# Labrador – Island Transmission Link

## Ecological Land Classification

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***WTO TBR0060 Work Order 664156***
***Contract # LC-EV-002***

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**July 26, 2010**

# 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. Project planning and design are (as of the time at which this study was completed) at a stage of having identified a 2 km wide corridor for the on-land portions of the proposed HVdc transmission line, as well as various alternative corridor segments in particular areas.

As part of the environmental assessment (EA) for the Project, Nalcor Energy has carried out a regional Ecological Land Classification (ELC). The purpose of the ELC was to identify, categorize and evaluate vegetation types and associated habitats on a regional scale along the identified transmission corridors and adjacent areas, for use in the EA.

**Approach and Methods**

Habitat Types within a 15 km wide ELC Study Area and associated 2 km wide transmission corridor from Gull Island to Soldiers Pond were surveyed during a 60 field team-day field program in the summer of 2008. Vegetation, site photographs, site conditions and wildlife suitability data were collected for 404 sites within the Study Area. High-resolution satellite images and aerial photographs were incorporated into a computer-based geographic information system (GIS) and used to define and delineate Habitat Types. There are 19 Ecoregions (areas with distinctive recurring patterns of vegetation, soil and climate) within Newfoundland and Labrador, nine of which occur on the Island of Newfoundland (Damman 1983) and 10 in Labrador (Meades 1990). The proposed transmission corridor will transverse 10 of these Ecoregions: High Boreal Forest, Low Subarctic Forest, String Bog, Forteau Barrens, Strait of Belle Isle Barrens, Northern Peninsula Forest, Long Range Barrens, Central Newfoundland Forest, Maritime Barrens and Avalon Forest.

**Results – ELC Study Area (15 km)**

Fifteen (15) ELC Habitat Types (as defined by plant species presence and abundance) were identified within the Ecoregions which overlap with the 15 km wide ELC Study Area. Ten ELC Habitat Types were identified for Southeastern Labrador: Black Spruce Lichen Forest (4 percent); Burn (1 percent); Conifer Forest (20 percent); Conifer Scrub (16 percent); Exposed Bedrock (<1 percent); Hardwood Forest (< 1 percent); Lichen Heathland (5 percent); Mixedwood Forest (<1 percent); Open Conifer Forest (25 percent) and Wetland (24 percent).

Eleven ELC Habitat Types were identified for the Island of Newfoundland: Alpine Vegetated (<1 percent); Burn (<1 percent); Conifer Forest (12 percent); Conifer Scrub (2 percent); Cutover (10 percent); Kalmia Lichen/Heathland (2 percent); Mixedwood Forest (20 percent); Open Conifer Forest (13 percent); Rocky Barrens (<1 percent); Scrub/Heathland/Wetland Complex (21 percent) and Wetland (10 percent). Burn, Conifer Forest, Conifer Scrub, Mixedwood Forest, Open Conifer Forest and Wetland ELC Habitat Types are common to both Southeastern Labrador and the Island of Newfoundland.

Additionally, there are three ELC non-habitat areas identified in Labrador (Clouds/Shadow, Exposed Earth/Anthropogenic/Cutblock and Open Water) accounting for <7 percent of the mapped ELC habitat. There

are four ELC non-habitat areas identified for the Island of Newfoundland (Clouds/Shadow, Exposed Earth/Anthropogenic/Cutblock, Exposed Earth/Anthropogenic and Open Water) accounting for <11 percent of the mapped ELC Habitat.

**Results – Transmission Corridor (2 km)**

Similarly, some fourteen (14) ELC Habitat Types comprise the 2 km wide transmission corridor, with minor components of Exposed Bedrock as observed within the Low Subarctic Forest, String Bog, and Forteau Barrens Ecoregions of Labrador, no longer evident within the narrower, refined transmission corridor. As such, nine ELC Habitat Types were identified within the 2 km wide transmission corridor for Labrador: Black Spruce Lichen Forest (3 percent); Burn (2 percent); Conifer Forest (20 percent); Conifer Scrub (19 percent); Hardwood Forest (<1 percent); Lichen Heathland (5 percent); Mixedwood Forest (<1 percent); Open Conifer Forest (27 percent) and Wetland (21 percent).

Eleven ELC Habitat types were identified within the transmission corridor on the Island of Newfoundland: Alpine Vegetated (<1 percent); Burn (<1 percent); Conifer Forest (14 percent); Conifer Scrub (2 percent); Cutover (11 percent); Kalmia Lichen/Heathland (2 percent); Mixedwood Forest (22 percent); Open Conifer Forest (13 percent); Rocky Barrens (1 percent); Scrub/Heathland/Wetland Complex (20 percent) and Wetland (9 percent). Burn, Conifer Forest, Conifer Scrub, Mixedwood Forest, Open Conifer Forest and Wetland ELC Habitat Types are common to both Labrador and the Island of Newfoundland.

Non-habitat areas, including Exposed Earth/Anthropogenic/Cutblock, Cloud/Shadow and Open Water, account for <2 percent of the mapped ELC in Southeastern Labrador. For the Island of Newfoundland, four ELC non-habitat types were identified (Clouds/Shadow, Exposed Earth/Anthropogenic/Cutblock, Exposed Earth/ Anthropogenic and Open Water) accounting for <7 percent of the mapped ELC Habitat within the 2 km transmission corridor.

Although the ELC was developed as is available at a scale of 1:50,000, the atlas of all Habitat Types within the Study Area is presented at a reduced scale of 1:75,000 for ease of presentation and inclusion as an appendix to this report.

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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 Project's environmental assessment (EA) is on-going, with an Environmental Impact Statement (EIS) currently being prepared by Nalcor Energy.

In preparation for and in support of the Project's EA, this *Ecological Land Classification* was completed in order to present information on vegetation communities and habitats in the area of, and which may interact with, the proposed Project as environmental baseline information for use in the EIS.

This report presents the results of an Ecological Land Classification (ELC) of a 15 km wide Study Area encompassing the proposed and alternate transmission corridors. The report:

- identifies and describes the regional vegetation communities and habitats within the Study Area; and
- maps those vegetation communities and habitats using field studies and remote sensing software.

## 1.1 Project Overview

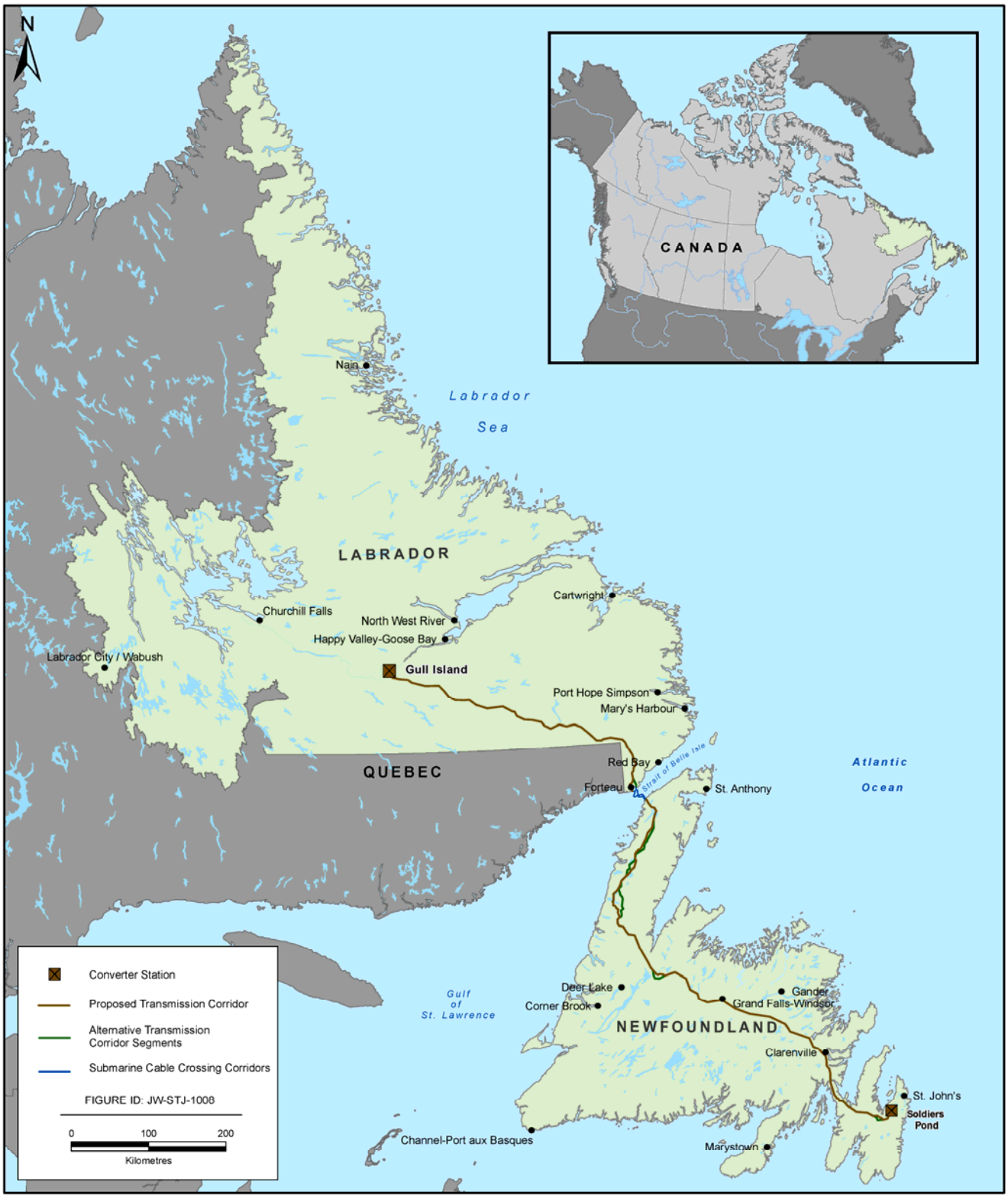
The Project involves the construction and operation of transmission infrastructure within and between Labrador and the Island of Newfoundland.

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. This 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;
- cable crossings of the Strait of Belle Isle with associated infrastructure, including 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 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 portion of the proposed transmission line and 500 m wide corridors for the proposed Strait of Belle Isle cable crossings, as well as various alternative corridor segments in particular areas.

**Figure 1.1 Labrador-Island Transmission Link**



It is these proposed transmission corridors and components that were the subject of Nalcor Energy's environmental baseline study program. 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 eventually identify and select a specific routing for the Project. The eventual transmission routes and locations will be selected with consideration of technical, environmental and socioeconomic factors.

## 1.2 Study Purpose and Objectives

The purpose of this ELC study was to present information on regional vegetation communities and habitats in the area of, and which may interact with, the proposed Project, as environmental baseline information for use in the EA.

The ELC will serve as an essential and integral component of the EA, and provides key and core information that will be used in assessing and quantifying the Project's potential interactions with aspects of the terrestrial environment (vegetation and wildlife).

The ELC exercise itself comprised several key deliverables, which are reported on both here and elsewhere, including:

1. A detailed ELC study report outlining field and mapping methods and ecological descriptions of map units (this report);
2. Detailed ELC vegetation maps (this report) and an associated GIS system produced at a scale of 1:75,000 covering a 15 km wide regional Study Area encompassing the transmission corridor and adjacent areas;
3. A Wetland Inventory and Classification study, using and building upon the ELC to identify and classify all wetlands along the proposed transmission corridor according to the Canadian System of Wetland classification (a separate report); and
4. Detailed wildlife habitat suitability analysis and mapping, based on the ELC, for caribou, other large mammals, furbearers and small mammals and avifauna (presented separately in various other Wildlife Component Studies).

## 1.3 Study Area

The ELC was developed at a scale of 1:50,000 but printed at a scale of 1:75,000 for an area of land 15 km wide and approximately 1,100 km long, from Gull Island in Labrador to Soldiers Pond on the Island of Newfoundland as defined in Appendix A (Atlas – Index).

# 2.0 APPROACH AND METHODS

An iterative approach using a variety of data formats including satellite imagery (Landsat 7 and Spot 5), forestry vector data (for the Island of Newfoundland), air photos, elevation and field survey data serve as the foundation for the ELC study. This combination of data formats resulted in a field survey program (Section 2.2) designed to support a systematic remote-sensing-based mapping program (Section 2.3). The combination of these two separate but interrelated programs provided the best combination for the acquisition of ecological information relevant to the Project and mapping accuracy over the geographic area involved.

The satellite imagery data served as foundation for the selection of survey site locations. The field surveys (Section 2.2) were designed to provide information on vegetation abundance and community composition, which was used to assess overall plant species distribution and wildlife habitat ratings. Surveyed sites were also used to identify specific locations and the distribution of defined Habitats Types.

