goose Bay, National Defence Headquarters, Ottawa, ON.

Raptor (primarily Peregrine Falcon, Gyrfalcon and Golden Eagle) nests were located during surveys within the Low-level Training Area (north of Southeastern Labrador Region). At this time the Low-level Training Area extended further north (than at present). Surveys were carried out to establish exclusion zones around active nests, from low-level training (effective 1 May to 31 August). Recommendations for further surveys were included.

Jacques Whitford. 1992. 1992 Raptor Monitoring Program: Goose Bay EIS. Report #L-519 prepared for PMO Goose Bay, National Defence Headquarters, Ottawa, ON.

Over 3,500 linear km of habitat was aerial surveyed during 1992. Based on raptor nest results, exclusion zones to low-level flight training at Harp Lake were removed and others were established at areas of confirmed nesting. Other important findings included 19 sightings of 73 Harlequin Duck not previously known and the identification of a possible American Black Duck molting site at Lac Fourmont (within Southeastern Labrador Region).

Jacques Whitford. 1993. Raptor Monitoring Program. Report prepared for PMO Goose Bay, National Defence Headquarters, Ottawa, ON.

Raptor and Harlequin Duck monitoring was continued on the Ungava Peninsula to identify nests of raptor species of special concern (includes Southeastern Labrador Region). This was the first year a control area was flown in the annual program. A total of 4,987 linear km were flown during the 1993 surveys, which identified 70 active raptor nests of species of concern. No difference in nesting activity between control and experimental areas was apparent. Thirty sightings of 67 individual Harlequin Duck and several American Black Duck molting areas were identified.

Jacques Whitford. 1994. Raptor Survey: Pine Cove Distribution Route. Report prepared for Pine Cove Resources Inc, St. John's, NL.

An aerial survey for Bald Eagle and Osprey nests was completed along the proposed 7.4 km distribution line route in Newfoundland (within the Central and Eastern Newfoundland portion of the Study Area). The report also included information on various species of wildlife in the area and a discussion of the effects of right-of-way on wildlife.

Jacques Whitford. 1994. Raptor Study of the Proposed Peter's Barren to Hawke's Bay; Bear Cove to St. Anthony Airport; and St. Anthony Airport to St. Anthony Diesel Plant Transmission Lines. Report# 684 prepared for Newfoundland and Labrador Hydro, St. John's, NL.

These aerial surveys were conducted to document the presence of birds of prey and their nests, principally Bald Eagle and Osprey, along three sections of the proposed Transmission Corridor located on the Northern Peninsula. This information would be used by NL Hydro and the provincial Wildlife Division to assess known sensitivities and consider mitigation strategies where required. A corridor 154 km long and 1,000 or 1,500 m wide was surveyed. One Osprey nest was located in the section from Hawke's Bay to Peter's Barren in Newfoundland.

Jacques Whitford. 1995. 1994 Avoidance Monitoring Program Raptor/Harlequin Duck GB 475 01. Report prepared for the Goose Bay Office, National Defence Headquarters. Ottawa, ON.

The annual monitoring of the Low-level Training Area (includes Southeastern Labrador Region) that began in 1991 was expanded in 1994. In 1994, a higher level (than in previous years) of nesting activity was detected, with 5,246 linear km of habitat surveyed and 125 active nests recorded. The number of Harlequin Duck observed was greater than in previous years, with 47 sightings totaling 104 individuals. Also, a Phase III set of

surveys was conducted in 1994 to assess number of nestlings in control and experimental areas. Nest success and number of young to fledge was also determined.

Jacques Whitford. 1996. Environmental Baseline Technical Data Report Terrestrial Program. Prepared for the Voisey's Bay Mine/Mill Project EIS, St. John's, NL.

A series of baseline programs including ELC, waterfowl, seabird, bird of prey and other wildlife surveys and programs were completed over different seasonal periods during 1995-1996. The work was completed in support of a proposed nickel mine at Voisey's Bay in northern Labrador (north of the Southeastern Labrador Region). Important areas of concentration during staging and breeding were identified and considered in the design of the project and subsequent EA.

Jacques Whitford. 1996. 1996 Raptor Monitoring Surveys, GB 475 01. Final Report #840 prepared for PMO Goose Bay, National Defence Headquarters, Ottawa, ON.

In 1996, 142 active nests were found in the Low-level Training Area (includes Southeastern Labrador). In August, the status of 57 Osprey nests was examined that indicated that Osprey production was considerably lower than the previous year. Prey cycles and cold/warm spring weather appear to be the most important factors affecting the breeding activity and success of this bird of prey.

Jacques Whitford. 1996. 1995 Raptor/Harlequin Duck Monitoring Program. Jacques Whitford Environment Limited Final Report prepared for PMO Goose Bay, National Defence Headquarters, Ottawa, ON.

This research was a continuation of nest research that began in 1991 (includes Southeastern Labrador). In 1995, 214 active nests were found along 6,026 linear km of habitat. This is higher nesting activity than in previous years. Harlequin Duck sightings were lower in this year, with 49 individuals found in 18 sightings. Other species' nests and sightings were also recorded.

Jacques Whitford. 1998. Trans Labrador Highway (Red Bay to Cartwright) Environmental Assessment. Report # 1152 prepared for the Department of Works, Services and Transportation, St. John's, NL.

This EA examined a 325 km highway along the south coast of Labrador (includes Southeastern Labrador). Several component studies for wildlife including waterfowl, passerines and birds of prey were completed using a combination of aerial and ground surveys. There was little suitable tree nesting habitat for birds of prey found in the study area. As well, sub-optimal foraging opportunities for Bald Eagle and Osprey was detected. It was suggested that low densities of other bird of prey species occur in the study area.

Jacques Whitford. 1998. 1997 Raptor Monitoring Program. Final report # 976 prepared for Goose Bay Office, National Defence Headquarters, Ottawa, ON.

This research was a continuation of annual monitoring for Golden Eagle, Gyrfalcon, Peregrine Falcon, Osprey and Bald Eagle throughout the Low-level Training Area (includes Southeastern Labrador), although focus has been on Osprey and Bald Eagle due to low to no active nests of other species detected in previous years. A total of 182 active nests were surveyed in 1997: 176 Osprey, five Bald Eagle and one Golden Eagle.

Jacques Whitford. 1999. Bald Eagle Nest Surveys in Labrador and Northeastern Quebec 1991-1998. Report prepared for the Goose Bay Office, National Defence Headquarters. Ottawa, ON.

This report summarizes the results of Bald Eagle surveys from 1991 to 1997 and provides a detailed report of the results of the 1998 surveys. The highest number of active nests (n=16) were located in 1998. Average nesting success during 1994 to 1998 was 68 percent. It is believed that the increased number of Bald Eagle sightings is a reflection of increased and expanded survey effort in the west and into the eastern control area (includes Southeastern Labrador Region) where the species appears to be more abundant.

Jacques Whitford. 1999. Military Flying Activity and the Reproductive Success of Osprey in Labrador and northeastern Quebec. Report # 1158-1478 prepared for Goose Bay Office, National Defence Headquarters, Ottawa, ON.

This continuous research began in 1991. In 1997 and 1998, the program examined the effectiveness of exclusion zones by examining nesting activity and reproductive output of Osprey nests subjected to different treatments within the Low-level Training Area and control areas (includes Southeastern Labrador Region). Of the 168 and 276 active and occupied nests in 1997 and 1998, respectively, no relationship of nesting success or reproductive output was detected in relation to the military training. The maintenance of a 2.5 nautical mile radius exclusion zone as a mitigation measure was no longer recommended.

Jacques Whitford. 1999. Baseline Monitoring Study: CFB Goose Bay, Labrador. Prepared for Defence Construction Canada, Ottawa, ON.

Examined areas within and adjacent to the Low-level Training Area through aerial surveys in 1997 and 1998. Moose, birds of prey and waterfowl were compared in terms of habitat potential and occurrence in an area east of the Military Training Area in Labrador (includes a portion of the Lower Churchill River and Lake Melville geographic region of the Study Area).

Jacques Whitford. 2000, 2001, 2002, 2003, 2004, 2005. Osprey Long-term Monitoring Program Year 1- 1999. Prepared for the Goose Bay Office, National Defence Headquarters, Ottawa, ON.

Since 1994, Osprey had been monitored with low-level flying showing no measurable effect on the reproductive success of Osprey detected. In 1999, all exclusion zones around active nests were removed and a long-term program was designed with the Provincial Government. A randomly selected set of 30 nests inside the Low-level Training Area and 30 outside and to the east were involved (included Southeastern Labrador Region). Three parameters were analyzed: nest activity; nest success; and productivity of Osprey within the Low-level Training Area and in the control area. The 1999 data indicated a general increase in all three parameters as compared to previous years, with no significant difference between the two samples. The program was repeated in the same manner over each of the subsequent five years.

Jacques Whitford. 2003. Raptor Component Study Addendum: Cartwright Junction to Happy Valley-Goose Bay Trans Labrador Highway. Report prepared for Department of Works, Services and Transportation, St. John's, NL.

A raptor component study for the alternate route proposed for the Trans Labrador Highway from Cartwright to Happy Valley-Goose Bay (includes Southeastern Labrador Region) was completed through a series of aerial surveys. Thirteen Osprey nests were identified within the 2 km wide study area that extended over 200 km.

Jacques Whitford. 2006, 2007, 2008, 2009. Survey for Bald Eagle and Golden Eagle nests in CYA 732. Prepared for the Institute of Environmental Monitoring and Research, Happy Valley-Goose Bay, NL.

During annual aerial surveys within the Low-level Training Area (includes Southeastern Labrador Region), known Bald Eagle and Golden Eagle nest locations were visited and recorded as active or non-active. Any new nests encountered during the surveys were also recorded. All active nests were later isolated from military training activities by a 2.5 nautical mile radius exclusion zone.

LeDrew, Fudge and Associates Ltd. 1989. Raptor Component Study for the Tally Pond/Duck Pond Environmental Impact Assessment. Report Prepared for Noranda Minerals Inc., Toronto, ON.

A description and assessment of birds of prey in the vicinity of a proposed base metals mine was completed near Buchans, Newfoundland (south of the Central and Eastern Newfoundland Region). During June 1989, aerial and ground (i.e., call playback was used of various birds of prey) surveys were completed to identify active nest sites. The results of these dedicated and incidental observations during other wildlife surveys identified Osprey, Merlin and Great-horned Owl near Tally Pond, but no nests were observed.