The field surveys are a key requirement in the development of the remote-sensing algorithm (Section 2.3), which is a procedure or formula for effectively solving a problem using a sequence of instructions. The degree of coverage chosen for the field survey (404 plots in total) was to allow for adequate tie in of the remote sensing algorithm to the satellite images necessary for the production of a high quality ELC product.

A computer-based algorithm was developed using satellite images to delineate the habitats identified in the field program for the entire Study Area. The field survey data were used to train (refine and clarify) the algorithm. The use of satellite images and remote sensing technologies allowed for a systematic and consistent identification and delineation of large scale vegetation patterns throughout the geographic extent of the Study Area. Therefore, the use of remote sensing technologies and satellite images was preferred over manual interpretation due to the large geographic extent of the Study Area. The output of the computer-based algorithm is a raw classification grid that is further processed by mosaicing and then generalized for mapping presentation (Section 2.4).

The resultant maps were not designed to provide detailed site-specific information, but rather, an appropriate representation of the regional landscape. A similar approach to ELC mapping has been used for other projects and in support of EAs including the Lower Churchill Hydroelectric Generation Project (Minaskuat 2008a, 2008b) Aurora Michelin Project (Minaskuat 2009c), Kitimat LNG EA (Kitimat LNG Inc. 2005) and Enbridge Gateway EA (Gateway Pipeline Limited Partnership 2005).

## 2.1 Ecological Land Classification in Canada

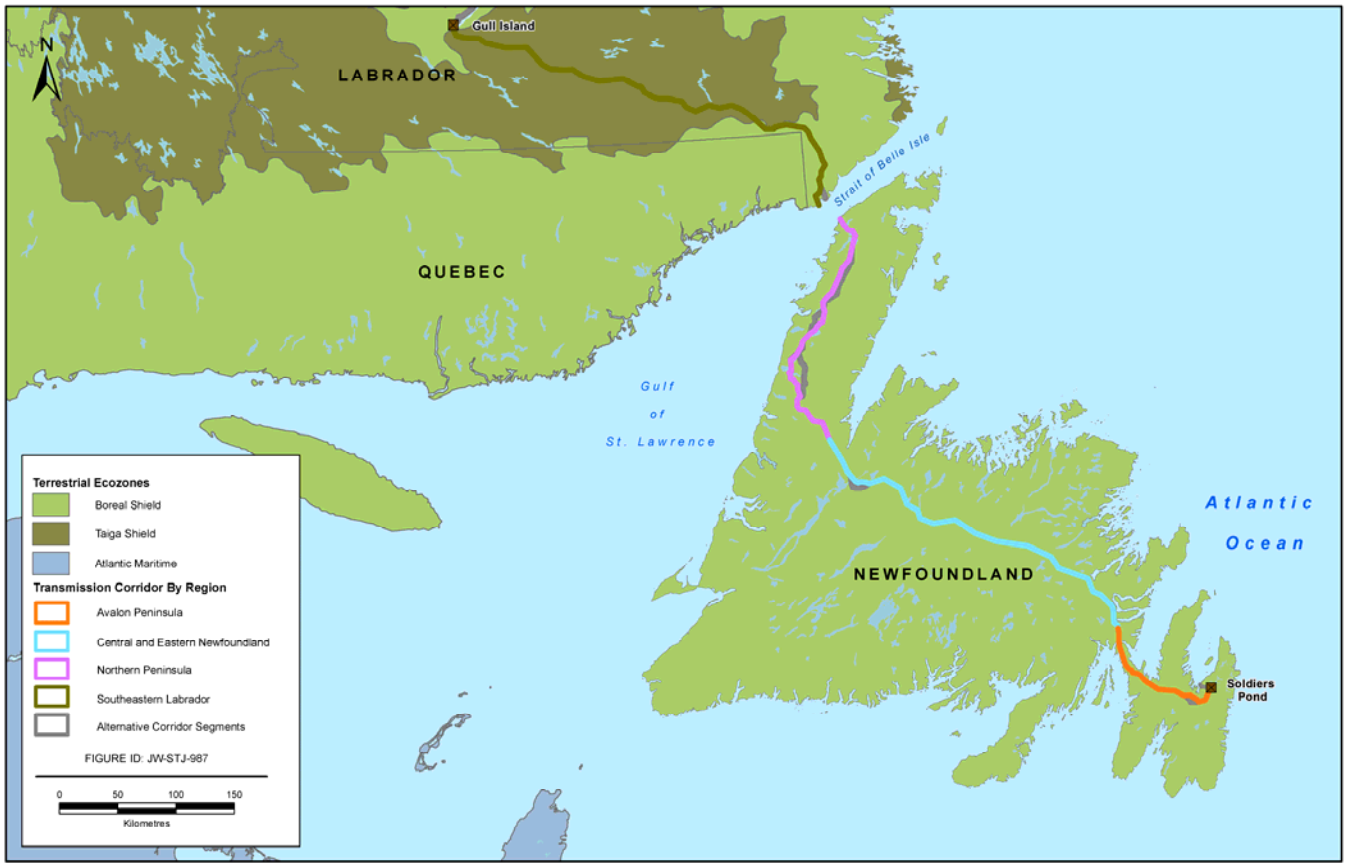
Marshall and Schutt (1999) describe a hierarchical framework for ELC in Canada that forms the basis of this ELC. This framework provides a consistent, national spatial context within which ecosystems, at various levels of generalization, can be described, classified and monitored. By using this framework, this ELC incorporates a standard and well-validated methodology for describing ecological units, thereby facilitating comparisons of

ELCs undertaken in other jurisdictions, including other ELCs that have been undertaken in Newfoundland and Labrador.

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. The Project crosses two Ecozones: *Boreal Shield* and the *Taiga Shield* (Figure 2.1).

The Island of Newfoundland and the Churchill River valley and the southeast coast of Labrador form the eastern extent of the Boreal Shield Ecozone. 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 Ecozone is generally continental, with long, cold winters, short, warm summers and abundant precipitation. Cool temperatures and a short growing season, along with acidic soils, reduces productivity, although most of the area is forested, primarily coniferous species, intermixed with hardwoods, mixed with bogs and other wetlands. Lichens and shrubs are common on areas of exposed rock (Wilkin 1986).

**Figure 2.1 Ecozones that Encompass the Labrador – Island Transmission Link**



The interior of southeastern Labrador is within the Taiga Shield 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 black spruce, and are mixed with numerous bogs and other wetlands, scattered hardwood stands, and rock outcrops dominated by lichens and low shrubs (Wilkin 1986).

These two Ecozones are further divided into a number of Ecoregions. Ecoregions are smaller land units within Ecozones having distinctive, recurring patterns of vegetation and soil determined and controlled by local climate and geology. Ecoregions also differ from each other in their combinations of plant communities, landscapes, geology and other features (Marshall and Schutt 1999; Parks and Natural Areas Division 2008).

There are 19 Ecoregions within the province, nine in Newfoundland (Damman 1983) and 10 in Labrador (Meades 1990). The transmission corridor will pass through 10 of these Ecoregions, four in Labrador and six on the Island of Newfoundland (Figure 2.2). A description of the Ecoregions and relevant subregions crossed by the transmission corridor and ELC Study Area is presented in Table 2-1 and Table 2-2. Note, an additional Ecoregion (Mid-Boreal Forest-Paradise River Ecoregion) is included since it marginally intersects with the 15 km wide ELC Study Area but is not intersected by the 2 km wide transmission corridor.

The national ELC system described by Marshall and Schutt (1999) does not map units smaller than Ecodistricts. However, ELC systems often include smaller units such as Ecosections, with scales generally between 1:50,000 to 1:100,000, and Ecotypes, with approximate scale 1:10,000 to 1:50,000.

For this study, the Study Area ELC maps delineate the Habitat Type, which is not an ELC unit. Its classification is between the definitions of ELC Ecosections and ELC Ecotypes. Focusing at this scale was a practical decision based on the scale of mapping and imagery, the regional focus of a project of this size, and cost for value considerations. Habitat Types are a broader class than Ecotype, and a given map polygon may be composed of several Ecotypes that are not distinguishable at the scale of the study.

The Habitat Type is sufficiently uniform in terms of ecological characteristics to reliably support the wildlife interpretations, wetland mapping and listed plant potential mapping that are central to the ELC study's outcomes.

**Figure 2.2 Ecoregions of Newfoundland and Labrador**

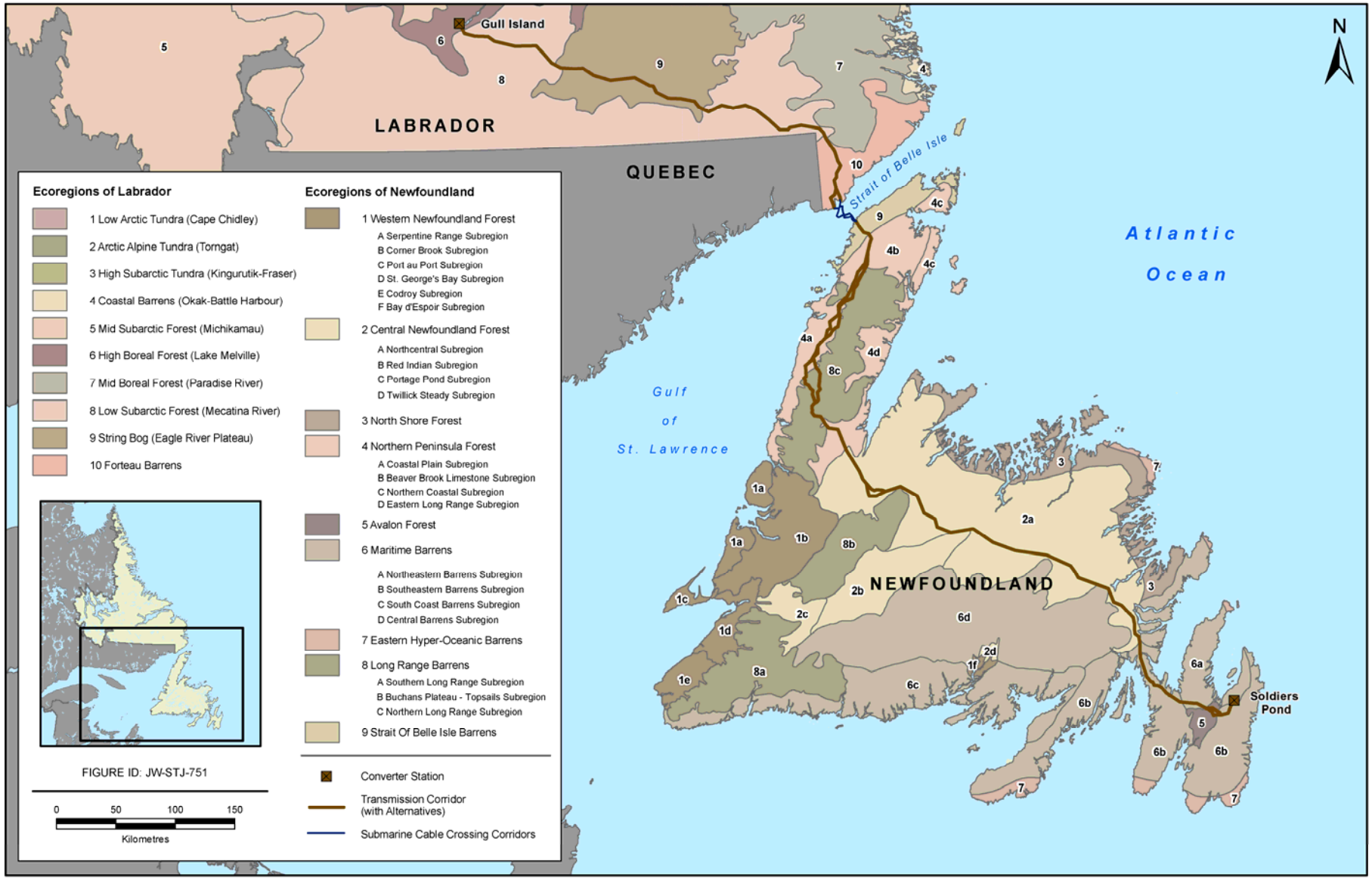


**Table 2.1 Ecoregions of Labrador Crossed by the Transmission Corridor and ELC Study Area**

| Ecoregion |
|---|
| 6) High Boreal Forest-Lake Melville Ecoregion (Boreal Shield Ecozone)<br>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 are 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. |
| 7) Mid Boreal Forest-Paradise River Ecoregion (Boreal Shield Ecozone)<br>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. |
| 8) Low Subarctic Forest-Mecatina River Ecoregion (Taiga Shield Ecozone)<br>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. |
| 9) String Bog – Eagle River Plateau Ecoregion (Taiga Shield Ecozone)<br>The Eagle River Plateau 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. |
| 10) Forteau Barrens Ecoregion (Boreal Shield Ecozone)<br>Located at the southeastern-most tip of Labrador, adjacent to the Strait of 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. |
| Source: Meades (1990) |

**Table 2.2 Ecoregions and Subregions of the Island of Newfoundland Ecoregions Crossed by the Transmission Corridor and ELC Study Area**

| |
|---|
| 9) Strait of Belle Isle Barrens Ecoregion<br>Dominated by almost treeless tundra vegetation. White spruce and balsam fir occur 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. |
| 4) Northern Peninsula Forest Ecoregion<br>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. |

a) Coastal Plain Subregion

This 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.

b) 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.

d) 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. Treeline decreases towards the northern end of the subregion.