Lemon, D. and J. Brazil. 1990. Preliminary report on breeding peregrine falcons, *Falco peregrines*, in Labrador: 1987 and 1988 survey results. *Canadian Field-Naturalist* 104(2): 200-202.

Surveys were conducted in 1987 and 1988 to locate breeding Peregrine Falcon in coastal and interior sections of Labrador (includes Southeastern Labrador Region). Nests were located in a variety of cliff habitats comprising coastal area, including offshore islands and fiords and interior river valleys. Seven active nest sites were located during these surveys.

Minaskuat Inc. 2008. Inventory of Osprey, Bald Eagle and Golden Eagle in the Lower Churchill River Valley. Prepared for the Lower Churchill Hydroelectric Project, Newfoundland and Labrador Hydro, St. John's, NL.

An aerial survey was completed of known nest sites within the lower Churchill River watershed (includes Southeastern Labrador Region). Osprey was the most common and several active sites were encountered and later used to collect material for a baseline methylmercury program. Previously known Bald Eagle and Golden Eagle nest sites were also active during the 2006 survey.

Minaskuat Limited Partnership. 2004. Climate and Reproductive Success of Osprey in Central Labrador. Report prepared for the Institute for Environmental Monitoring and Research, Happy Valley-Goose Bay, NL.

Based on several years of annual monitoring of Osprey reproductive success in central Labrador (includes Southeastern Labrador) and northeastern Québec, this study investigated possible relationships with extreme meteorological events (e.g., precipitation, wind, temperature). While no obvious, consistent or significant relationships were identified, a trend of increasing reproductive success every four to five years was noted over monitoring that extended to the early 1990s. The causal mechanisms as to this trend were discussed.

Minaskuat Limited Partnership. 2005. Bald Eagle Nest Reconnaissance. Final Report prepared for the Institute of Environmental Monitoring and Research, Happy Valley-Goose Bay, NL.

This research was a continuation of ongoing surveys since 1991. The 2005 objective was to re-examine previously known and locate new Bald Eagle nests in areas of suitable habitat, and to assess nest status and condition. Active nest sites were documented for consideration when planning future supersonic environmental effects monitoring studies. The main areas of interest includes the Smallwood Reservoir and adjacent locations (beneath CYA 732), some locations beneath CYA 733 (including Minipi Lake) and locations for possible control (regarding supersonic flight) beneath CYA 731 and CYA 755 along the Churchill River (includes Southeastern Labrador). Thirty-six known nests were surveyed. Nine were active.

Minaskuat Limited Partnership. 2005. Golden Eagle Nest Reconnaissance, Final Report prepared for the Institute of Environmental Monitoring and Research, Happy Valley-Goose Bay, NL.

Previously known and encountered Golden Eagle nests were examined in areas of suitable habitat, and assessed for nest status and condition in central Labrador (north of Southeastern Labrador). Nine active nest sites were documented for consideration when planning future supersonic environmental effects monitoring studies.

Montevecchi, W.A., J.W. Gosse, D. Whitaker and M. Mayo. 1995. Distribution and Relative Abundances of Birds of Prey in Different Habitat in the Western Newfoundland Model Forest. Report 2-205-006 prepared for the Western Newfoundland Model Forest, Corner Brook, NL.

This report further expands on previous reports by the same authors. Three appendices include additional information on habitat preferences for birds of prey, prey remains collected at Sharp-shinned Hawk nest sites in Western Newfoundland, and attempts to determine if Rough-legged Hawks from Labrador move to Newfoundland to breed during years of low prey abundance.

Montevecchi, W.A. 1993. Habitat Relationships and Feeding Ecologies of Birds of Prey, Woodpeckers and Cone-dependent Finches in the Western Newfoundland Model Forest. Report 2-205-001 prepared for the Western Newfoundland Model Forest, Corner Brook, NL.

This report summarizes ongoing work being conducted at the time (including a portion of the Central and Eastern Newfoundland Region). Included were various research projects that investigated trophic relationships, interactions with habitat, and the dynamics of habitat change and modification by forestry practices. Species diversity and abundance as well as spatial and temporal patterns of habitat use were expected results.

Tecsult Inc. 1998. Raptors/Harlequin Ducks Residual Impacts Monitoring Study. Prepared for the Department of National Defence, Ottawa, ON. DCC Project # GB 675 02.

Breeding population data from aerial surveys were compared to previous results from the same area that was obtained during low-level flying (north of Southeastern Labrador Region). The objective was to assess the usefulness of establishing exclusion zones for active raptor nests and Harlequin Duck sightings to reduce potential effects on reproductive success. A total 102 and 134 raptor nest structures were conducted in the experimental area and in a northern control block, respectively. Conclusions included that the usefulness of exclusion zones was not clearly demonstrated during this research. The most critical period for cliff nesting raptors may be earlier during courtship and nest initiation.

Trimper, P.G., N. Standen, L.M. Lye, D. Lemon, T.E. Chubbs and G. Humphries. 1998. Effects of low-level jet aircraft noise on the behavior of nesting Osprey. *Journal of Applied Ecology* 35: 122-130.

Approximately 240 hours of observations were made on nesting Osprey along the Naskapi River (north of Southeastern Labrador Region) exposed to 139 controlled low-level CF-18 jet aircraft overflights. Noise levels varied. Osprey behaviour did not differ significantly between pre- and post-overflight periods. Osprey were attentive to and occasionally flushed from nests when float planes, other Osprey or birds of prey entered territories, and when observers were entering or exiting blinds. Additional insight regarding nest ecology was obtained.

OTHER RELEVANT SOURCES

Minaskuat Inc. 2008. Wildlife Habitat Associations in the Lower Churchill River. Prepared for the Lower Churchill Hydroelectric Generation Project.

In association with site classification effort in the lower Churchill River watershed (includes Southeastern Labrador), terrestrial wildlife ecologists were also deployed with field crews in an extensive program during 2006. Following a predetermined checklist, ecologists evaluated vegetation point plots for the presence and potential for several species. Wildlife sign and on-site assessments were used to identify primary, secondary and tertiary habitat quality for each species, which was later considered in the associated EA of the Lower Churchill Hydroelectric Generation Project.

Minaskuat Inc. 2008. Wetland Assessment and Evaluation. Report prepared for the Lower Churchill Hydroelectric Generation Project.

Over 100 wetlands were classified and evaluated for wildlife habitat sign and potential throughout the lower Churchill River watershed during 2006 (includes Southeastern Labrador Region). Fens and bogs dominate, with some marsh habitat occurring in riparian areas adjacent to the lower Churchill River. The information was used in the baseline characterization of this habitat type for the EA of the lower Churchill Hydroelectric Generation Project.

Morrison, R.I.G. 2001. Shorebird population trends and issues in Canada - An overview. *Bird Trends* (Winter 2001).

The author finds evidence that pointed to widespread declines in shorebird populations. These declines may have been a factor of: habitat loss; habitat destruction; pollution; increases in predator populations; climate change; changes in amount of precipitation; climactic change of prevailing wind patterns; and/or changes in ocean primary productivity.

Schwab, F.E., N.P.P. Simon and S. Nash. 2005. Age and sex segregation of wintering willow ptarmigan in Labrador. *Northeastern Naturalist* 12 (1): 113-118.

The authors obtained age and sex ratios from 340 hunter-harvested Willow Ptarmigan from four winter areas in Labrador (west of the Southeastern Labrador Region). Age and sex ratios differed among wintering areas. Results suggest that hunter-harvest can suppress breeding success.

APPENDIX B

Profiles of Study Team Members

APPENDIX B

The project manager for this study was Mr. Perry Trimper. In addition to participating in all aspects of this role (including ensuring adherence to the workscope, schedule and budget), Mr. Trimper served as the regional lead for Labrador. In this capacity, he liaised with government agencies and offices in Labrador as well as collected information relevant to avifauna. Regional leads for the Island portion of this study (based in Corner Brook and St. John's) included Ms. Tina Newbury and Ms. Elizabeth Way, respectively. Their responsibilities included liaison with local regulatory agencies, compilation of literature and data, and report preparation. Additional data collection, research and writing support were provided by Ms. Karen Rashleigh, Ms. Shawna Peddle, Mr. John Pennell and Mr. James Loughlin. The GIS team in St. John's was led by Mr. Stephen Rowe, with analytical support from Ms. Carolyn Pelley, Mr. Erin Marshall and Mr. Bernie MacNeil. Word Processing was completed by Ms. Beverley Best and Ms. Tracy Osmond. Senior review of all draft and final reports was completed by Mr. Earle Hickey. Brief profiles of Study Team members are as follows:

Perry Trimper, B.Sc.F, served as the Project Manager for the *Wildlife Avifauna Component Study*. His 24 years of experience is primarily in northern environments of both Canada and Russia where areas of specialization include boreal and Arctic wildlife research, northern indigenous peoples, environmental assessment and sustainable resource development. He has been involved in every large environmental assessment in Labrador over the last two decades. Relevant projects related to aspects of hydroelectric development or northern issues include: various wildlife programs and preliminary assessment of the proposed hydroelectric development on the Churchill River of Labrador; and registration and environmental assessment of hydroelectric projects in Newfoundland and Labrador.

Earle Hickey, M.Sc., has been involved in various elements of environmental management for over 25 years in a wide range of projects. Mr. Hickey is a Senior Principal with Stantec Consulting Ltd. and a longtime EIS practitioner having been involved in numerous federal and provincial EISs. His international experience includes work in Brunei, the Caribbean, China, the Middle East and Russia for the Canadian International Development Agency, the World Bank and private sector clients.

Tina Newbury, M.Sc., is a Level III scientist with Stantec Consulting Ltd.'s Corner Brook, NL office. Since 2008, Ms. Newbury has assisted in report writing, literature review, data management and field programs for several projects related to the proposed Nalcor Energy transmission line development, Keystone Pipeline, Labrador Iron Mines, Aurora uranium exploration and St. Lawrence Wind Turbine projects. She has had extensive experience with forest passerine identification, nest searching, small mammal trapping, radio telemetry and general wildlife surveys. Ms. Newbury also has had involvement with an ongoing contract with Environment Canada that has led to experience with marine water quality sampling.