8) Long Range Barrens Ecoregion

Discontinuous region of highlands (Southern Long Range, Buchans Plateau-Topsails, 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.

c) 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.

2) 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. Dwarf shrub (Kalmia) barrens have replaced forest stands in areas that have been burned repeatedly. Raised bogs are the characteristic wetland type.

a) 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 the most part has a rolling topography below 200 m. Pure back 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. Relatively low moisture, coarse soils and the prevalence of black spruce cover types make this subregion particularly susceptible to regeneration failure. 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.

6) Maritime Barrens Ecoregion

Extends from 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 barren, 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.

a) 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.

b) Southeastern Barrens Subregion

The landscape is dominated by heathlands, and the forest only occurs 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.

d) Central Barrens Subregion

Occurs south of the Central Newfoundland Forest Ecoregion and north of the South Coast Barrens Subregion. Residual forests that have not been destroyed by fire have moderate forest capability. 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.

5) 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.

Source: Damman (1983)

## 2.2 Field Program

A field survey program was carried out to describe the vegetation communities/Habitat Types within the Study Area and to provide field-verified ground information necessary for the remote-sensing mapping algorithms (Figure 2.3).

Field surveys were conducted during July and August 2008 for a total of 60 field-team days. Field teams were comprised of a vegetation ecologist, wildlife ecologist and field technologist. Helicopters were used to access all surveyed sites (plots) in Labrador. Sites were accessed on the Island of Newfoundland by helicopter and vehicle. When access was by helicopter, crews were landed in forest openings, barren ground or wetlands and then traversed by foot to the site.

For areas with digital forestry data (Island of Newfoundland), resource roads were plotted on topographic maps for access planning and navigation. Plot locations were recorded using hand-held global positioning system

(GPS) receivers and downloaded at the end of each day into a generic GPS software program that allowed for a tracking of plot locations.

Reconnaissance flyovers and spatial imagery were used to identify areas that best represented the dominant broad Habitat Types within the Ecoregions of the corridor. Plots were selected in the field and were spaced evenly within the corridor as was reasonably possible to ensure optimal distribution of ground-verified sites required for the remote-sensing mapping program. Plots were specifically established in areas within a homogeneous cover and composition of vegetation.

A total of 404 plots were surveyed, including 67 plots in Labrador and 337 on the Island of Newfoundland. The locations of those plots are presented in Figure 2.4. Although the ELC was developed and is available at a scale of 1:50,000, the atlas presented in Appendix A is printed at a scale of 1:75,000 for ease of presentation.

### 2.2.1 Vegetation Inventory

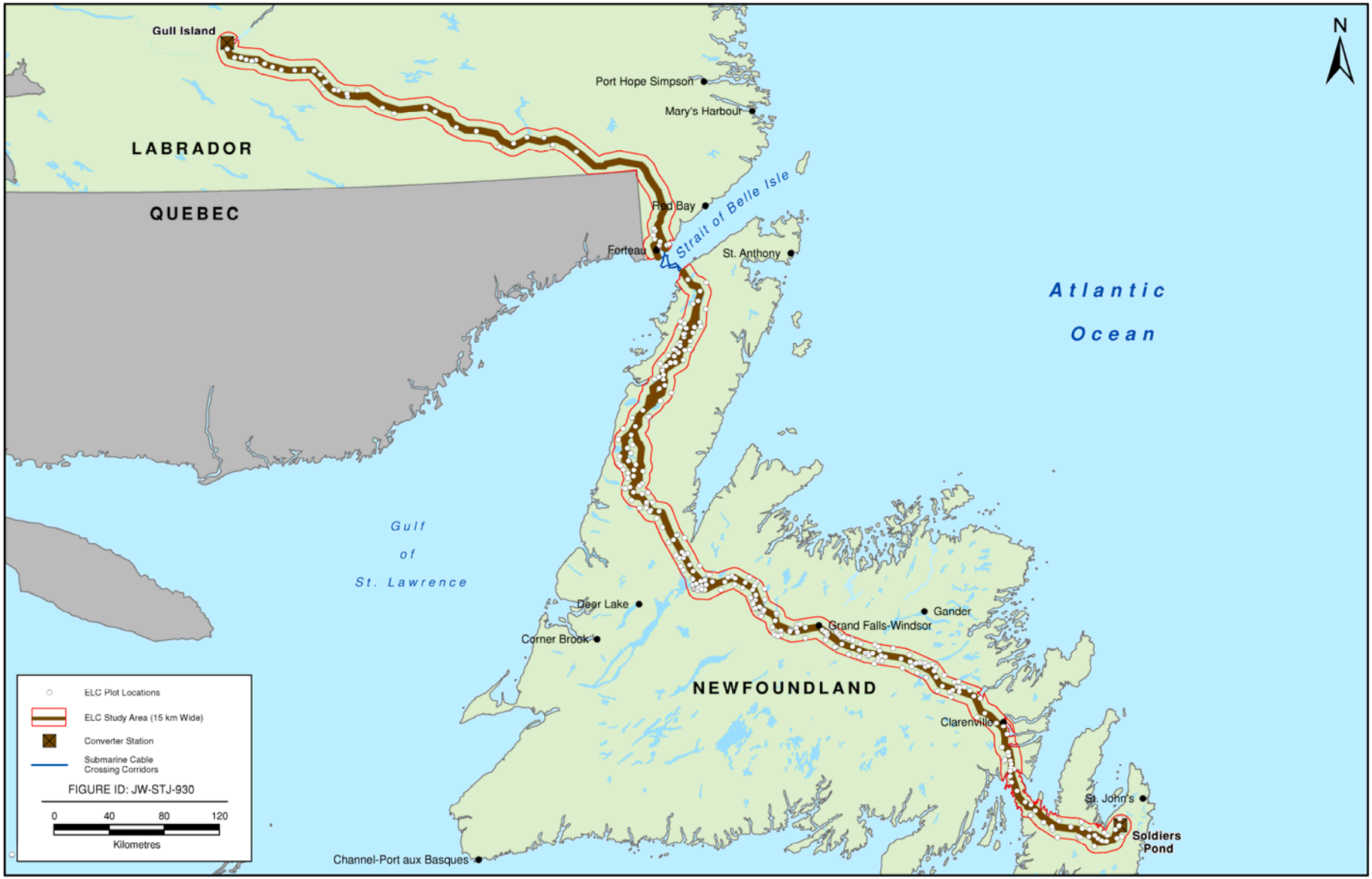
A vegetation inventory (Figure 2.3) was conducted for the tree, shrub and ground layers within an area of approximately 400 $m^2$. Percent ground cover was estimated for each observed plant species within each layer. Species names were in accordance with annotated checklist of the vascular plants of Newfoundland and Labrador (Meades et al. 2000). Vegetation inventory data were recorded in handheld Trimble Nomad$^{tm}$ electronic data loggers. The location of each plant species and thus the plot was recorded by the data logger in Universal Transverse Mercator (UTM) 1983 North American Datum (NAD 83) coordinates. General site conditions including a preliminary Habitat Type name were also recorded. Representative photographs were taken at each plot and vouchers of plants of uncertain identity were collected for post-field day identification.

**Figure 2.3 Field Team Member Conducting Vegetation Inventory**

Vegetation field data were downloaded from the data loggers into ArcGIS 9.0 and subsequently into a MS Excel spreadsheet for processing and analysis. UTM coordinates for all plant species observed within each plot were amalgamated into a single coordinate to allow for ease of data manipulation. Field Habitat Type descriptors and vegetation composition data were used to re-group the sampled vegetation communities into similar broad-scale Habitat Types. Vegetation and wildlife habitat plot data were used to develop typical Habitat Type descriptions and vegetation summary tables (Appendix B).

The locations of the classified Habitat Types were used in the remote-sensing program as training (control) sites for the algorithm development.

**Figure 2.4 ELC Field Survey Plot Locations for the Proposed Labrador-Island Transmission Link**



### 2.2.2 Habitat Types

Plant species presence and abundance (expressed as a percentage of ground area covered by the species) were used to group the surveyed vegetation communities into Habitat Types. This information, when applied against known wildlife species requirements, was used to generate habitat ratings (to be used for other studies) for each Habitat Type.

The summaries of the vegetation cover for each Habitat Types for the Labrador and Newfoundland portions of the Study Area are presented in Appendix B. Percent occurrence and average cover values derived from the field observations are included in the summary vegetation tables.

The scientific and common names of the plant species observed during the field surveys are presented in Appendix C.

## 2.3 Satellite-based Ecological Land Classification

Satellite-based ELC programs use a combination of ground-verified areas and remote-sensing industry analytical tools to identify and delineate similar areas of ground vegetation cover. Individual satellite images often differ from each other due to the difference in environmental conditions at the time of acquisition (e.g., differences in time of year, time of day or amount of cloud cover). As a result of these differences, each image used in a mapping program requires specific processing and analysis. Additionally, satellite images are rich in information that must be summarized prior to final use.

The Study Area was covered by eight Landsat 7 images (scenes). Although Landsat 7 images were used as the primary mapping platform, high resolution SPOT 5 satellite images and air photos were also acquired and used to verify and adjust the algorithm for areas of specific interest.

### 2.3.1 Background and Technical Information

Image-based classifications are used to automatically aggregate pixel values within an image into predefined land cover classes. Pixels are placed into classes based on their spectral signature/reflectance pattern across all multispectral bands used in the analysis of the image. The available multispectral bands vary depending on the remote-sensing platform used to capture the imagery. Classes are defined (ELC Habitat Types) differently between the supervised and unsupervised systems.

A supervised classification relies on user-delineated “training” areas to define example reflectance patterns and spectral characteristics of each ELC Habitat Type desired in the final output. Training areas are collected with the aid of existing reference data, such as field surveys and regional vector data. The classification algorithm then analyzes the reflectance value for each pixel analyzed across all spectral bands input by the analyst and places it into the class, as defined by the training areas, to which it is most similar.

An unsupervised classification does not use training points. Instead, the algorithm looks at each pixel (analyzed across all spectral bands input by the analyst) and places them into clusters/natural collections called spectral

classes. These classes are based on similarities in reflectance patterns. This works on the assumption that values belonging to the same class will be similar or close in proximity in the measurement space, and pixels that do not belong together will not. Reference data are then required by the analyst to compare the spectral classes and assign each an appropriate ELC Habitat Type. This type of classification is preferred when working with a large number of classes, rendering a supervised classification and adequate training impossible.

### 2.3.2 Data Specifications and Sources

Satellite-based multispectral imagery was used for this classification. The imagery was captured by National Aeronautics and Space Administration's (NASA) Landsat 7 Earth-observation satellite. This satellite and its Enhanced Thematic Mapper Plus (ETM+) imager collects six bands of 30 m multispectral image data with a sensitivity range from 0.45 µ to 2.35 µ. This represents wavelengths from blue to well into the non-thermal infrared (IR).

Eight Landsat 7 satellite scenes were used for this study. The scenes were provided by Natural Resources Canada and downloaded from the Government of Canada's Geobase® website.

Orthocorrected digital aerial photography at a scale of 1:30,000 for central Newfoundland was provided by the Newfoundland and Labrador Department of Environment and Conservation, Survey and Mapping Division. The high-resolution digital aerial photography has a spatial resolution of 60 cm. The vintage of the photography ranged from 1999 to 2006.

For portions of the Study Area not covered by the digital aerial photography, high-resolution SPOT 5 satellite imagery with a spatial resolution of 2.5 m and 5 m was acquired. The 2.5 m panchromatic (greyscale) imagery was coloured using both SPOT 5 10 m multispectral imagery and Landsat 7 imagery. The most recent imagery, having less than 10 percent cloud cover acquired during snow free conditions between the months of June and October, was used for this program. The vintage of the imagery ranged from 2005 to 2008.

Samples of spatial imagery used in the remote sensing program are presented in Figures 2.5 to 2.8.

### 2.3.3 Study Area

The ELC Study Area is 15 km wide, approximately 1,100 km long and covers an area of approximately 16,900 $km^2$. The area required eight Landsat scenes that were classified separately and used in the final classification.

The process used for this land cover classification involved the use of both supervised and non-supervised classification methods. A supervised algorithm was used to extract vegetated ELC Habitat Types. A non-supervised algorithm was used to extract non-vegetated portions of the images within the Study Area. The output data from each algorithm were then combined to create one seamless land cover dataset for each scene. All image data processing was completed using PCI's Geomatica 9.0 computer software.