Elizabeth Way, M.Sc., is a Team Lead for the Environmental Management Group of Stantec Consulting Ltd., in St. John's. Since 2002, Ms. Way has assisted in report writing, literature review, data management, and field programs for several projects, including the White Rose Habitat Compensation Program, and Strategic Environmental Assessments for the Laurentian Sub-Basin and Sydney Basin. She has also gained experience related to environmental assessment while working on the Environmental and Socioeconomic Assessment for the proposed Gateway Pipeline in British Columbia, Pokak Seismic Survey in the North West Territories, the

environmental assessment of snowmobiling activity in Gros Morne National Park, the Socioeconomic Baseline Study and Impact Statement for the Long Harbour Commercial Nickel Processing Plant for Vale Inco (formerly VBNC), and the Lower Churchill Hydroelectric Generation Project baseline program and environmental assessment.

Karen Rashleigh, M.Sc., is an Environmental Scientist based in Happy Valley-Goose Bay, NL. Ms. Rashleigh has a background in conducting biological surveys on a variety of species and their habitats, including birds, fish and mammals. Her responsibilities are primarily to conduct ecological investigations related to resource development in Labrador, in particular studies involving avifauna (waterfowl, birds of prey and forest passerines) including all aspects of data analyses and reporting.

Shawna Peddle, M.Sc., is a Senior Project Manager with Stantec in Guelph, Ontario. She is experienced in managing and undertaking large and small-scale environmental assessments in the energy, water and waste, transportation and industrial sectors. She is skilled at interacting with diverse study teams, subconsultants, clients, agencies and the public. She has experience in Ontario and Newfoundland provincial and federal environmental assessment project development and management, consultant team coordination, public involvement and report preparation and coordination. Ms. Peddle also has extensive public consultation and communications experience related to risk assessment, mining, oil and gas, transportation and waste management. Ms. Peddle has gained experience in all aspects of EA management and preparation, and has developed and participated in numerous public consultation programs. Her skills include project management and consultant team coordination, public and stakeholder consultation program development, design and implementation and environmental assessment consultation preparation.

John Pennell B.Sc., was a member of the Environmental Management Group in St. John's, specializing in environmental sciences. Mr. Pennell assisted in field programs, report writing, literature review and data management for several projects related to terrestrial studies, including the Lower Churchill Hydroelectric Generation Hydroelectric Generation Project. He has also gained experience related to Socioeconomic Assessment for the Lower Churchill Project. He has also assisted in report writing, literature review, data management and field programs for both ecological land classification and rare plant studies for transportation, mining and power development projects. He has assisted in report writing, literature review, data management and field programs for offshore oil and gas including the Labrador Shelf Strategic Environmental Assessment.

James Loughlin, B.Sc., was a member of the Environmental Management Group in the St. John's office. Mr. Loughlin assisted in report writing, literature review, data management and field programs for several projects related to offshore oil and gas and fish and fish habitat. He had extensive involvement with the execution of field work in support of the Newfoundland and Labrador sentinel fishery. Programs completed include cod and halibut tagging, Cod Reproductive Potential surveys, July Mobile Sentinel survey, cod stomach, liver and otolith sampling and collection. Other involvement with fishery related programs include, monitoring vessel and crew activities, identifying, sexing, collecting, measuring and sampling various fish species in the Bering Sea and the North Atlantic Ocean as part of national fisheries observer program. Mr. Loughlin has conducted various environmental screening reports for Fisheries and Oceans Canada, Small Craft Harbours division for various sites in Newfoundland and Labrador in accordance with the *Canadian Environmental Assessment Act*.

Stephen Rowe, B.Sc., M. GIS (candidate) is a GIS Specialist and Team Leader of the Information Management team with Stantec Consulting Ltd. in St. John's, Newfoundland. Since graduating with a Bachelor of Science degree in Geography in 1998, he has gained over 10 years experience as a GIS professional, including working for Parks Canada, Provincial Parks and for a seismic surveying company. His work at Stantec has involved himself in various GIS assignments including ecosystem mapping, linear corridor utility and pipeline projects, wetland and watershed studies, marine geomatics, biophysical assessments, mapping of environmentally significant areas and species at risk, and a range of wildlife/resource management projects.

Carolyn Pelley, B.Sc., is a GIS Technician based in St. John's, NL. Ms. Pelley has been involved in mapping for the Lower Churchill Project, the Newfoundland Liquid Natural Gas project, the Long Harbour Nickel Commercial Processing Plant, the Labrador Shelf Strategic Environmental Assessment, habitat mapping for military properties in Newfoundland and wind power project mapping for Fermeuse, NL.

Erin Marshall, B.Sc., is a GIS Analyst in the Geomatics Department within Stantec Consulting Ltd. (St. John's, NL). Mr. Marshall has been involved in the Geomatics industry for the past seven years, where he has accumulated a diverse background and work experience. Mr. Marshall has conducted ecological classifications, 3D visualization models, wildlife and terrain models, site assessments and regional and site mapping for clients including government departments and agencies (domestic and foreign), First Nation groups, oil and gas companies, forestry organizations and information technology groups. Mr. Marshall is skilled in land and marine survey data collection and interpretation using GPS, bathymetry data, and satellite and LiDAR imagery.

Bernie MacNeil was a CAD/GIS Technician with Stantec Consulting Ltd.; his academic training is in geomatics engineering technology. Mr. MacNeil gained over four years experience as a CAD/GIS Technician in the exploration and mining industry. Prior to joining Stantec Consulting Ltd., Mr. MacNeil was a Geomatics Engineering Technologist with Aur Resources Inc. and a CAD/GIS Technician with Teck Cominco Limited. As a CAD/GIS Technician for Stantec Consulting Ltd., Mr. MacNeil was involved in the Aurora Michelin Project and the Labrador Iron Mines Project.

APPENDIX C

Data from the 2008 Passerine Bird Survey

APPENDIX C

Table C-1 Species Observed during Point Count Surveys in 2008

English Name	AOU Code	Scientific Name	Bird Guild	Total # Passerine Point Count Records	Included in Ecoregion Abundance Indices	BBS Trend for Canada (1987- 2007)
Common Loon	COLO	*Gavia immer*	Waterbird	6	No	Positive
American Bittern	AMBI	*Botaurus lentiginosus*	Waterbird	1	No	Negative
Canada Goose	CANG	*Branta canadensis*	Waterbird	7	No	**Positive**
Mallard	MALL	*Anas platyrhynchos*	Waterbird	1	No	**Negative**
American Black Duck	ABDU	*Anas rubripes*	Waterbird	10	No	Negative
American Green-winged Teal	AGWT	*Anas crecca*	Waterbird	12	No	**Negative**
Ring-necked Duck	RNDU	*Aythya collaris*	Waterbird	1	No	Negative
Common Goldeneye	COGO	*Bucephala clangula*	Waterbird	2	No	Positive
Common Merganser	COME	*Mergus merganser*	Waterbird	1	No	Negative
Surf Scoter	SUSC	*Melanitta perspicillata*	Waterbird	11	No	N/A
Ruffed Grouse	RUGR	*Bonasa umbellus*	Other	1	No	**Negative**
Red-tailed Hawk	RTHA	*Buteo jamaicensis*	Bird of prey	1	No	Negative
Northern Harrier	NOHA	*Circus cyaneus*	Bird of prey	2	No	**Negative**
Merlin	MERL	*Falco columbarius*	Bird of prey	1	No	**Positive**
Osprey	OSPR	*Pandion haliaetus*	Bird of prey	1	No	**Positive**
Northern Gannet	NOGA	*Morus bassanus*	Waterbird	9	No	N/A
Ring-billed Gull	RBGU	*Larus delawarensis*	Waterbird	6	No	Negative
Herring Gull	HEGU	*Larus argentatus*	Waterbird	70	No	**Negative**
Great Black-backed Gull	GBBG	*Larus marinus*	Waterbird	19	No	**Negative**
Greater Yellowlegs	GRYE	*Tringa melanoleuca*	Waterbird	9	No	**Positive**
Solitary Sandpiper	SOSP	*Tringa solitaria*	Waterbird	26	No	Positive
Spotted Sandpiper	SPSA	*Actitis macularia*	Waterbird	5	No	**Negative**
Wilson's Snipe	WISN	*Gallinago delicata*	Waterbird	53	No	Positive
Dowitcher sp.		*Limnodromus sp.*	Waterbird	2	No	N/A
Belted Kingfisher	BEKI	*Megaceryle alcyon*	Other	6	No	**Negative**
Black-backed Woodpecker	BBWO	*Picoides arcticus*	Woodpecker	2	No	**Negative**
American Three-toed Woodpecker	ATTW	*Picoides tridactylus*	Woodpecker	8	No	**Positive**
Downy Woodpecker	DOWO	*Picoides pubescens*	Woodpecker	1	No	Negative
Hairy Woodpecker	HAWO	*Picoides villosus*	Woodpecker	6	No	Positive
Northern Flicker	NOFL	*Colaptes auratus*	Woodpecker	5	No	Negative