**Figure 2.5 Sample Landsat 7 Imagery for a Region of Labrador**

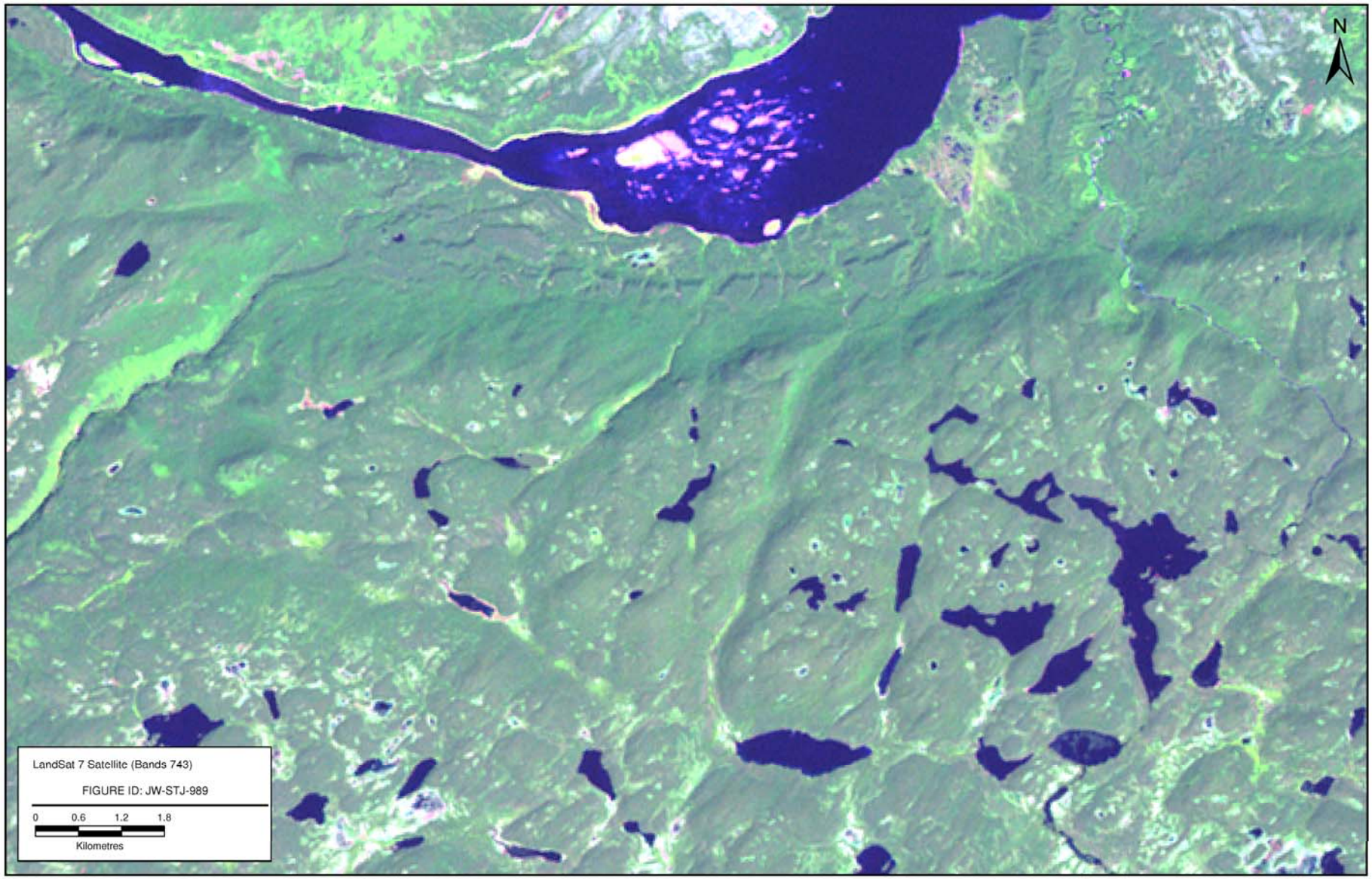


**Figure 2.6 Sample Landsat 7 Imagery for a Region of the Island of Newfoundland**

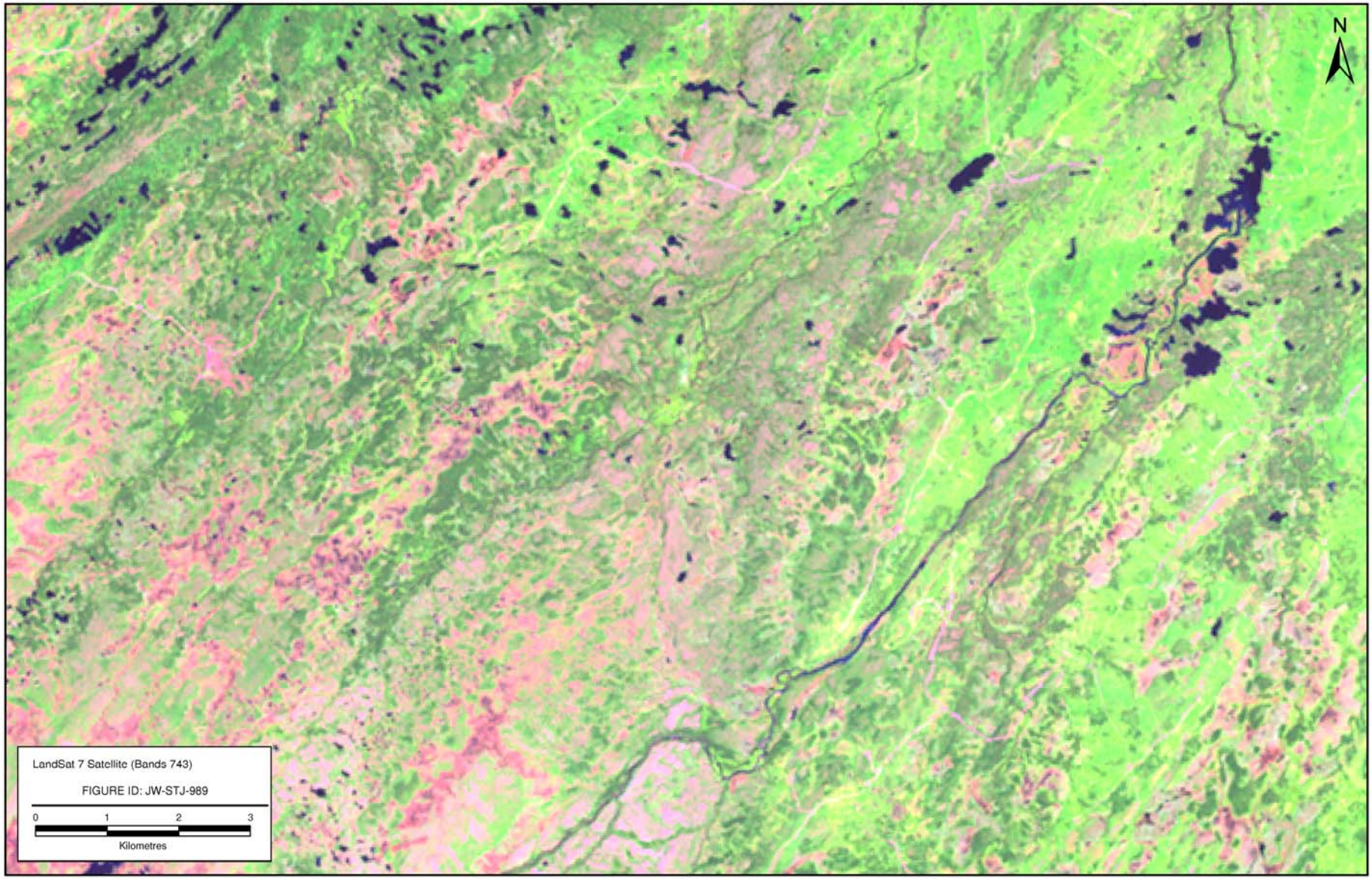


**Figure 2.7 Sample SPOT 5 Infrared Imagery for a Region of the Island of Newfoundland**

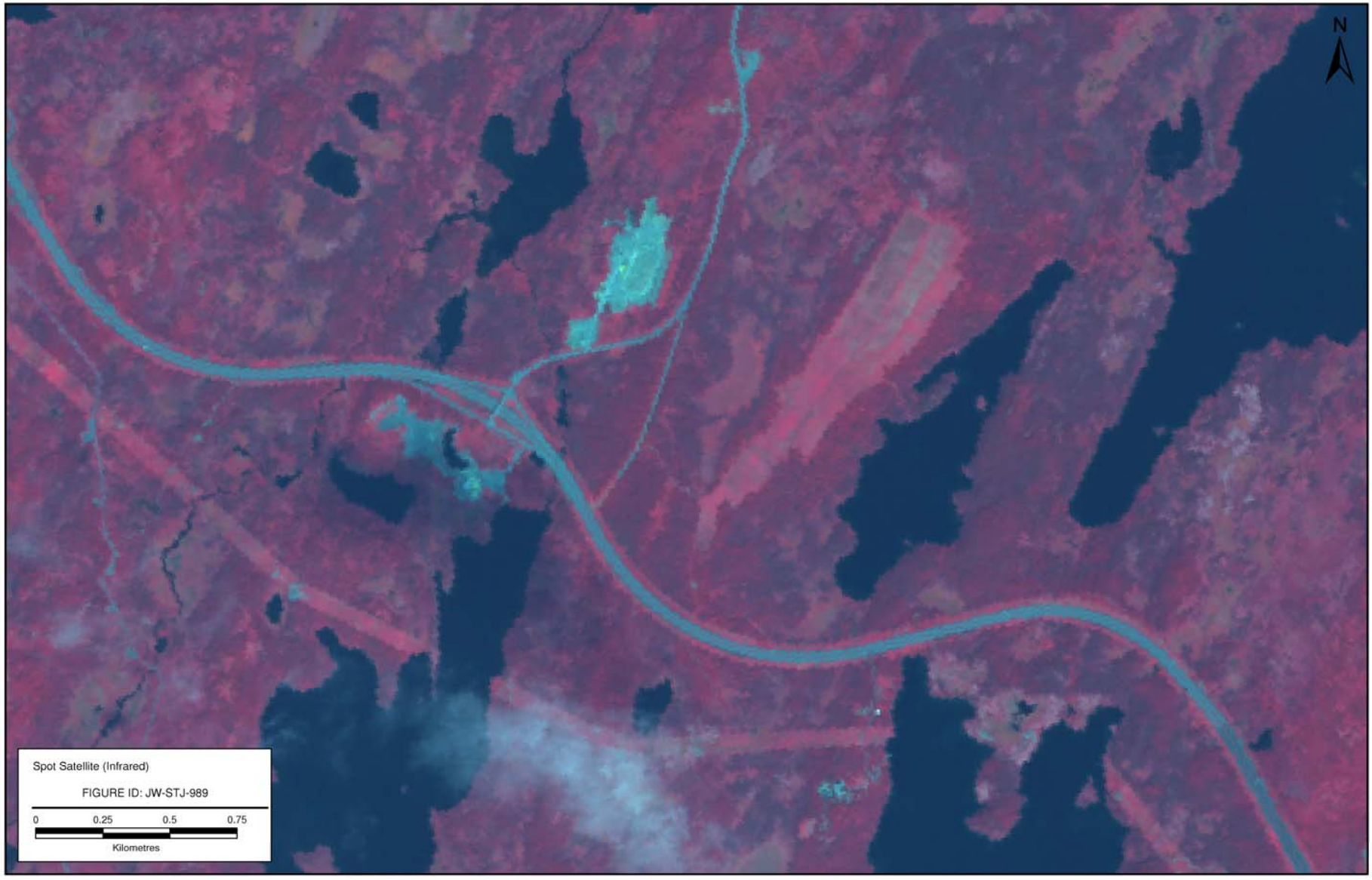
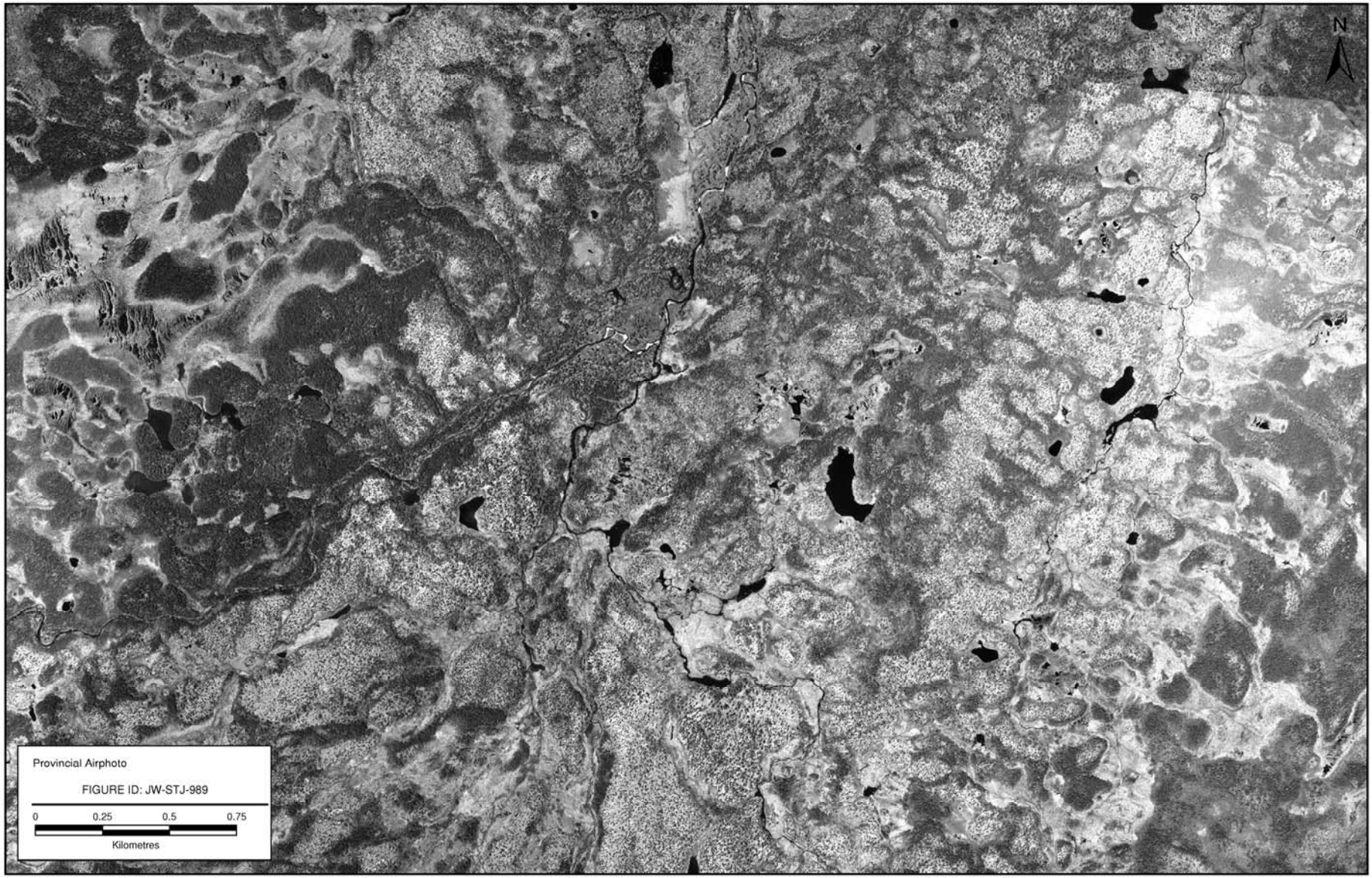