English Name	AOU Code	Scientific Name	Bird Guild	Total # Passerine Point Count Records	Included in Ecoregion Abundance Indices	BBS Trend for Canada (1987- 2007)
Alder Flycatcher	ALFL	*Empidonax alnorum*	Passerine	47	Yes	Positive
Yellow-bellied Flycatch	YBFL	*Empidonax flaviventris*	Passerine	279	Yes	Negative
Olive-sided Flycatcher	OSFL	*Contopus cooperi*	Passerine	11	Yes	**Negative**
Tree Swallow	TRSW	*Tachycineta bicolor*	Passerine	31	Yes	**Negative**
Red-eyed Vireo	REVI	*Vireo olivaceus*	Passerine	5	No	**Positive**
Blue-headed Vireo	BHVI	*Vireo solitaries*	Passerine	2	No	**Positive**
Blue Jay	BLJA	*Cyanocitta cristata*	Passerine	10	No	**Positive**
Gray Jay	GRJA	*Perisoreus canadensis*	Passerine	27	Yes	**Negative**
American Crow	AMCR	*Corvus brachyrhyncos*	Passerine	61	No	**Positive**
Common Raven	CORA	*Corvus corax*	Passerine	89	No	**Positive**
Black-capped Chickadee	BCCH	*Poecile atricapillus*	Passerine	11	Yes	**Positive**
Boreal Chickadee	BOCH	*Poecile hudsonicus*	Passerine	22	Yes	Negative
Red-breasted Nuthatch	RBNU	*Sitta canadensis*	Passerine	16	Yes	Negative
Winter Wren	WIWR	*Troglodytes troglodytes*	Passerine	28	Yes	Positive
Ruby-crowned Kinglet	RCKI	*Regulus calendula*	Passerine	211	Yes	**Negative**
Golden-crowned Kinglet	GCKI	*Regulus satrapa*	Passerine	12	Yes	**Negative**
Grey-cheeked Thrush	GCTH	*Catharus minimus*	Passerine	20	Yes	N/A
Swainson's Thrush	SWTH	*Catharus ustulatus*	Passerine	123	Yes	**Negative**
Hermit Thrush	HETH	*Catharus guttatus*	Passerine	79	Yes	Neutral
American Robin	AMRO	*Turdus migratorius*	Passerine	278	Yes	**Negative**
European Starling	EUST	*Sturnus vulgaris*	Passerine	7	No	**Negative**
Cedar Waxwing	CEDW	*Bombycilla cedrorum*	Passerine	16	No	**Negative**
Black-and-white Warbler	BAWW	*Mniotilta varia*	Passerine	113	Yes	**Negative**
Tennessee Warbler	TEWW	*Vermivora peregrina*	Passerine	33	Yes	**Negative**
Orange-crowned Warbler	OCWA	*Vermivora celata*	Passerine	8	No	**Negative**
Nashville Warbler	NAWA	*Vermivora ruficapilla*	Passerine	25	Yes	Positive
Yellow Warbler	YWAR	*Dendroica petechia*	Passerine	119	Yes	**Negative**
Palm Warbler	PAWA	*Dendroica palmarum*	Passerine	1	No	Positive
Bay-breasted Warbler	BBWA	*Dendroica castanea*	Passerine	1	No	Negative
Magnolia Warbler	MAWA	*Dendroica magnolia*	Passerine	74	Yes	Positive
Yellow-rumped Warbler	YRWA	*Dendroica coronata*	Passerine	155	Yes	**Negative**
Blackpoll Warbler	BLPW	*Dendroica striata*	Passerine	188	Yes	**Negative**
Cape May Warbler	CMWA	*Dendroica tigrina*	Passerine	9	No	Negative
Black-throated Green Warbler	BTNW	*Dendroica virens*	Passerine	85	Yes	Positive
Wilson's Warbler	WIWA	*Wilsonia pusilla*	Passerine	49	Yes	**Negative**

English Name	AOU Code	Scientific Name	Bird Guild	Total # Passerine Point Count Records	Included in Ecoregion Abundance Indices	BBS Trend for Canada (1987- 2007)
American Redstart	AMRE	*Setophaga ruticilla*	Passerine	78	Yes	**Negative**
Mourning Warbler	MOWA	*Oporornis philadelphia*	Passerine	38	Yes	**Negative**
Ovenbird	OVEN	*Seiurus aurocapillus*	Passerine	15	Yes	**Negative**
Northern Waterthrush	NOWA	*Seiurus noveboracensis*	Passerine	226	Yes	Negative
Common Yellowthroat	COYE	*Geothlypis trichas*	Passerine	23	Yes	**Negative**
Rusty Blackbird	RUBL	*Euphagus carolinus*	Passerine	24	Yes	**Negative**
American Tree Sparrow	ATSP	*Spizella arborea*	Passerine	2	No	N/A
Savannah Sparrow	SAVS	*Passerculus sandwichensis*	Passerine	70	Yes	**Negative**
Song Sparrow	SOSP	*Melospiza melodia*	Passerine	3	No	Negative
Lincoln's Sparrow	LISP	*Melospiza lincolnii*	Passerine	90	Yes	**Negative**
Swamp Sparrow	SWSP	*Melospiza georgiana*	Passerine	38	Yes	**Positive**
White-throated Sparrow	WTSP	*Zonotrichia albicollis*	Passerine	496	Yes	Negative
White-crowned Sparrow	WCSP	*Zonotrichia leucophrys*	Passerine	42	Yes	Positive
Fox Sparrow	FOSP	*Passerella iliaca*	Passerine	263	Yes	Negative
Dark-eyed Junco	DEJU	*Junco hyemalis*	Passerine	155	Yes	**Negative**
Pine Siskin	PISI	*Carduelis pinus*	Passerine	50	Yes	**Negative**
American Goldfinch	AMGO	*Carduelis tristis*	Passerine	35	Yes	Negative
Common Redpoll	CORE	*Carduelis flammea*	Passerine	7	No	N/A
Purple Finch	PUFI	*Carpodacus purpureus*	Passerine	34	Yes	**Negative**
White-winged Crossbill	WWCR	*Loxia leucoptera*	Passerine	43	Yes	Negative
Pine Grosbeak	PIGR	*Pinicola enucleator*	Passerine	14	Yes	Positive
Evening Grosbeak	EVGR	*Coccothraustes vespertinus*	Passerine	11	No	**Negative**
Note: Significant BBS trends in bold (North American Breeding Bird Survey 2007).						

Labrador Passerine Communities

The following sections present the species observed, by habitat type, in Labrador.

Spruce Lichen Habitat – Labrador

The Black Spruce Lichen habitat type in Labrador comprised 15 passerine species, with Fox Sparrow, Slate-coloured Junco Swainson's Thrush and White-throated Sparrow accounting for the majority (66 percent) of the individuals recorded. Lesser numbers of Ruby-crowned Kinglet and Swainson's Thrush occurred, with one to three individuals of the remaining species.

Table C-2 Passerines Associated with Black Spruce Lichen Habitat Type (Labrador)

Species	# individuals	Frequency of Occurrence	Importance Index
AMRO	1	1	0.017
EWCS	3	2	0.033
FOSP	10	4	0.067
GRAJ	1	1	0.017
HETH	2	2	0.033
LISP	1	1	0.017
NOWA	1	1	0.017
OCWA	2	1	0.017
RCKI	5	4	0.067
SCJU	13	4	0.067
SWTH	5	4	0.067
WISN	1	1	0.017
WIWA	1	1	0.017
WTSP	11	4	0.067
WWCR	2	1	0.017

Burn Habitat – Labrador

The Burn habitat type in Labrador had a more diverse passerine community of 20 species. The four most common species (Fox Sparrow, Slate-coloured Junco, Wilson's Warbler and White-throated Sparrow) represented 50 percent of the observations.

Table C-3 Passerines Associated with Burn Habitat Type (Labrador)

Species	# individuals	Frequency of Occurrence	Importance Index
ALFL	1	1	0.018
AMGO	2	1	0.018
AMRO	1	1	0.018
EWCS	2	1	0.018
FOSP	6	4	0.071
GRAJ	1	1	0.018
HETH	2	1	0.018
NAWA	1	1	0.018
NOWA	3	1	0.018
OCWA	2	2	0.036

Species	# individuals	Frequency of Occurrence	Importance Index
PIGR	3	1	0.018
RCKI	2	2	0.036
SAVS	1	1	0.018
SCJU	6	2	0.036
SWTH	3	2	0.036
WIWA	5	2	0.036
WTSP	9	4	0.071
WWCR	2	1	0.018
YBFL	3	3	0.054
YRWA	1	1	0.018

Conifer Forest Habitat – Labrador

A total of 14 species were recorded in the Conifer Forest habitat type in Labrador. Fox Sparrow and Ruby-crowned Kinglet were the dominant species (44.2 percent).

Table C-4 Passerines Associated with Conifer Forest Habitat Type (Labrador)

Species	# Individuals	Frequency of Occurrence	Importance index
ATTW	1	1	0.018
BOCH	1	1	0.018
FOSP	12	5	0.087
GRAJ	3	2	0.035
LISP	2	1	0.018
NOWA	4	2	0.035
RCKI	7	5	0.087
SAVS	1	1	0.018
SCJU	3	1	0.018
SWTH	3	2	0.035
TREW	1	1	0.018
WISN	1	1	0.018
WWCR	3	2	0.035
YRWA	1	1	0.018

Conifer Scrub Habitat - Labrador

Conifer Scrub Habitat Type was one of the most diverse in Labrador and supported 34 passerine species. Those present in largest numbers were American Robin, Black-and white warbler, Blackpoll Warbler, Fox Sparrow, Northern Waterthrush and Yellow Warbler, comprising 29.7 percent of the total observations.

Table C-5 Passerines Associated with Conifer Scrub Habitat Type (Labrador)

Species	# Individuals	Frequency of Occurrence	Importance Index
ALFL	5	2	0.009
AMCR	3	2	0.009
AMRE	1	1	0.004
AMRO	14	9	0.039

Species	# Individuals	Frequency of Occurrence	Importance Index
ATSP	2	1	0.004
ATTW	1	1	0.004
BAWW	11	4	0.017
BLPW	19	10	0.043
CORA	1	1	0.004
CORE	3	2	0.009
COYE	1	1	0.004
FOSP	25	10	0.043
GCTH	3	1	0.004
GRAJ	1	1	0.004
HETH	4	2	0.009
LISP	5	4	0.017
MOWA	4	3	0.013
NAWA	5	2	0.009
NOWA	19	8	0.035
PISI	7	2	0.009
PUFI	1	1	0.004
RCKI	8	7	0.030
SAVS	2	2	0.009
SCJU	3	3	0.013
SWTH	4	3	0.013
TEWA	7	4	0.017
TRES	9	4	0.017
WIWA	4	3	0.013
WIWR	8	5	0.022
WTSP	9	4	0.017
YBFL	6	3	0.013
YRWA	4	3	0.013
YWAR	13	6	0.026

Mixedwood Habitat – Labrador

The passerine community of the Mixedwood habitat type in Labrador comprised 19 species. Species with the majority of individuals were Fox Sparrow, Ruby-crowned Kinglet, and White-throated Sparrow; these species represented 44.3 percent of the total observations.

Table C-6 Passerines Associated with Mixedwood Habitat Type (Labrador)

Species	# Individuals	Frequency of Occurrence	Importance Index
AMCR	2	2	0.031
AMRE	1	1	0.016
AMRO	1	1	0.016
BLPW	1	1	0.016
BOCH	2	2	0.031
FOSP	7	5	0.078
HETH	1	1	0.016

Species	# Individuals	Frequency of Occurrence	Importance Index
LISP	1	1	0.016
NAWA	2	1	0.016
NOWA	4	2	0.031
RCKI	9	4	0.063
RUBL	1	1	0.016
SCJU	4	3	0.047
SWTH	5	4	0.063
TEWA	3	1	0.016
WTSP	11	4	0.063
WWCR	4	1	0.016
YBFL	1	1	0.016
YRWA	1	1	0.016

Open Conifer Forest Habitat – Labrador

Open Conifer Forest habitat type had 22 species. Those in largest numbers were Fox Sparrow, and Northern Waterthrush, comprising 27.7 percent of the total observations.