**Figure 2.8 Sample Aerial Photograph for a Region of Newfoundland**



### 2.3.4 Image Processing

Each of the eight scenes required a considerable amount of pre-processing before any classifications were run. Each scene's spectral bands (six in total) were imported and combined into one, multi-band image file. Both a "Normalized Difference Vegetation Index" (NDVI) and a Tasseled Cap (Brightness, Greenness, Wetness) analysis were preformed to assist in the classification. The following 10 channels were used to build the foundation of the classification:

- Landsat 7 ETM+ Band 1 (Blue);
- Landsat 7 ETM+ Band 2 (Green);
- Landsat 7 ETM+ Band 3 (Red);
- Landsat 7 ETM+ Band 4 (Near-IR);
- Landsat 7 ETM+ Band 5 (Mid-IR);
- Landsat 7 ETM+ Band 7 (Mid-IR);
- NDVI;
- Tasseled Cap – Brightness;
- Tasseled Cap – Greenness; and
- Tasseled Cap – Wetness.

### 2.3.5 Classification of Non-Vegetation Areas

For each scene, the non-vegetated areas were identified, masked and classified separately from the vegetated areas. To identify the non-vegetated portions of the image, the NDVI channel was used. A NDVI is a numerical scale that allows the analyst to determine if the matter found within a pixel contains live green vegetation. Through manual visual comparison, a threshold NDVI value was determined as the point at which a pixel turns from non-vegetated to vegetated. The 8-bit NDVI channel provided a scale from 0 to 255. In most cases, the threshold value fell between 95 and 110. Once this value was determined, a "Non-Veg" mask was created in order to mask all pixels that fell beneath the determined NDVI threshold value.

A non-supervised classification was then run on the masked, non-vegetated areas. The process created 20 unassigned spectral classes. Through a manual aggregation process, each of the 20 spectral classes were assigned to one of the six, predetermined, non-vegetated ELC classes:

- Exposed Earth/Anthropogenic/Cutblock;
- Open Water;
- Shallow Water with Vegetation;
- Snow/Ice;
- Burn; and
- Cloud/Shadow.

### 2.3.6 Classification of Vegetated Areas

The next step was to create masks to isolate the vegetated areas of the image and perform a supervised image classification. The "vegetation" mask was created through a logical function by subtracting the "non-vegetation" mask from a previously created mask of the Study Area. This mask isolated the vegetated areas and allowed them to be analyzed separately from the rest of the image.

The first step in the supervised classification process was the collection of training areas. In this exercise, training areas were collected as vector polygons in Environmental Systems Research Institute's (ESRI) ArcGIS 9.2. Training areas were based on a number of reference datasets, including field sample points collected in the summer of 2008, 10 m SPOT imagery, provincial vector datasets and high-resolution aerial photography. A non-supervised classification grid was used to assist with the training in areas where sample points and imagery were inconclusive. The classification grid of the vegetated areas helped identify ELC Habitat Types through patterns created by the spectral clusters. This also helped identify homogeneous areas in which to digitize training polygons. At least 15 training sites were collected per scene for each ELC class. Each training area was comprised of no less than 10 pixels.

A supervised classification was established for the vegetated areas being analyzed. The previously collected training sites were imported to create spectral signatures for each ELC Habitat Type trained. These signatures were needed in order for the Gaussian Maximum Likelihood algorithm to determine which ELC Habitat Type pixel should be assigned. The accuracy of the output dataset depended entirely on the training areas and the algorithm's ability to build a comprehensive spectral signature for each of the classes. The output was an 8-bit grid image illustrating the dispersion of ELC classes across the image.

### 2.3.7 Post-processing

The majority of the post-processing work involved the visual identification of errors (areas classed incorrectly), masking and then re-classing them manually. A common example of this occurred when the algorithm mistakenly grouped newly burned areas (class 6) with newly cut areas (class 4). These two classes were spectrally similar enough that this was necessary in almost all scenes. These types of issues were identified and corrected manually.

To complete the classification, ELC grids for each scene (Non-Vegetated and Vegetated channels) were combined into one continuous grid. This ensured there were no "No-Data" areas and gaps in the data. PCI allowed for simple channel aggregation using its modelling scripting utility.

The final step was to export the finalized ELC channel for each scene. All final mapping for this ELC was done in ArcGIS 9.2 and required compatible grids. PCI's Geomatic 9 allowed for the export of image channels to ASCII grid format. These ASCII grids were then converted (using ArcGIS' "ASCII to Raster" function) to ESRI grid format.

## 2.4 Habitat Type Mapping

The remote-sensing program produced interpretations of the ground for areas as small as one pixel (30 m by 30 m). This level of detail must be generalized before a meaningful map can be produced. Standard GIS tools designed to generalize the remote-sensing product were used in conjunction with additional landscape

information (such as digital forestry data and elevation within the area mapped) to produce maps that could be analysed and presented in a meaningful format.

### 2.4.1 ELC Polygon Development

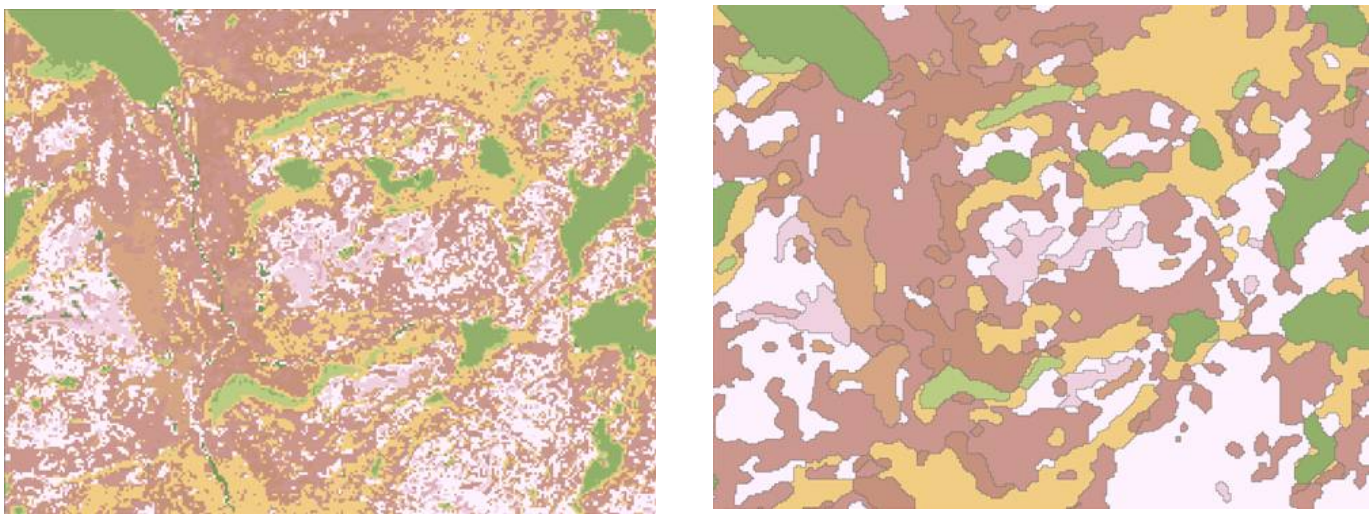
Using ESRI's ArcGIS 9.2, a seamless raster dataset was created by mosaicing the satellite-based ELC classification tiles for both Labrador and the Island of Newfoundland. The mosaiced datasets were later used as input into the generalization analysis process.

The generalization analysis functions found in ESRI's ArcGIS 9.2 were used to account for insignificant, erroneous and unnecessary detail data from the satellite-based ELC classification to allow for a more generalized product. The following tools were used to generalize the satellite-based ELC classification:

- *Majority Filter:* The majority filter function replaces cell values according to the cell value of neighbouring cells based on contiguous neighbourhoods. There are two criteria that must be met before replacement values can occur. At least half of the neighbouring cells must have the same value (that is, four out of eight cells have the same value) and the cells must be contiguous to the centre of the specified filter (an eight-cell filter was used) to ensure spatial connectivity and minimize the corruption of spatial patterns. If these parameters are met, the cell value is changed to the majority value of surrounding cells; otherwise, the cell retains its value.
- *Boundary Clean:* The boundary clean function is used to clean jagged edges between classified zones through an expand and shrink method. Zones or classes with a larger area have a higher priority and overrun neighbouring zones. The analysis looks at all eight connecting cells. The function then shrinks back the cells that are not surrounded by cells of the same value. Any cell that is considered a boundary cell (not a centre of eight connecting cells of the same value) may be replaced.
- *Region Group:* The majority filter and boundary clean functions only absorb small or misclassified cells in to immediate neighbouring zones; there is still a need to rid all groups that are too small to represent a true classification grouping. The region group places cells from the same zone (cells in a raster with the same value) into regions that are a contiguous set of cells from a like zone. The region group function assigns a unique identifier to each new region; as the tool analyzes the raster dataset from left to right, the top to bottom tool assigns a new value to each new region encountered.
- *Extract by Attributes:* Using the output from the region group, an analysis mask was created to identify regions that are too small to represent a continuous grouping or isolated groupings that should be dissolved into surrounding groups. Using the extract by attributes tool, a data mask was created from regions with areas greater than 20 cells (600 m – 20 cells x 30 m resolution of original satellite-based ELC classification).
- *Nibble:* The nibble function allows areas known to have erroneous data to be assigned the value of the cells nearest neighbour. The algorithm first assigns the areas from the mask raster with the value of No Data, allowing for the corresponding areas in the input raster (the output of the boundary clean function) to be recoded based on neighbouring values based on Euclidean distance.
- *Resample:* The resample function was then used to help smooth boundaries between classifications. The majority filter, re-sampling technique was used to resample the dataset from 30 m cell size to 5 m cell size.
- *Raster to Polygon:* The re-sampled dataset was then converted from raster to ESRI's Shapefile for analysis and mapping purposes.

An illustration of the results of the polygon generalization process is presented in Figure 2.9.

**Figure 2.9 Example of Pre- and Post-Polygon Generalization of Satellite Images**



Notes:
Left: This image represents the raw satellite-based ELC classification. Notice the irregular (jagged) boundary between classes and the small, isolated cell clusters located throughout the scene.
Right: This image represents the same location after the generalization analysis function was performed.

### 2.4.2 Ecological Land Classification Mapped Label Refinement

Once the ELC grids derived from the remote-sensing program were generalized into discrete polygons, available provincial government digital forestry data were used in conjunction with elevations to further refine the interpreted label (note: polygon boundaries were not altered in this stage, but only the Habitat Type label assigned to specific polygons). Approximately 10 percent of all ELC polygon labels were adjusted. Minimal forestry data were available for Labrador, and therefore ELC polygons in that portion of the corridor were not adjusted. The criteria and resulting change applied to some ELC labels are presented in Table 2.3.

While Kalmia Lichen Heathland, Conifer Scrub and Wetlands were mapped as discrete Habitat Types in most cases, there were many instances where these Habitat Types formed a mosaic on the landscape too complex to be separated by the mapping process. A visual inspection and analysis of forestry information of the Habitat Type mapping indicated that a Bog-treed Bog Habitat Type (standard recognized remote-sensing signature) captured this mosaic as a single Habitat Type. The Bog-treed Bog Habitat Type label was therefore changed to Scrub/Heathland/Wetland. Note, however, that although these Habitat Types do differ, they are similar in composition and often, the transition between them is vague. In addition, wetlands within the 2 km wide transmission corridor were also inventoried and mapped under the Wetlands Inventory and Classification Study (Stantec 2010) in association with this study. That study was able to separately and very accurately identify and classify wetlands within the proposed transmission corridor.

Using forestry data, it was possible in some non-vegetated areas on the Island of Newfoundland to distinguish cutblocks originally interpreted as Exposed Earth/Anthropogenic/Cutblock. For those areas, a subset Habitat Type was refined to Exposed Earth/Anthropogenic. Although this subset could not be consistently separated, it was refined where possible in the interest of mapping accuracy. Due to a lack of forestry data for Labrador, it

was not possible to distinguish timber harvesting areas (i.e., cutblocks) that were originally interpreted as Exposed Earth/Anthropogenic/Cutblock.

Essentially, the remote sensing classification process used to complete the land cover classification for the Project involved the use of both supervised and non-supervised classification algorithms. Land cover/habitat categories were processed using a supervised image classification algorithm. Prior to that, areas representing non-vegetated plots were isolated using a calculated Normalized Difference Vegetation Index (NDVI), masked and classified separately using a non-supervised algorithm. Additional provincial datasets such as forestry and infrastructure (disturbance) may be introduced to assist in the training and classification process. As with all classifications, some degree of post-processing was required to correct confusions or errors in the output datasets. Datasets were reviewed and any such "confusions" isolated and corrected manually. A common example of this occurs between fresh clear cuts and newly burnt areas. As such, the Exposed Earth/ Anthropogenic/Cutblock unit reflects vector data received from the province of known anthropogenic/cleared areas and cutblocks, which were included in the final ELC product.

Additionally, there exists a temporal difference between the two data sets. The imagery acquisition date (early 2000s) does not correspond with that of the cutblock/cleared areas (variable 2005 to 2008) provided by the province. Ultimately, confidence in the provincially supplied vector data is greater than that produced through the supervised classification process, as areas were typically mapped at a much larger scale (typically 1:12,500).

**Table 2.3 Adjusted Ecological Land Classification Labels Using Digital Forestry and Elevation Data for the Island of Newfoundland**

| Original ELC Label | Adjusted ELC Label | Criteria |
|---|---|---|
| Cutover | Exposed Earth/ Anthropogenic | Greater than or equal to 50 percent of ELC polygon is comprised of forest polygons with stand IDs of 940, 950 (i.e., Rock Barren or Soil Barren). |
| | Wetland | Greater than or equal to 50 percent of ELC polygon is comprised of forest polygons typed as stand IDs of 920, 925, 930, 940, 950 (i.e., Bog, Wet Bog, Treed Bog, Rock Barren, Soil Barren). |
| Bog-treed Bog | Cutover | Greater than or equal to 70 percent of ELC polygon made up of forest polygons with all stand IDs except 900, 910, 920, 925, 930, 940, 950, 960, 961, 962, 970, 980, 990, 991, 992. |
| | Conifer Scrub | Greater than or equal to 70 percent of the ELC polygon is comprised of stand ID 900 - Softwood Scrub. |
| | Scrub/Heathland/ Wetland | All remaining Bog-treed bog ELC polygons that are not modified by other criterion. |
| Conifer Forest | Mixedwood Forest | Greater than or equal to 20 percent of ELC polygon is comprised of forest types dominated by deciduous species. |
| Conifer Scrub | Cutover | Greater than or equal to 50 percent of ELC polygon comprised of stand IDs not equal to IDs 900, 910, 915, 920, 925, 930, 940, 950. |
| Exposed Earth/ Anthropogenic/ Cutblock | Cutover | Greater than or equal to 50 percent of the ELC polygon is comprised of forest types not equal to IDs 920, 925, 930, 940, 950, 951, 960, 970, 980, 990, 991. |
| | Exposed Earth/ Anthropogenic | Greater than or equal to 50 percent of the ELC polygon comprised of forest types describing barren ground. Stand IDs of 940, 950 and 951. |
| Kalmia Lichen/ Heathland | Cutover | Greater than or equal to 50 percent of the ELC polygon comprised of stand IDs not equal to 900, 920, 925, 930, 940, 950 (i.e., not Softwood Scrub, Bog, Wet Bog, Treed Bog, Rock Barren, Soil Barren). |
| Mixedwood Forest | Conifer Forest | Greater than or equal to 80 percent of the ELC polygon is comprised of pure conifer forest stands. |
| | Wetland | Greater than or equal to 70 percent of the ELC polygon is covered by forest stands with non-forest stand IDs that are primarily wetland and barren grounds. Stand IDs 920, 925, 930, 940, 950, 951, 960. |

| Original ELC Label | Adjusted ELC Label | Criteria |
|---|---|---|
| Open Conifer Forest | Mixedwood Forest | Greater than or equal to 20 percent of ELC polygon is comprised of forest types dominated by deciduous species.<br>Greater than or equal to 50 percent of ELC polygon is comprised of forest stands with at least 25 percent deciduous stands as identified in the species compilation. The species compilation is a data field within a stand that indicates trees species found including dominant, secondary and tertiary species. |
| Rocky Barren | Cutover | Greater than or equal to 50 percent of ELC polygon comprised of Stand IDs other than 900, 910, 915, 920, 925, 930, 940, 950. |
| | Alpine Vegetated | ELC polygons occurring in the higher elevation Northern Long Range Subregion. |
| Wetland | Cutover | Greater than or equal to 50 percent of the ELC polygon has a forest stand ID indicating forest interpretation of either commercial forest or cleared land (i.e., all stand IDs except for 900, 920, 925, 930, 940 and 950). |

Due to inclement weather throughout the time of the fieldwork, and despite several attempts to access the area, there are relatively fewer ground plots along the Labrador section of the proposed corridor near the Strait of Belle Isle. Given the homogeneity observed along much of the Labrador corridor during the field program, it was determined that the field data collected would allow for an acceptable interpretation of the site if augmented by a detailed satellite imagery analysis performed by the field ecologist in the post-field season. The dominant Habitat Types were well sampled, with Open Conifer and Wetlands receiving 9 and 20 plots, respectively. However, the Black Spruce Lichen Forest and Mixedwood Forest Habitat Types received only one plot each. Although the vegetation data for these Habitat Types were limited to the sampled plots, the habitat defined by these Habitat Types is well understood by wildlife ecologists and accounted for in the wildlife habitat ratings.

Although sampled, two Habitat Types (Alder Thicket and Black Spruce Lichen Forest) within the Newfoundland corridor were not mapped due to the relatively small areas occupied by these Habitat Types on the landscape. Conifer Scrub and Tuckamore Habitat Types, although identifiable on the ground, were not distinguishable by the remote-sensing algorithm. As a result, these two Habitat Types were combined and mapped as a single type.

Due to the geographic extent of the ELC, multiple satellite scenes were required to cover the area. As a result, inconsistencies may occur between scenes, affecting the remote-sensing algorithm. The Newfoundland portion of the ELC received the benefit of digital forestry data as a final check to the Habitat Type classification. Although forestry data were not available for the Labrador portion of the corridor, the area is relatively less diverse, with only four Ecoregions represented. The number of plots and the involvement of the vegetation ecologist in the algorithm development reduce uncertainties associated with the lack of forestry data for the Labrador portion of the ELC.

## 2.5 Study Team

The Study Team included the component manager, a study lead, lead field observers, field assistants and field data management and reporting personnel. The Study Team leads and their respective roles are presented in Table 2.4. Brief biographical statements, highlighting roles and responsibilities and relevant education and employment experience are provided in Appendix D.

**Table 2.4 Study Team and Respective Roles**

| Role | Personnel |
|---|---|
| Component Manager | Brent Keeping (2008-2009) |
| Lead Report Authors | Brent Keeping (2008-2009) |
| | Chris Shupe |
| | Tina Newbury |
| | Sean Bennett (2010) |
| Lead Vegetation Ecologists | Brent Keeping (2008-2009) |
| | Michael Crowell |
| Lead Wildlife Ecologists | Perry Trimper |
| | Tina Newbury |
| GIS and Remote Sensing | Stephen Rowe |
| | Chris Shupe |

# 3.0 RESULTS

Ten ELC Habitat Types were identified and mapped for Labrador and eleven for the Island of Newfoundland. Six Habitat Types were common to both Labrador and the Island of Newfoundland. The common ELC Habitat Types to the Island of Newfoundland and Labrador are Burn, Conifer Forest, Conifer Shrub, Mixedwood Forest, Open Conifer Forest and Wetland. A description of the Habitat Types and the areas covered by them is presented in Section 3.1 for Labrador and Section 3.2 for the Island of Newfoundland.

A number of non-habitat areas were also included in the mapping of the ELC Study Area. These include Exposed Earth/Anthropogenic/Cutblock, Exposed Earth/Anthropogenic, Cloud/Shadow and Open Water. A description of the Non-habitat Areas is presented in Section 3.1 for Labrador and Section 3.2 for the Island of Newfoundland.

## 3.1 Labrador ELC Habitat Types and Non-Habitat Areas

The ten ELC Habitat Types mapped within the Labrador portion of the Study Area are presented in Table 3.1. Six of the ten ELC Habitat Types identified in Labrador are also common to the Island of Newfoundland, with the remaining four exclusive to Labrador. There are three non-vegetated habitat areas within the Labrador ELC Habitat Types.

**Table 3.1 Surveyed and Mapped Habitat Types and Non-Habitat Areas for Labrador Indicating Exclusiveness to the Region**

| Habitat Type | Notes |
|---|---|
| Black Spruce Lichen Forest | Exclusive to Labrador Study Area |
| Burn | Found in Labrador and Island of Newfoundland portions of Study Area |
| Conifer Forest | Found in Labrador and Island of Newfoundland portions of Study Area |
| Conifer Scrub | Found in Labrador and Island of Newfoundland portions of Study Area |
| Exposed Bedrock | Exclusive to Labrador Study Area |
| Hardwood Forest | Exclusive to Labrador Study Area |
| Lichen Heathland | Exclusive to Labrador Study Area |
| Mixedwood Forest | Found in Labrador and Island of Newfoundland portions of Study Area |
| Open Conifer Forest | Found in Labrador and Island of Newfoundland portions of Study Area |
| Wetland | Found in Labrador and Island of Newfoundland portions of Study Area |
| Cloud/Shadow | Found in Labrador and Island of Newfoundland portions of Study Area |
| Exposed Earth/Anthropogenic/Cutblock | Found in Labrador and Island of Newfoundland portions of Study Area |
| Open Water | Found in Labrador and Island of Newfoundland portions of Study Area |

### 3.1.1 Black Spruce Lichen Forest Habitat Type

The Black Spruce Lichen Forest Habitat Type is characterized by open stands of black spruce and an almost continuous ground cover of reindeer lichens (Figure 3.1). Black spruce also forms a scattered shrub layer along with blueberries and Labrador tea. Feathermoss comprises an important part of the ground vegetation in addition to lichens. Herbaceous vegetation is very limited, with bunchberry being the most common species.