Table C-7 Passerines Associated with Open Conifer Forest Habitat Type (Labrador)

Species	# Individuals	Frequency of Occurrence	Importance Index
AMCR	1	1	0.010
AMRE	1	1	0.010
AMRO	1	1	0.010
ATTW	1	1	0.010
BLPW	1	1	0.010
BOCH	2	1	0.010
FOSP	16	9	0.094
GRAJ	4	3	0.031
HETH	2	1	0.010
NOWA	10	5	0.052
OCWA	4	2	0.021
RCKI	9	6	0.063
RUBL	5	2	0.021
SCJU	5	3	0.031
SWTH	4	2	0.021
TRES	4	3	0.031
WISN	5	3	0.031
WIWA	4	3	0.031
WTSP	7	3	0.031
WWCR	2	1	0.010
YBFL	1	1	0.010
YRWA	5	4	0.042

Wetland Habitat – Labrador

The Wetland habitat type had the greatest diversity of passerines within Labrador, with 40 species. Species with highest numbers were Fox Sparrow, Northern Waterthrush, Ruby-crowned Kinglet, Slate-coloured Junco and White-throated Sparrow; these species comprised 30.6 percent of the total observed. Several other species were present in relatively high numbers.

Table C-8 Passerines Associated with Wetland Habitat Type (Labrador)

Species	# Individuals	Frequency of Occurrence	Importance Index
AGWT	1	1	0.003
ALFL	8	3	0.008
AMCR	3	3	0.008
AMRE	3	2	0.005
AMRO	11	6	0.016
ATTW	3	3	0.008
BAWW	2	1	0.003
BLPW	10	7	0.019
BTNW	1	1	0.003
CAGO	5	1	0.003
CORA	1	1	0.003
CORE	4	2	0.005
COYE	3	2	0.005
EWCS	2	2	0.005
FOSP	43	16	0.044
GRAJ	8	6	0.016
GRYE	3	3	0.008
HETH	3	2	0.005
LISP	3	3	0.008
MAWA	1	1	0.003
MOWA	1	1	0.003
NOWA	19	9	0.025
PISI	17	3	0.008
PUFI	1	1	0.003
RCKI	32	14	0.038
RUBL	16	9	0.025
RUGR	1	1	0.003
SAVS	12	7	0.019
SCJU	20	11	0.030
SPSA	3	2	0.005
SWTH	17	11	0.030
TRES	8	5	0.014
WISN	6	3	0.008
WIWA	1	1	0.003
WIWR	4	3	0.008
WTSP	28	12	0.033
WWCR	13	3	0.008

Species	# Individuals	Frequency of Occurrence	Importance Index
YBFL	4	4	0.011
YRWA	8	5	0.014
YWAR	8	5	0.014

Lichen Heathland Habitat – Labrador

The Lichen Heathland habitat type in Labrador had a total of 20 associated species. American Robin, Blackpoll Warbler, Swainson's Thrush and White-throated Sparrow were found in the greatest numbers, comprising 47.1 percent of the total observed.

Table C-9 Passerines Associated with the Lichen Heathland Habitat Type (Labrador)

Species	# Individuals	Frequency of Occurrence	Importance Index
AMCR	1	1	0.010
AMRO	10	4	0.098
BAWW	3	2	0.029
BLPW	9	6	0.088
BOCH	1	1	0.010
FOSP	8	5	0.078
GCTH	1	1	0.010
NAWA	1	1	0.010
NOWA	8	4	0.078
PISI	1	1	0.010
RCKI	2	2	0.019
SAVS	7	4	0.069
SCJU	8	4	0.078
SWTH	12	2	0.118
WIWA	2	1	0.019
WIWR	4	3	0.039
WTSP	17	6	0.167
WWCR	2	1	0.019
YBFL	1	1	0.010
YWAR	4	3	0.039

Newfoundland Passerine Communities

The following sections present the species observed, by habitat type, in Newfoundland.

Conifer Forest Habitat – Newfoundland

The Conifer Forest habitat type in Newfoundland comprised 26 passerine species. American Robin, Yellow-bellied Flycatcher and Yellow-rumped Warbler were observed most often and represented 34.1 percent of those observed.

Table C-10 Passerines Associated with Conifer Forest Habitat Type (Newfoundland)

Species	# Individuals	Frequency of Occurrence	Importance Index
AMRE	1	1	0.012
AMRO	11	7	0.077
BAWW	3	3	0.033
BCCH	3	2	0.022
BHVI	1	1	0.012
BLPW	1	1	0.012
BTNW	7	5	0.055
CORA	5	3	0.033
FOSP	3	3	0.033
GRAJ	2	1	0.012
HETH	1	1	0.012
MAWA	2	2	0.022
MOWA	1	1	0.012
NOWA	3	3	0.033
PIGR	1	1	0.012
PISI	1	1	0.012
PUFI	2	2	0.022
RBNU	1	1	0.012
RCKI	5	5	0.055
REVI	2	2	0.022
SCJU	2	2	0.022
SWTH	3	2	0.022
WTSP	6	5	0.055
YBFL	9	7	0.077
YRWA	9	7	0.077

Conifer Scrub Habitat – Newfoundland

The Conifer Scrub habitat type in Newfoundland had the least diverse avian community throughout the province, comprising only seven species. Slate-coloured Junco (33.3 percent) was the most abundant species observed.

Table C-11 Passerines Associated with Conifer Scrub Habitat Type (Newfoundland)

Species	# Individuals	Frequency of occurrence	Importance Index
AMRO	1	1	0.083
NOWA	1	1	0.083
SCJU	4	2	0.167
SWSP	1	1	0.083
WTSP	1	1	0.083
YBFL	2	2	0.167
YRWA	2	1	0.083

Cutover Habitat Type – Newfoundland

The Cutover habitat type comprised the largest passerine community in the province, with 51 species Fox Sparrow, Northern Waterthrush, White-throated Sparrow, Yellow-bellied Flycatcher and Yellow Warbler had greatest abundance. These five species comprised 42.2 percent of the passerines recorded. The White-throated Sparrow was dominant, with 132 individuals recorded. Several other species were recorded in relatively high numbers.

Table C-12 Passerines Associated with Cutover Habitat Type (Newfoundland)

Species	# Individuals	Frequency of Occurrence	Importance Index
ALFL	16	14	0.018
AMCR	13	12	0.016
AMGO	7	5	0.007
AMRE	37	28	0.037
AMRO	69	40	0.052
ATTW	1	1	0.001
BAWW	33	32	0.042
BCCH	3	3	0.004
BEKI	2	2	0.003
BHVI	1	1	0.001
BLJA	1	1	0.001
BLPW	11	10	0.013
BOCH	2	1	0.001
BTNW	8	4	0.005
CMWA	1	1	0.001
CORA	7	5	0.007
COYE	6	6	0.008
DOWO	1	1	0.001
EVGR	3	2	0.003
EWCS	3	2	0.003
FOSP	40	33	0.043
GCKI	1	1	0.001
GRAJ	1	1	0.001
GRYE	1	1	0.001
HAWO	4	4	0.005
HETH	28	22	0.029
LISP	9	7	0.009
MAWA	14	12	0.016
MOWA	13	12	0.016
NAWA	5	5	0.007
NOFL	1	1	0.001
NOWA	41	29	0.038
OSFL	1	1	0.001
OVEN	10	9	0.012
PIGR	2	2	0.003
PISI	1	1	0.001

Species	# Individuals	Frequency of Occurrence	Importance Index
PUFI	9	9	0.012
RBNU	3	2	0.003
RCKI	27	20	0.026
SAVS	1	1	0.001
SCJU	20	18	0.023
SWSP	8	8	0.010
SWTH	6	4	0.005
TEWA	10	9	0.012
WISN	7	7	0.009
WIWA	4	4	0.005
WTSP	132	53	0.069
WWCR	1	1	0.001
YBFL	49	32	0.037
YRWA	27	23	0.030
YWAR	59	32	0.037

Hardwood Forest Habitat – Newfoundland

The Hardwood Forest habitat type in Newfoundland had only a single dominant species, the White-throated Sparrow that comprised 23.8 percent of the observations, compared to the other 15.

Table C-13 Passerines Associated with Hardwood Forest Habitat Type (Newfoundland)

Species	# Individuals	Frequency of Occurrence	Importance Index
ALFL	1	1	0.020
AMRO	1	1	0.020
BAWW	1	1	0.020
BLPW	1	1	0.020
CEDW	2	1	0.020
FOSP	1	1	0.020
NAWA	3	2	0.041
PIGR	1	1	0.020
PISI	1	1	0.020
RCKI	2	2	0.041
SCJU	1	1	0.020
SWTH	7	3	0.061
TEWA	2	2	0.041
WIWA	4	2	0.041
WTSP	10	3	0.061
YBFL	4	2	0.041

Kalmia Lichen Heathland – Newfoundland

The Kalmia Lichen Heathland habitat type had 13 species in association. Blackpoll Warbler and Lincoln's Sparrow were the two dominant species, comprising 34.4 percent of the observations.

Table C-14 Passerines Associated with Kalmia Lichen Heathland Habitat Type (Newfoundland)

Species	# Individuals	Frequency of Occurrence	Importance Index
AMRO	3	2	0.063
BLPW	5	2	0.156
FOSP	3	1	0.063
GCTH	2	1	0.063
LISP	6	1	0.188
RCKI	2	1	0.063
SAVS	2	2	0.063
SWSP	1	1	0.031
WIWA	1	1	0.031
WTSP	4	1	0.125
YBFL	1	1	0.031
YRWA	1	1	0.031
YWAR	1	1	0.031

Mixedwood Habitat – Newfoundland

The Mixedwood habitat type had a relatively diverse passerine community, with 45 species observed. The most abundant species were American Robin, Ruby-crowned Kinglet, White-throated Sparrow, Yellow-bellied Flycatcher and Yellow-rumped Warbler; these species comprised 39.2 percent of the observations. Several other species were found in relatively high numbers.