**Figure 3.1 Black Spruce Lichen Forest Habitat Type**

### 3.1.2 Burn Habitat Type

The Burn Habitat Type is a successional stage that follows forest fire (Figure 3.2 and 3.3). This Habitat Type (Figure 3.2) is largely devoid of a tree layer, although some scattered spruce may be found and there is often an abundance of dead trees (snags). A discontinuous, but prominent, shrub layer formed by species of dwarf birch characterizes this Habitat Type. Other shrubs, such as Labrador tea and blueberry, are also common and regenerating trees may be present (Figure 3.3). Ground vegetation is largely dominated by lichens, although scattered occurrences of mosses, herbs and grasses are also present.

**Figure 3.2 Burn Habitat Type Dominated by Glandular Birch**

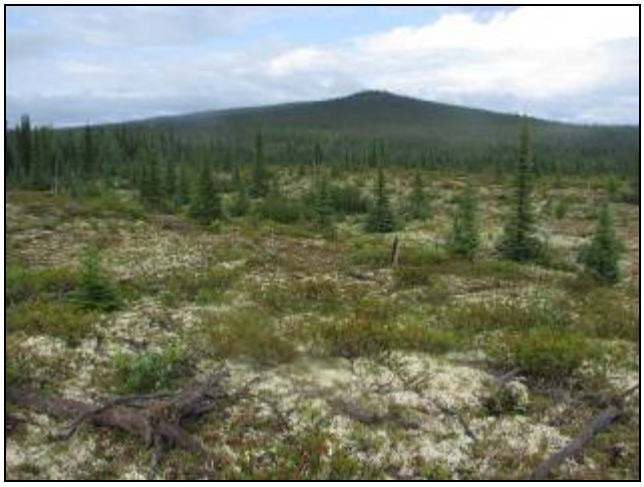


**Figure 3.3 Burn Habitat Type with Some Spruce Regeneration**

### 3.1.3 Conifer Forest Habitat Type

The Conifer Forest Habitat Type is very common throughout the Study Area but varies in character (Figure 3.4). Typically, mature black spruce and lesser amounts of balsam fir comprise the tree layer, although scattered larch and hardwoods may be found. Black spruce and balsam fir are also common throughout the understory, as are shrubs such as Labrador tea and blueberry. The ground vegetation is characterized by a continuous moss layer,

with sphagnum being dominant in poorly-drained areas and feathermoss being particularly extensive in others (Figure 3.5). A variety of forms, grasses and sedges may be encountered depending on the moisture regime of the site.

**Figure 3.4 Conifer Forest Habitat Type with Good Drainage**

**Figure 3.5 Conifer Forest Habitat Type with Imperfectly Drained Areas**

### 3.1.4 Conifer Scrub Habitat Type

The Conifer Scrub Habitat Type (Figure 3.6 and 3.7) is characterized by scrubby black spruce and balsam fir. The patchy tree layer formed by these species is typically comprised of small diameter individuals. Black spruce and balsam fir form a prominent shrub layer, along with Labrador tea, willow spp., and blueberry. A variety of mosses, most notably feathermoss, form an extensive ground layer, along with scattered lichens, forbs, grasses and sedges.

**Figure 3.6 Conifer Scrub Habitat Type**

**Figure 3.7 Conifer Scrub Habitat Type – Dense Shrub Cover Formed by Balsam Fir and Willow**

### 3.1.5 Exposed Bedrock Habitat Type

The Exposed Bedrock Habitat Type is characterized by an abundance of un-vegetated bedrock (Figure 3.8). This Habitat Type may be found on exposed hills and forms a mosaic with patches of wetlands, tuckamore and scrub forest. Thin soils harbour vegetation interspersed amongst the exposed bedrock, on which only crustose lichens are prominent. Trees are absent and the shrub layer is extremely sparse. Well-drained soils are comprised of reindeer lichens, and low-lying woody species such as blueberry and black crowberry. Deergrass is the most common herbaceous species and is especially prominent where soils are poorly-drained.

**Figure 3.8** **Exposed Bedrock Habitat Types with Patch of Poorly-drained, Deergrass-dominated Vegetation**

### 3.1.6 Hardwood Forest Habitat Type

The Hardwood Forest Habitat Type is characterized by an overstory dominated by birch trees (Figure 3.9 and 3.10). Although black spruce and balsam fir are present in the tree layer, they are of relatively little abundance. This Habitat Type is uncommon within the Study Area and varies considerably. On southwest facing slopes, tree cover is generally continuous with a prominent shrub layer comprised mainly of birch, alder and black spruce. The cover of ground vegetation at such sites is sparse, but a variety of mosses, herbs, graminoids and low-lying woody species are often present (Figure 3.9). The Hardwood Forest Habitat Type also encompasses regenerating habitats characterized by a sparser tree cover and an extensive shrub layer formed primarily of blueberry (Figure 3.10). At such areas, lichen and moss cover are moderate whereas herbaceous cover is low. Such areas are similar to the regenerating stands of the Mixedwood Forest Habitat Type but are not as abundant in softwoods.

**Figure 3.9** **Hardwood Forest Habitat Type – Southwest-facing Slope**

**Figure 3.10** **Hardwood Forest Habitat Type - Open, Regenerating Stand**

### 3.1.7 Lichen Heathland Habitat Type

The Lichen Heathland Habitat Type may be found on exposed, rocky hilltops (Figure 3.11 and Figure 3.12). It is characterized by the absence of a tree layer and extensive, low-lying shrub cover. Dominant shrub species include stunted black spruce and Labrador tea. Low woody species such as alpine bilberry and black crowberry are common (Figure 3.11). Reindeer lichens form an extensive component of the ground vegetation and although several herbs are found within this Habitat Type, they are generally not abundant (Figure 3.12).

**Figure 3.11** **Lichen Heathland Habitat Type on Rolling Topography**

**Figure 3.12** **Lichen Heathland Habitat Type with Extensive Reindeer Lichen Cover**

### 3.1.8 Mixedwood Forest Habitat Type

The Mixedwood Forest Habitat Type characterizes habitats with discontinuous tree cover provided by approximately equal abundances of birch and black spruce, with traces of balsam fir (Figure 3.13). It is similar to regenerating forests of the Hardwood Forest Habitat Type, but a higher abundance of softwood trees is present. Shrub cover is extensive and is primarily provided by blueberry and Labrador tea. Feathermoss forms an important component of the ground vegetation and lichens are common. Although a number of herbaceous species may be found in this Habitat Type, they are generally not abundant.

**Figure 3.13** **Mixedwood Forest Habitat Type**

### 3.1.9 Open Conifer Forest Habitat Type

The Open Conifer Forest Habitat Type is similar to the Conifer Forest Habitat Type, but its tree cover is not as extensive (Figure 3.14). Black spruce dominates the tree layer, while balsam fir is common and traces of mountain maple and larch may be present. Shrub cover is well-developed (Figure 3.15) and is primarily formed

by black spruce, balsam fir, Labrador tea, sheep laurel and blueberry. A variety of mosses dominate the ground vegetation, with feathermoss being particularly abundant. Herbaceous cover varies depending on the moisture regime of the site but is often sparse.

**Figure 3.14** **Open Conifer Forest Habitat Type - Dominated by Black Spruce**

**Figure 3.15** **Open Conifer Forest Habitat Type with Abundant Shrub Cover**

### 3.1.10 Wetland Habitat Type

The Wetland Habitat Type is characterized by species tolerant of saturated soils and encompasses both the bog and fen classes of wetlands (Figures 3.16 and 3.17). Bogs are especially common throughout the Study Area and may form wetland complexes in conjunction with fens. Tree cover is generally absent, but a variety of graminoids, shrubs and forbs are common. This Habitat Type often has raised ridges that alternate with pools of water in which emergent and submergent species are located. The ridges are often abundant in shrubs such as black spruce, bog rosemary, blueberry, leatherleaf and glandular dwarf birch. Sphagnum mosses and sedges dominate the ground layer.

**Figure 3.16** **Wetland Habitat Type**

**Figure 3.17** **Wetland Habitat Type with Alternating Ridges and Pools**

### 3.1.11 Cloud/Shadow

Cloud/Shadow non-vegetated habitat area consist of heavy cloud cover, haze or ground shadows found in the satellite imagery that prevented image interpretation and habitat typing. This class is not a representation of the land cover but atmospheric variance influencing/blocking the spectral reflectance of the land.

### 3.1.12 Exposed Earth/Anthropogenic/Cutblock

The Exposed Earth/Anthropogenic/Cutblock non-vegetated habitat area is characterized by river sediments, exposed soils, pond or lake sediments, beaches, landings, mudflat sediments, cutbacks, moraines or other non-vegetated surfaces for Exposed Earth areas; clearings for human settlement, economic activity, and major transportation routes or other associated clearings for Anthropogenic areas; and timber harvesting areas for Cutblock areas.

### 3.1.13 Open Water

Open Water non-vegetated habitat area include lakes, reservoirs, rivers, streams or salt water (generally <1 percent vegetation/land cover). The classification of water bodies is based solely on the spectral signature of the satellite imagery. Hence, the boundaries may differ from those on topographic base maps.

## 3.2 Island of Newfoundland ELC Habitat Types and Non-Habitat Areas

Eleven ELC Habitat Types (Table 3.2) were identified and mapped on the Island of Newfoundland portion of the Study Area. Six of the eleven ELC Habitat Types identified on the Island of Newfoundland are also common to Labrador. There are four non-vegetated habitat areas within the Newfoundland ELC Habitat Types.

**Table 3.2 Surveyed and Mapped Habitat Types and Non-Habitat Areas for the Island of Newfoundland Indicating Exclusiveness to the Region.**

| Habitat Type | Notes |
|---|---|
| Alpine Vegetated | Exclusive to Island of Newfoundland Study Area |
| Burn | Found in Labrador and Island of Newfoundland portions of Study Area |
| Conifer Forest | Found in Labrador and Island of Newfoundland portions of Study Area |
| Conifer Scrub | Found in Labrador and Island of Newfoundland portions of Study Area |
| Cutover | Exclusive to Island of Newfoundland Study Area |
| Kalmia Lichen/Heathland | Exclusive to Island of Newfoundland Study Area |
| Mixedwood Forest | Found in Labrador and Island of Newfoundland portions of Study Area |
| Open Conifer Forest | Found in Labrador and Island of Newfoundland portions of Study Area |
| Rocky Barrens | Exclusive to Island of Newfoundland Study Area |
| Wetland | Found in Labrador and Island of Newfoundland portions of Study Area |
| Scrub/Heathland/Wetland | Mosaic of Conifer Scrub, Kalmia Heathland and Wetland. Individual Habitat Types were sampled. Mosaic exclusive to Island of Newfoundland Study Area |
| Cloud/Shadow | Found in Labrador and Island of Newfoundland portions of Study Area |
| Exposed Earth/Anthropogenic/Cutblock | Found in Labrador and Island of Newfoundland portions of Study Area |
| Exposed Earth/Anthropogenic | Exclusive to Island of Newfoundland Study Area |
| Open Water | Found in Labrador and Island of Newfoundland portions of Study Area |

### 3.2.1 Alpine Vegetated Habitat Type

The Alpine Vegetated Habitat Type is found at higher elevations. It is wind-swept with a thin, poorly-developed soil layer. Exposed bedrock, frost-shattered boulders and exposed mineral soil are common and sometimes extensive (Figures 3.18 and 3.19). The patchy vegetation is characterized by a lack of a tree layer and sparse low-lying shrub and herb layers. Typical shrub species are stunted black spruce, balsam fir and sheep laurel. Other low-lying species include bunchberry and crowberry (often extensive) grasses, lichens and mosses.

**Figure 3.18** **Typical Alpine Vegetated Habitat Type with Exposed Bedrock**

**Figure 3.19** **Typical Alpine Vegetated Habitat Type with Stones and Boulders**

### 3.2.2 Burn Habitat Type

Although Burns, like Cutovers, may not be a 'true' Habitat Type in that they are in a state of rapid change reverting back to a forested site, they are common and have therefore been included. Burn Habitat Types contain few if any trees but typically have burnt remnants of the former stand still in place and upright (Figure 3.20). The shrub layer is often dominated by larger woody shrubs such as lambkill and rhodora and regenerating black spruce. Ground cover consists mainly of early colonizers (Figure 3.21) such as pearly everlasting, bunchberry and wild raspberry, sedges and grasses. Moss cover is highly variable, ranging from sparse to extensive, often comprised of feathermosses.

**Figure 3.20 Burn Habitat Type and Ground Vegetation**

**Figure 3.21 Burn Habitat Type and Ground Vegetation**

### 3.2.3 Conifer Forest Habitat Type

The Conifer Forest Habitat Type is the most common and variable Habitat Type within the corridor, with well developed tree and shrub layers (Figure 3.22). The dominant tree species is usually balsam fir or black spruce, often with a lesser amount of larch. Numerous shrub species are found within this Habitat Type, with sheep laurel, black spruce or balsam fir being the most common. Although the herb layer is at times sparse, bunchberry and creeping snowberry are often present. The moss layer is extensive and is comprised of mainly sphagnum and feathermoss (Figure 3.23).