Table C-15 Passerines Associated with Mixedwood Habitat Type (Newfoundland)

Species	# Individuals	Frequency of Occurrence	Importance Index
ALFL	2	2	0.004
AMCR	3	2	0.004
AMRE	21	16	0.031
AMRO	37	29	0.056
ATTW	1	1	0.002
BAWW	15	14	0.027
BBWO	2	2	0.004
BCCH	4	4	0.008
BLJA	4	2	0.004
BLPW	18	15	0.029
BOCH	3	3	0.006
BTNW	31	20	0.039
CMWA	4	4	0.008
CORA	16	11	0.021
COYE	1	1	0.002
FOSP	15	15	0.029
GCKI	8	6	0.012
GCTH	2	2	0.004
GRAJ	3	3	0.006
HETH	13	13	0.025
MAWA	27	23	0.044

Species	# Individuals	Frequency of Occurrence	Importance Index
MOWA	1	1	0.002
NAWA	2	2	0.004
NOFL	2	2	0.004
NOWA	34	30	0.058
OSFL	1	1	0.002
OVEN	5	5	0.010
PIGR	4	4	0.008
PUFI	5	5	0.010
RBNU	8	7	0.014
RCKI	39	32	0.062
REVI	2	2	0.004
RUBL	1	1	0.002
RUGR	1	1	0.002
SAVS	1	1	0.002
SCJU	16	15	0.029
SWSP	3	3	0.006
SWTH	12	11	0.021
TEWA	4	4	0.008
WISN	3	3	0.006
WIWA	5	3	0.006
WTSP	43	33	0.064
YBFL	45	34	0.066
YRWA	36	30	0.058
YWAR	7	6	0.012

Open Conifer Forest Habitat – Newfoundland

Open Conifer Forest habitat type had a passerine community of 36 species. American Robin, Northern Waterthrush, White-throated Sparrow, and Yellow-bellied Flycatcher occurred in the greatest numbers, representing of 36.2 percent of the total observations.

Table C-16 Passerines Associated with Open Conifer Forest Habitat Type (Newfoundland)

Species	# Individuals	Frequency of Occurrence	Importance Index
ALFL	1	1	0.003
AMCR	5	2	0.006
AMRO	27	18	0.058
BAWW	17	12	0.039
BEKI	1	1	0.003
BLJA	1	1	0.003
BLPW	14	11	0.035
BTNW	14	9	0.029
CORA	16	8	0.026
EWCS	2	1	0.003
FOSP	9	8	0.026
GCKI	1	1	0.003

Species	# Individuals	Frequency of Occurrence	Importance Index
GRYE	2	2	0.006
HAWO	1	1	0.003
HETH	8	6	0.019
LISP	6	6	0.019
MAWA	8	7	0.023
MOWA	6	3	0.010
NAWA	1	1	0.003
NOWA	19	13	0.042
PAWA	1	1	0.003
PISI	9	6	0.019
PUFI	2	2	0.006
RBNU	1	1	0.003
RCKI	16	10	0.032
REVI	1	1	0.003
SAVS	2	2	0.006
SCJU	8	6	0.019
SWSP	1	1	0.003
SWTH	14	11	0.035
WISN	5	5	0.016
WIWR	4	3	0.010
WTSP	26	18	0.058
YBFL	38	21	0.068
YRWA	15	13	0.042
YWAR	2	2	0.006

Rocky Barren Habitat – Newfoundland

The Rocky Barren habitat type in Newfoundland had an association of nine species, all of which were found to have a single representative each.

Table C-17 Passerines Associated with Rocky Barren Habitat Type (Newfoundland)

Species	# Individuals	Frequency of Occurrence	Importance Index
BLPW	1	1	0.100
COYE	1	1	0.100
GRYE	1	1	0.100
SCJU	1	1	0.100
SWSP	1	1	0.100
WIWA	1	1	0.100
WTSP	1	1	0.100
YBFL	1	1	0.100
YWAR	1	1	0.100

Scrub/Heathland/Wetland Complex – Newfoundland

The passerine community of the Scrub Heathland Wetland Complex was comprised of 43 species. American Robin, Blackpoll warbler, Lincoln's Sparrow, White-throated Sparrow and Yellow-bellied Flycatcher comprised

45.8 percent of the total observations. As with some other habitat types, White-throated Sparrow was dominant, with 101 individuals recorded.

Table C-18 Passerines Associated with Scrub Heathland Wetland Complex (Newfoundland)

Species	# Individuals	Frequency of Occurrence	Important Index
ALFL	5	2	0.003
AMCR	8	7	0.010
AMGO	5	2	0.003
AMRE	4	3	0.004
AMRO	48	35	0.051
BAWW	13	11	0.016
BCCH	1	1	0.001
BLPW	58	37	0.054
BOCH	5	5	0.007
BTNW	3	2	0.003
CMWA	3	3	0.004
COGO	1	1	0.001
CORA	7	3	0.004
COYE	5	5	0.007
EVGR	1	1	0.001
EWCS	16	10	0.015
FOSP	33	25	0.036
GCTH	7	3	0.004
GRAJ	1	1	0.001
HETH	12	11	0.016
LISP	41	12	0.017
MAWA	9	7	0.010
MOWA	5	4	0.006
NOWA	31	27	0.039
OSFL	6	4	0.006
PIGR	1	1	0.001
PISI	1	1	0.001
PUFI	4	4	0.006
RCKI	20	16	0.023
SAVS	29	19	0.028
SCJU	22	17	0.025
SOSP	3	3	0.004
SWSP	16	12	0.017
SWTH	14	9	0.013
TEWA	1	1	0.001
TRES	1	1	0.001
WISN	4	4	0.006
WIWA	11	10	0.015
WIWR	8	5	0.007
WTSP	101	39	0.057
YBFL	54	33	0.048

Species	# Individuals	Frequency of Occurrence	Important Index
YRWA	29	25	0.036
YWAR	13	10	0.015

Wetland Habitat – Newfoundland

The Wetland habitat type in Newfoundland had a diverse passerine community, with 45 species observed. Species in greatest abundance were American Robin, Blackpoll warbler, Fox Sparrow, White-throated Sparrow and Yellow-bellied Flycatcher; these species represented 41.2 percent of the observations. Several other species were found in relatively high numbers.

Table C-19 Passerines Associated with Wetland Habitat Type (Newfoundland)

Species	# Individuals	Frequency of Occurrence	Importance Index
ALFL	7	6	0.013
AMCR	17	12	0.026
AMGO	2	2	0.004
AMRE	8	5	0.011
AMRO	24	18	0.038
BAWW	9	6	0.013
BEKI	2	2	0.004
BLJA	1	1	0.002
BLPW	29	18	0.038
BOCH	4	4	0.009
BTNW	6	4	0.009
CMWA	1	1	0.002
CORA	22	10	0.021
COYE	4	4	0.009
EVGR	1	1	0.002
EWCS	14	6	0.013
FOSP	27	19	0.040
GCKI	1	1	0.002
GCTH	5	3	0.006
GRAJ	1	1	0.002
GRYE	2	2	0.004
HETH	6	2	0.004
LISP	16	12	0.026
MAWA	10	6	0.013
MOWA	6	4	0.009
NAWA	3	3	0.006
NOFL	2	2	0.004
NOWA	17	12	0.026
OSFL	1	1	0.002
PIGR	2	2	0.004
PISI	5	2	0.004
PUFI	4	3	0.006

Species	# Individuals	Frequency of Occurrence	Importance Index
RBNU	2	1	0.002
RCKI	21	14	0.030
SAVS	8	5	0.011
SCJU	12	9	0.019
SWSP	5	5	0.011
SWTH	11	8	0.017
TEWA	2	2	0.004
WISN	10	7	0.015
WIWA	4	4	0.009
WTSP	65	25	0.053
YBFL	44	23	0.049
YRWA	7	7	0.015
YWAR	9	8	0.017

Table C-20 Summary of Avifaunal Observations according to Habitat Type and Ecoregion

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
ABDU	Cutover		2								2
	Open Conifer Forest									1	1
	Open Water		7								7
ABDU Total			9							1	10
AGWT	Scrub / Heathland / Wetland Complex							11			11
	Wetland			1							1
AGWT Total				1				11			12
ALFL	Burn						1				1
	Conifer Scrub				5						5
	Cutover		15						1		16
	Hardwood Forest						1				1
	Mixedwood Forest								1		1
	Open Conifer Forest								1		1
	Open Water		1								1
	Scrub / Heathland / Wetland Complex		3						2		5
	Wetland		3	8					3		14
	Other/Unclassified					2					2
ALFL Total			22	8	5	2	2		8		47
AMBI	Cutover		1								1
AMBI Total			1								1
AMCR	Conifer Scrub				3						3
	Cutover		10					2	1		13
	Lichen Heathland				1						1
	Mixedwood Forest		1	1				2			4
	Open Conifer Forest			1						5	6
	Scrub / Heathland / Wetland Complex	3	1						4		8
	Wetland		1	3					1	14	19
	Other/Unclassified	2								4	6
AMCR Total		5	13	5	4			4	6	23	60
AMGO	Burn						2				2
	Cutover		7								7

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
	Scrub / Heathland / Wetland Complex	1						4			5
	Wetland									2	2
	Other/Unclassified							4			4
AMGO Total		1	7				2	8		2	20
AMRE	Conifer Forest		1								1
	Conifer Scrub				1						1
	Cutover		36					1			37
	Mixedwood Forest		19	1				1			21
	Open Conifer Forest			1							1
	Open Water		1								1
	Scrub / Heathland / Wetland Complex		3						1		4
	Wetland		1	3					7		11
	Other/Unclassified					1					1
AMRE Total			61	5	1	1		2	8		78
AMRO	Black Spruce Lichen Forest			1							1
	Burn						1				1
	Conifer Forest		3					1	7		11
	Conifer Scrub				14			1			15
	Cutover	2	54					4	8		68
	Hardwood Forest						1				1
	Kalmia Lichen/Heathland					2		1			3
	Lichen Heathland				10						10
	Mixedwood Forest	2	27	1				7			37
	Open Conifer Forest		2	1					11	14	28
	Open Water		1					1			2
	Scrub / Heathland / Wetland Complex	7	4			8		17	12		48
	Wetland		2	9	2			1	9	12	35
	Other/Unclassified	2	1			3		3	2	5	16
AMRO Total		13	94	12	26	13	2	36	49	31	276
ATSP	Conifer Scrub				2						2
ATSP Total					2						2
ATTW	Conifer Forest						1				1
	Conifer Scrub				1						1
	Cutover		1								1
	Mixedwood Forest		1								1

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
	Open Conifer Forest			1							1
	Wetland			2			1				3
ATTW Total			2	3	1		2				8
	Conifer Forest		2						1		3
	Conifer Scrub				11						11
	Cutover		28					1	3		32
	Hardwood Forest						1				1
	Lichen Heathland				3						3
	Mixedwood Forest		10					4			14
	Open Conifer Forest		2						8	7	17
	Open Water		1					1			2
	Scrub / Heathland / Wetland Complex	1	2					5	5		13
	Wetland		1	2					8		11
AWW	Other/Unclassified					4		2			6
BAWW Total		1	46	2	14	4	1	13	25	7	113
BBWA	Other/Unclassified					1					1
BBWA Total						1					1
BBWO	Mixedwood Forest							2			2
BBWO Total								2			2
	Conifer Forest		3								3
BCCH	Cutover	1	2								3
	Mixedwood Forest		2					2			4
	Scrub / Heathland / Wetland Complex							1			1
BCCH Total		1	7					3			11
	Cutover		2								2
BEKI	Open Conifer Forest									1	1
	Wetland								1	1	2
BEKI Total			2						1	2	5
	Conifer Forest								1		1
BHVI	Cutover								1		1
BHVI Total									2		2
	Cutover	1									1
BLJA	Mixedwood Forest		4								4
	Open Conifer Forest								1		1

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
	Wetland									1	1
BLJA Total		1	4						1	1	7
BLPW	Conifer Forest								1		1
	Conifer Scrub				19						19
	Cutover	2	3					2	3		10
	Hardwood Forest						1				1
	Kalmia Lichen/Heathland					3		3			6
	Lichen Heathland				9						9
	Mixedwood Forest	2	3	1				9	4		19
	Open Conifer Forest			1					6	8	15
	Open Water							1			1
	Rocky Barrens							1			1
	Scrub / Heathland / Wetland Complex	5				26		21	6		58
	Wetland			8	2	2		1	17	9	39
	Other/Unclassified	1				3		2	2	1	9
BLPW Total		10	6	10	30	34	1	40	39	18	188
BOCH	Conifer Forest						1				1
	Cutover								2		2
	Lichen Heathland				1						1
	Mixedwood Forest		1	1				2			4
	Open Conifer Forest						2				2
	Open Water			1							1
	Scrub / Heathland / Wetland Complex	1	1			1		1	1		5
	Wetland								3	1	4
	Other/Unclassified					1			1		2
BOCH Total		1	2	2	1	2	3	3	7	1	22
BTNW	Conifer Forest		5					1	1		7
	Cutover		5						3		8
	Mixedwood Forest		24					3	3		30
	Open Conifer Forest		1						13		14
	Open Water		1								1
	Scrub / Heathland / Wetland Complex								3		3
	Wetland			1					6		7
	Other/Unclassified		1			14					15
BTNW Total			37	1		14		4	29		85

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
CAGO	Scrub / Heathland / Wetland Complex							2			2
	Wetland			5							5
CAGO Total				5				2			7
	Hardwood Forest						2				2
CEDW	Other/Unclassified		6								6
CEDW Total			6				2				8
CMWA	Cutover		1								1
	Mixedwood Forest		4								4
	Scrub / Heathland / Wetland Complex		2					1			3
	Wetland		1								1
CMWA Total			8					1			9
COGO	Scrub / Heathland / Wetland Complex								1		1
COGO Total									1		1
COLO	Conifer Forest								2		2
	Lichen Heathland				2						2
	Mixedwood Forest			2				1			3
	Open Conifer Forest						1		2		3
	Scrub / Heathland / Wetland Complex	1							6		7
	Wetland						1		2	2	5
COLO Total		1		2	2		2	1	12	2	22
COME	Black Spruce Lichen Forest			1							1
COME Total				1							1
	Conifer Forest		2						3		5
	Conifer Scrub				1						1
	Cutover		7					1			8
	Mixedwood Forest	3	6					7			16
	Open Conifer Forest								4	12	16
	Scrub / Heathland / Wetland Complex							2	5		7
	Wetland			1					15	7	23
CORA	Other/Unclassified								3		3

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
CORA Total		3	15	1	1			10	30	19	79
CORE	Conifer Scrub				3						3
	Wetland				4						4
CORE Total					7						7
COYE	Conifer Scrub				1						1
	Cutover		5					1			6
	Open Water		1								1
	Rocky Barrens							1			1
	Scrub / Heathland / Wetland Complex		1					4			5
	Wetland		4		3						7
	Other/Unclassified							2			2
COYE Total			11		4			8			23
DOWO	Cutover		1								1
DOWO Total			1								1
EVGR	Cutover		3								3
	Scrub / Heathland / Wetland Complex		1								1
	Wetland		1								1
EVGR Total			5								5
EWCS	Black Spruce Lichen Forest			1			2				3
	Burn						2				2
	Cutover		1						2		3
	Open Conifer Forest								2		2
	Scrub / Heathland / Wetland Complex					7			9		16
	Wetland			2					14		16
EWCS Total			1	3		7	4		27		42
FOSP	Black Spruce Lichen Forest			9			1				10
	Burn						6				6
	Conifer Forest			2			10		3		15
	Conifer Scrub				25						25
	Cutover		35					1	3		39
	Hardwood Forest						2				2
	Kalmia Lichen/Heathland					3					3
	Lichen Heathland				8						8

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
	Mixedwood Forest		8	5			1	5	2		21
	Open Conifer Forest			9			7		4	5	25
	Open Water			1				1			2
	Scrub / Heathland / Wetland Complex	2	3			12		12	4		33
	Wetland		5	27	6	2	10	2	9	9	70
	Other/Unclassified		1					1		2	4
FOSP Total		2	52	53	39	17	37	22	25	16	263
GBBG	Conifer Scrub				4						4
	Wetland									2	2
GBBG Total					4					2	6
GCKI	Cutover	1									1
	Mixedwood Forest		6					2			8
	Open Conifer Forest								1		1
	Wetland								1		1
	Other/Unclassified					1					1
GCKI Total		1	6			1		2	2		12
GCTH	Conifer Scrub				3						3
	Kalmia Lichen/Heathland					2					2
	Lichen Heathland				1						1
	Mixedwood Forest		2								2
	Scrub / Heathland / Wetland Complex					7					7
	Wetland					3			2		5
GCTH Total			2		4	12			2		20
GRAJ	Black Spruce Lichen Forest			1							1
	Burn						1				1
	Conifer Forest						3		2		5
	Conifer Scrub				1						1
	Cutover								1		1
	Mixedwood Forest		3								3
	Open Conifer Forest			3			1				4
	Scrub / Heathland / Wetland Complex								1		1
	Wetland			5	1		2		1		9
	Other/Unclassified					1					1
GRAJ Total			3	9	2	1	7		5		27
GRYE	Cutover		1								1
	Open Conifer Forest									2	2

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
	Rocky Barrens							1			1
	Wetland		1	3						1	5
GRYE Total			2	3				1		3	9
HAWO	Cutover		4								4
	Open Conifer Forest								1		1
	Other/Unclassified					1					1
HAWO Total			4			1			1		6
HERG	Conifer Forest		4								4
	Conifer Scrub				15						15
	Cutover		2								2
	Lichen Heathland				1						1
	Mixedwood Forest	1									1
	Open Conifer Forest									3	3
	Open Water			1							1
	Rocky Barrens							1			1
	Scrub / Heathland / Wetland Complex							5			5
	Wetland				5					4	9
	Other/Unclassified					1				8	9
HERG Total		1	6	1	21	1		6		15	51
HETH	Black Spruce Lichen Forest			1			1				2
	Burn						2				2
	Conifer Forest								1		1
	Conifer Scrub				4						4
	Cutover		23					2	3		28
	Mixedwood Forest		10				1	3			14
	Open Conifer Forest		1	2					7		10
	Scrub / Heathland / Wetland Complex	2	1			1		7	1		12
	Wetland				1		2	1			4
	Other/Unclassified	1							1		2
HETH Total		3	35	3	5	1	6	13	13		79
LISP	Black Spruce Lichen Forest			1							1
	Conifer Forest						2				2
	Conifer Scrub				5						5
	Cutover		8						1		9
	Kalmia Lichen/Heathland					6					6
	Mixedwood Forest						1				1

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
	Open Conifer Forest								2	4	6
	Scrub / Heathland / Wetland Complex					35			6		41
	Wetland		2	2	1	5			1	8	19
LISP Total			10	3	6	46	3		10	12	90
MALL	Wetland			1							1
MALL Total				1							1
MAWA	Conifer Forest		1						1		2
	Cutover		9					1	4		14
	Mixedwood Forest		25					1	1		27
	Open Conifer Forest		2						3	3	8
	Scrub / Heathland / Wetland Complex							4	5		9
	Wetland		1	1					8		10
	Other/Unclassified		1			1			2		4
MAWA Total			39	1		1		6	24	3	74
MERL	Cutover		1								1
MERL Total			1								1
MOWA	Conifer Forest								1		1
	Conifer Scrub				4						4
	Cutover		11						2		13
	Mixedwood Forest		1								1
	Open Conifer Forest								6		6
	Scrub / Heathland / Wetland Complex		1						4		5
	Wetland		1	1					5		7
	Other/Unclassified								1		1
MOWA Total			14	1	4				19		38
NAWA	Burn						1				1
	Conifer Scrub				5						5
	Cutover		4						1		5
	Hardwood Forest						3				3
	Lichen Heathland				1						1
	Mixedwood Forest						2	1			3
	Open Conifer Forest								1		1
	Open Water		1								1
	Wetland									3	3

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
	Other/Unclassified									2	2
NAWA Total			5		6		6	1	2	5	25
NOFL	Cutover		1								1
	Mixedwood Forest		2								2
	Wetland		1						1		2
NOFL Total			4						1		5
NOHA	Wetland				1						1
NOHA Total					1						1
NOWA	Black Spruce Lichen Forest						1				1
	Burn						3				3
	Conifer Forest		1	2			2	1	1		7
	Conifer Scrub			2	17			1			20
	Cutover	3	35					1	1		40
	Lichen Heathland				8						8
	Mixedwood Forest	2	17	1				15			35
	Open Conifer Forest			2			6		9	10	27
	Open Water			3				1			4
	Scrub / Heathland / Wetland Complex	7	4			2		12	6		31
	Wetland		4	13	5		1		7	6	36
	Other/Unclassified					3			1	2	6
NOWA Total		14	62	23	30	5	13	35	25	19	226
OCWA	Black Spruce Lichen Forest						2				2
	Burn						2				2
	Open Conifer Forest						4				4
OCWA Total							8				8
OSFL	Cutover								1		1
	Mixedwood Forest		1								1
	Scrub / Heathland / Wetland Complex								6		6
	Wetland								1		1
	Other/Unclassified		2								2
OSFL Total			3						8		11
OSPR	Wetland								1		1
OSPR Total									1		1
OVEN	Cutover		10								10
	Mixedwood Forest		5								5

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
OVEN Total			15								15
PAWA	Open Conifer Forest									1	1
PAWA Total										1	1
PIGR	Burn						3				3
	Conifer Forest							1			1
	Cutover		1						1		2
	Hardwood Forest						1				1
	Mixedwood Forest		3					1			4
	Scrub / Heathland / Wetland Complex							1			1
	Wetland								1	1	2
PIGR Total			4				4	3	2	1	14
PISI	Conifer Forest								1		1
	Conifer Scrub				7						7
	Cutover								1		1
	Hardwood Forest						1				1
	Lichen Heathland				1						1
	Open Conifer Forest								7	2	9
	Scrub / Heathland / Wetland Complex								1		1
	Wetland			17					4		21
	Other/Unclassified					3					3
PISI Total				17	8	3	1		14	2	45
PUFI	Conifer Forest								2		2
	Conifer Scrub				1						1
	Cutover		8					1			9
	Mixedwood Forest	1	2					2			5
	Open Conifer Forest								2		2
	Scrub / Heathland / Wetland Complex	2						2			4
	Wetland			1					2	2	5
	Other/Unclassified	1						2		3	6
PUFI Total		4	10	1	1			7	6	5	34
RBGU	Wetland									3	3
RBGU Total										3	3
RBNU	Conifer Forest		1								1
	Cutover	1	2								3
	Mixedwood Forest		8								8

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
	Open Conifer Forest								1		1
	Wetland								2		2
	Other/Unclassified		1								1
RBNU Total		1	12						3		16
RCKI	Black Spruce Lichen Forest			4			1				5
	Burn						2				2
	Conifer Forest		2	2			5		3		12
	Conifer Scrub			1	7						8
	Cutover	1	17						9		27
	Hardwood Forest						2				2
	Kalmia Lichen/Heathland					2					2
	Lichen Heathland				2						2
	Mixedwood Forest		28	7				7	4		46
	Open Conifer Forest		2	8			1		12	2	25
	Open Water			2							2
	Scrub / Heathland / Wetland Complex	4						9	7		20
	Wetland			24		1	8		17	2	52
	Other/Unclassified	2				1		3			6
RCKI Total		7	49	48	9	4	19	19	52	4	211
REVI	Conifer Forest		1						1		2
	Mixedwood Forest		2								2
	Open Conifer Forest								1		1
REVI Total			3						2		5
RTHA	Open Conifer Forest			1							1
RTHA Total				1							1
RUBL	Mixedwood Forest							1			1
	Open Conifer Forest			5							5
	Open Water			1							1
	Wetland			12			4				16
RUBL Total				18			4	1			23
RUGR	Mixedwood Forest		1								1
	Wetland						1				1
RUGR Total			1				1				2
SAVS	Burn						1				1
	Conifer Forest						1				1
	Conifer Scrub				2						2
	Cutover							1			1

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
	Kalmia Lichen/Heathland					1		1			2
	Lichen Heathland				7						7
	Mixedwood Forest							1			1
	Open Conifer Forest									2	2
	Scrub / Heathland / Wetland Complex	1				14		11	3		29
	Wetland		6	7	2		3			2	20
	Other/Unclassified							1	2	1	2
SAVS Total		1	6	7	11	15	5	15	5	5	70
SBDO	Wetland			1			1				2
SBDO Total				1			1				2
SCJU	Black Spruce Lichen Forest			12			1				13
	Burn						6				6
	Conifer Forest		1				3	1			5
	Conifer Scrub		2	1	2			2			7
	Cutover	1	14					3	1		19
	Hardwood Forest						1				1
	Lichen Heathland				8						8
	Mixedwood Forest		14	1			1	2			18
	Open Conifer Forest		4	1			4		3	1	13
	Open Water			2				1			3
	Rocky Barrens							1			1
	Scrub / Heathland / Wetland Complex	5	1			2		14			22
	Wetland		4	13			7	2	1	5	32
	Other/Unclassified	3	1					2			6
SCJU Total		9	42	30	10	2	23	28	5	6	155
SOSA	Conifer Forest						3				3
	Open Conifer Forest									1	1
	Scrub / Heathland / Wetland Complex							1	1		2
	Wetland			13			5				18
	Other/Unclassified							1			1
SOSA Total				13			8	2	1	1	25
SOSP	Scrub / Heathland / Wetland Complex							3			3
SOSP Total								3			3
SPSA	Scrub / Heathland / Wetland Complex		1								1
	Wetland			3						1	4

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
SPSA Total			1	3						1	5
SUSC	Conifer Forest						11				11
SUSC Total							11				11
SWSP	Conifer Scrub							1			1
	Cutover		6					2			8
	Kalmia Lichen/Heathland							1			1
	Mixedwood Forest		2								2
	Open Conifer Forest									1	1
	Open Water		1								1
	Rocky Barrens							1			1
	Scrub / Heathland / Wetland Complex	1						15			16
	Wetland		1					1		3	5
	Other/Unclassified							1		1	2
SWSP Total		1	10					22		5	38
SWTH	Black Spruce Lichen Forest			3			2				5
	Burn						3				3
	Conifer Forest			1			2		3		6
	Conifer Scrub			2	2						4
	Cutover		1						5		6
	Hardwood Forest						7				7
	Lichen Heathland				4						4
	Mixedwood Forest		8	4				1	2		15
	Open Conifer Forest		2	1			3		5	7	18
	Open Water		1	1							2
	Scrub / Heathland / Wetland Complex					5		2	7		14
	Wetland			12			5		9	2	28
	Other/Unclassified					10			1		11
SWTH Total			12	24	6	15	22	3	32	9	123
TEWA	Conifer Scrub				7						7
	Cutover		10								10
	Hardwood Forest						2				2
	Mixedwood Forest		3				3	1			7
	Scrub / Heathland / Wetland Complex								1		1
	Wetland								2		2
	Other/Unclassified		1			3					4

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
TEWA Total			14		7	3	5	1	3		33
TRES	Conifer Forest			1							1
	Conifer Scrub				9						9
	Open Conifer Forest			3			1				4
	Scrub / Heathland / Wetland Complex							1			1
	Wetland			6			2				8
TRES Total				10	9		3	1			23
WISN	Black Spruce Lichen Forest			1							1
	Conifer Forest			1							1
	Cutover		7								7
	Mixedwood Forest		2						1		3
	Open Conifer Forest			5					2	3	10
	Scrub / Heathland / Wetland Complex							3	1		4
	Wetland			6					2	8	16
WISN Total			9	13				3	6	11	42
WIWA	Black Spruce Lichen Forest						1				1
	Burn						5				5
	Conifer Scrub				4						4
	Cutover		4								4
	Hardwood Forest						4				4
	Kalmia Lichen/Heathland					1					1
	Lichen Heathland				2						2
	Mixedwood Forest		2						1		3
	Open Conifer Forest			1			3			1	5
	Rocky Barrens							1			1
	Scrub / Heathland / Wetland Complex					3		6	2		11
	Wetland			1				1	2	1	5
	Other/Unclassified	1				1		1			3
WIWA Total		1	6	2	6	5	13	9	5	2	49
WIWR	Conifer Scrub				8						8
	Lichen Heathland				4						4
	Open Conifer Forest								3		3
	Scrub / Heathland / Wetland Complex								8		8
	Wetland			2	2						4

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
	Other/Unclassified								1		1
WIWR Total				2	14				12		28
WTSP	Black Spruce Lichen Forest			7			4				11
	Burn						9				9
	Conifer Forest		1					1	4		6
	Conifer Scrub		1		9						10
	Cutover		113					3	15		131
	Hardwood Forest						10				10
	Kalmia Lichen/Heathland					4					4
	Lichen Heathland				17						17
	Mixedwood Forest	2	33	5			4	4	3		51
	Open Conifer Forest		3	5			2		14	9	33
	Open Water		1	2				1			4
	Rocky Barrens							1			1
	Scrub / Heathland / Wetland Complex	5	6			37		22	31		101
	Wetland		14	26	2	3			40	8	93
	Other/Unclassified	2	2			2		3	3	3	14
WTSP Total		9	174	45	28	46	29	35	110	20	496
WWCR	Black Spruce Lichen Forest			2							2
	Burn						2				2
	Conifer Forest						3				3
	Cutover		1								1
	Lichen Heathland				2						2
	Mixedwood Forest			4							4
	Open Conifer Forest						2				2
	Wetland			12			1				13
	Other/Unclassified									3	3
WWCR Total			1	18	2		8			3	32
YBFL	Burn						3				3
	Conifer Forest		3					1	5		9
	Conifer Scrub		1		6			1			8
	Cutover		38					3	8		49
	Hardwood Forest						4				4
	Kalmia Lichen/Heathland							2			2
	Lichen Heathland				1						1
	Mixedwood Forest	3	29				1	10	3		46
	Open Conifer Forest		6	1					20	12	39

		Ecoregion									
Species	**Habitat Type**	**AF**	**CNF**	**ERP**	**FB**	**LRB**	**LSF**	**MB**	**NPF**	**SBIB**	**Total**
	Rocky Barrens							1			1
	Scrub / Heathland / Wetland Complex	8	3					26	17		54
	Wetland		4	3	1			1	29	10	48
	Other/Unclassified	4				7			2	2	15
YBFL Total		15	84	4	8	7	8	45	84	24	279
YRWA	Burn						1				1
	Conifer Forest		3	1					6		10
	Conifer Scrub		2	1	3						6
	Cutover	2	16					5	3		26
	Kalmia Lichen/Heathland							2			2
	Mixedwood Forest	2	25	1				8	1		37
	Open Conifer Forest		2	5					8	5	20
	Open Water							1			1
	Scrub / Heathland / Wetland Complex	5	4			4		13	3		29
	Wetland		2	8					4	1	15
	Other/Unclassified	3	1					2		2	8
YRWA Total		12	55	16	3	4	1	31	25	8	155
YWAR	Conifer Scrub			3	10						13
	Cutover		56					3			59
	Kalmia Lichen/Heathland							1			1
	Lichen Heathland				4						4
	Mixedwood Forest		4					2			6
	Open Conifer Forest								1	1	2
	Open Water		1								1
	Rocky Barrens							1			1
	Scrub / Heathland / Wetland Complex		4					9			13
	Wetland		5	8				1	2	1	17
	Other/Unclassified							1		1	2
YWAR Total			70	11	14			18	3	3	119
Grand Total		118	1186	443	356	268	267	480	753	296	4167