**Figure 3.22 Conifer Forest Habitat Type**

**Figure 3.23 Conifer Forest Habitat Type – Balsam Fir and Moss Ground Cover**

### 3.2.4 Conifer Scrub Habitat Type

Conifer Scrub Habitat Type has similar plant species as the Conifer Forest Habitat Type, but the poor growing conditions produce a stunted tree layer. This Habitat Type is often found in the transition zone between Conifer Forest and Wetland. The sparse, poorly-defined tree layer is typically dominated by black spruce, with minor amounts of other, mainly coniferous species (Figure 3.24). Black spruce is also common in the shrub layer, as is sheep laurel. The moist ground layer is similar to that found in the Conifer Forest Habitat Type, with abundant creeping snowberry, sphagnum and feathermosses.

**Figure 3.24 Conifer Scrub Habitat Type**

### 3.2.5 Cutover Habitat Type

As with Burns, the Cutover Habitat Type is generally in transition back to a forested state (Figure 3.25). It is the result of recent forest harvesting and is often found near the Conifer Forest and Mixedwood Forest Habitat Types. Site conditions are highly variable from wet to dry and exposed to sheltered. As a result, the vegetation is also often highly variable, sometimes dominated by shrubs and at other times by herbs and grass species (Figure 3.26). If there are trees, they are often non-merchantable hardwoods such as birch and poplar. The shrub layer often consists of sheep laurel, raspberry and immature tree species such as balsam fir and birch. Ground cover is varied but usually dominated by mosses and colonizing grass species.

**Figure 3.25 Cutover Habitat Type with Regenerating Balsam Fir**

**Figure 3.26 Cutover Habitat Type**

### 3.2.6 Kalmia Lichen/Heathland Habitat Type

Kalmia Lichen/Heathland Habitat Type is a non-forested shrub-dominated habitat found on hummocky terrain and may have thin soils with exposed bedrock (Figure 3.27). The shrub layer cover can be extensive and species-rich. Sheep laurel is usually dominant, but Labrador tea, blueberry and rhodora are often present with relatively high percent cover values. Tree species are always stunted and rarely grow above the shrub layer. The herb layer, also species-rich, is nearly always dominated by ground lichens and, in particular, reindeer lichens.

**Figure 3.27 Kalmia Lichen/Heathland Habitat Type**

### 3.2.7 Mixedwood Habitat Type

Mixedwood Habitat Type is species-rich and may be a transition between the Conifer Forest Habitat Type and the Hardwood Forest Habitat Type. The well-defined tree layer has a varying mix of conifers such as balsam fir and black spruce and deciduous trees such as birch and trembling aspen. The complex shrub layer is similar to that found in the Conifer Forest Habitat Type and is dominated by immature balsam fir and black spruce (Figure 3.28), along with varying amounts of blueberry and raspberry.

**Figure 3.28 Mixedwood Habitat Type**

Ground cover is extensive and also species-rich. It is comprised of many species but mosses, bunchberry and creeping snowberry, as well as various woodferns tend to dominate.

### 3.2.8 Open Conifer Forest Habitat Type

The Open Conifer Forest Habitat Type (Figures 3.29 and 3.30) is very similar to Black Spruce Lichen Forest Habitat Type. The tree layer is sparse to moderate, with black spruce as the dominant species, although it may also be comprised of balsam fir. The shrub layer ranges from moderate to extensive and is dominated by larger woody shrubs such as sheep laurel, rhodora, immature black spruce and balsam fir. Ground cover is variable, with feathermoss being the dominant ground cover. Bunchberry and reindeer lichens are also common components of the ground vegetation.

**Figure 3.29 Open Conifer Forest Habitat Type**

**Figure 3.30 Open Conifer Forest Habitat Type Tending Towards Kalmia Lichen/Heathland**

### 3.2.9 Rocky Barrens Habitat Type

Rocky Barrens Habitat Type is similar to Alpine Vegetated but is found at lower elevations and with generally more vegetated cover. It is windswept with a thin soil layer that consists of exposed bedrock (Figure 3.31), exposed soil, stone and boulders (Figure 3.32). It is characterized by its lack of a tree layer and sparse to extensive scrubby shrub layer. The shrub layer is comprised mainly of sheep laurel and various species of blueberry. Ground cover vegetation runs from sparse to extensive, consisting of mainly grasses, lichens, mosses, and smaller berry plants such as black crowberry.

**Figure 3.31 Rocky Barrens Habitat Type with Extensive Sheep Laurel**

**Figure 3.32 Rocky Barrens Habitat Type with Exposed Soil and Bedrock**

### 3.2.10 Wetland Habitat Type

The general Wetland Habitat Type is comprised predominantly of fens and bogs and, by definition, has saturated soils. The tree layer ranges from non-existent to very sparse. The shrub layer is sparse, with immature black

spruce, larch, sheep laurel and leather leaf dominating (Figure 3.33). The ground layer is extensive and is dominated by sphagnum moss (bogs), deergrass (fens) and various species of sedges (Figure 3.34).

**Figure 3.33 Wetland Habitat Type**

**Figure 3.34 Wetland Habitat Type**

Wetlands within the 2 km transmission corridor itself are described in detail in the associated *Wetlands Inventory and Classification Report* (Stantec 2010). In that report, wetlands have been classified to Wetland Class and Form and were manually identified from existing National Topographic Series wetland polygons, high-resolution air photos, and satellite images. Wetlands outside of the 2 km transmission corridor but within the larger ELC Study Area have not been classified to this level of detail. For consistency, wetlands in this study are grouped and mapped as a general Wetland Habitat Type.

### 3.2.11 Scrub/Heathland/Wetland Habitat Type

The Scrub/Heathland/Wetland Habitat Type is a complex of Kalmia Heathland, Conifer Scrub and Wetlands. Although mapped as discrete Habitat Types in most cases, there were many instances where these Habitat Types formed a mosaic on the landscape too complex to be separated by the mapping process. Although these Habitat Types do differ, they are similar in composition and often, the transition between them is vague.

### 3.2.12 Cloud/Shadow

Cloud/Shadow non-vegetated habitat areas consist of heavy cloud cover, haze or ground shadows found in the satellite imagery that prevented image interpretation and habitat typing. This class is not a representation of the land cover but atmospheric variance influencing/blocking the spectral reflectance of the land.

### 3.2.13 Exposed Earth/Anthropogenic/Cutblock

The Exposed Earth/Anthropogenic/Cutblock non-habitat area is characterized by river sediments, exposed soils, pond or lake sediments, beaches, landings, mudflat sediments, cutbacks, moraines or other non-vegetated

surfaces for Exposed Earth areas; clearings for human settlement, economic activity, and major transportation routes or other associated clearings for Anthropogenic areas; and timber harvesting areas for Cutblock areas.

### 3.2.14 Exposed Earth/Anthropogenic

The Exposed Earth/Anthropogenic non-habitat area is characterized by river sediments, exposed soils, pond or lake sediments, beaches, landings, mudflat sediments, cutbacks, moraines or other non-vegetated surfaces for Exposed Earth areas; clearings for human settlement, economic activity, and major transportation routes or other associated clearings for Anthropogenic areas.

Section 2.4.2 Ecological Land Classification Mapped Label Refinement describes the origin of these two distinct yet similar non-habitat areas.

### 3.2.15 Open Water

Open Water non-habitat areas include lakes, reservoirs, rivers, streams or salt water (generally <1 percent vegetation/land cover). The classification of water bodies is based solely on the spectral signature of the satellite imagery. Hence, the boundaries may differ from those on topographic base maps.

### 3.2.16 Habitat Types Areas

A summary of the total area covered by each ELC Habitat Type and Non-habitat Area within the 15 km wide Study Area and 2 km wide transmission corridor, by Ecoregion in Labrador, is provided in Tables 3.3 to 3.4. Graphical representation of the Habitat Types for the Labrador portion of the Study Area and transmission corridor are presented in Figures 3.35 and 3.36.

Regional summaries of the total area covered by each ELC Habitat Type and Non-habitat Area within the 15 km wide Study Area and 2 km wide transmission corridor, by Ecoregion for the Northern Peninsula, Central and Eastern Newfoundland and Avalon Peninsula are presented in Tables 3.5 to 3.14. Graphical representations of the Habitat Types for each regional portion of the Study Area on the Island of Newfoundland are presented in Figures 3.37 to 3.42.

**Table 3.3 Habitat Type and Non-habitat Area within the ELC Study Area by Ecoregion for Southeastern Labrador**

| Ecoregion | Habitat Types | | | | | | | | | | Non-habitat Areas | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Black Spruce Lichen Forest | Burn | Conifer Forest | Conifer Scrub | Hardwood Forest | Lichen Heathland | Mixedwood Forest | Open Conifer Forest | Wetland | Exposed Bedrock | Cloud/Shadow | Exposed Earth/ Anthropogenic/ Cutblock | Open Water | |
| Forteau Barrens | 0.1 | 0.1 | 77.6 | 333.9 | 0.0 | 281.1 | 0.0 | 2.1 | 152.9 | 0.3 | 22.9 | 0.7 | 43.0 | 914.7 |
| High Boreal Forest (Lake Melville) | 8.7 | 0.0 | 64.0 | 16.6 | 1.6 | 0.0 | 5.8 | 57.8 | 9.7 | 0.0 | 0.0 | 1.6 | 8.4 | 174.2 |
| Low Subarctic Forest (Mecatina River) | 74.6 | 64.6 | 870.9 | 339.0 | 3.3 | 33.4 | 16.2 | 861.9 | 579.9 | 0.1 | 1.5 | 0.0 | 159.0 | 3,004.4 |
| Mid Boreal Forest (Paradise River) | 0.2 | 0.5 | 23.3 | 42.7 | 0.0 | 4.3 | 0.0 | 5.8 | 38.7 | 0.0 | 1.2 | 0.0 | 1.1 | 117.8 |
| String Bog (Eagle River Plateau) | 136.4 | 24.5 | 171.0 | 251.4 | 3.9 | 0.0 | 16.0 | 610.3 | 701.8 | 0.4 | 0.4 | 0.0 | 65.6 | 1,981.7 |
| Total | 220.0 | 89.7 | 1,206.8 | 983.6 | 8.8 | 318.8 | 38.0 | 1,537.9 | 1,483.0 | 0.8 | 26.0 | 2.3 | 277.1 | 6,192.8 |
| **Percent of Southeastern Labrador (ELC Study Area)** | **3.6** | **1.4** | **19.5** | **15.9** | **<1.0** | **5.1** | **<1.0** | **24.8** | **23.9** | **<1.0** | **<1.0** | **<1.0** | **4.5** | **100.0** |
| Note: Units are $km^2$ | | | | | | | | | | | | | | |

**Table 3.4 Habitat Type and Non-habitat Area within the Transmission Corridor by Ecoregion for Southeastern Labrador**

| Ecoregion | Habitat Types | | | | | | | | | Non-habitat Areas | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Black Spruce Lichen Forest | Burn | Conifer Forest | Conifer Scrub | Hardwood Forest | Lichen Heathland | Mixedwood Forest | Open Conifer Forest | Wetland | Cloud/Shadow | Exposed Earth/ Anthropogenic/ Cutblock | Open Water | |
| Forteau Barrens | 0.0 | 0.0 | 10.3 | 57.6 | 0.0 | 40.6 | 0.0 | 1.5 | 20.8 | 0.1 | 0.0 | 2.2 | 133.1 |
| High Boreal Forest (Lake Melville) | 0.0 | 0.0 | 7.4 | 0.6 | 0.0 | 0.0 | 0.1 | 5.2 | 0.7 | 0.0 | 0.0 | 1.0 | 15.0 |
| Low Subarctic Forest (Mecatina River) | 11.2 | 10.8 | 129.0 | 52.9 | 0.9 | 3.1 | 2.0 | 126.9 | 75.2 | 0.0 | 0.0 | 9.6 | 421.6 |
| String Bog (Eagle River Plateau) | 16.7 | 6.4 | 20.8 | 44.1 | 0.1 | 0.0 | 1.2 | 88.9 | 80.2 | 0.0 | 0.0 | 2.5 | 260.9 |
| Total | 27.9 | 17.2 | 167.5 | 155.2 | 1.0 | 43.7 | 3.3 | 222.5 | 176.9 | 0.1 | 0.0 | 15.3 | 830.6 |
| **Percent of Southeastern Labrador (Transmission Corridor)** | **3.4** | **2.1** | **20.2** | **18.7** | **<1.0** | **5.3** | **<1.0** | **26.8** | **21.3** | **<1.0** | **<1.0** | **1.8** | **100.0** |

**Figure 3.35 Habitat Type and Non-habitat Area Summary (ELC Study Area) for Southeastern Labrador**

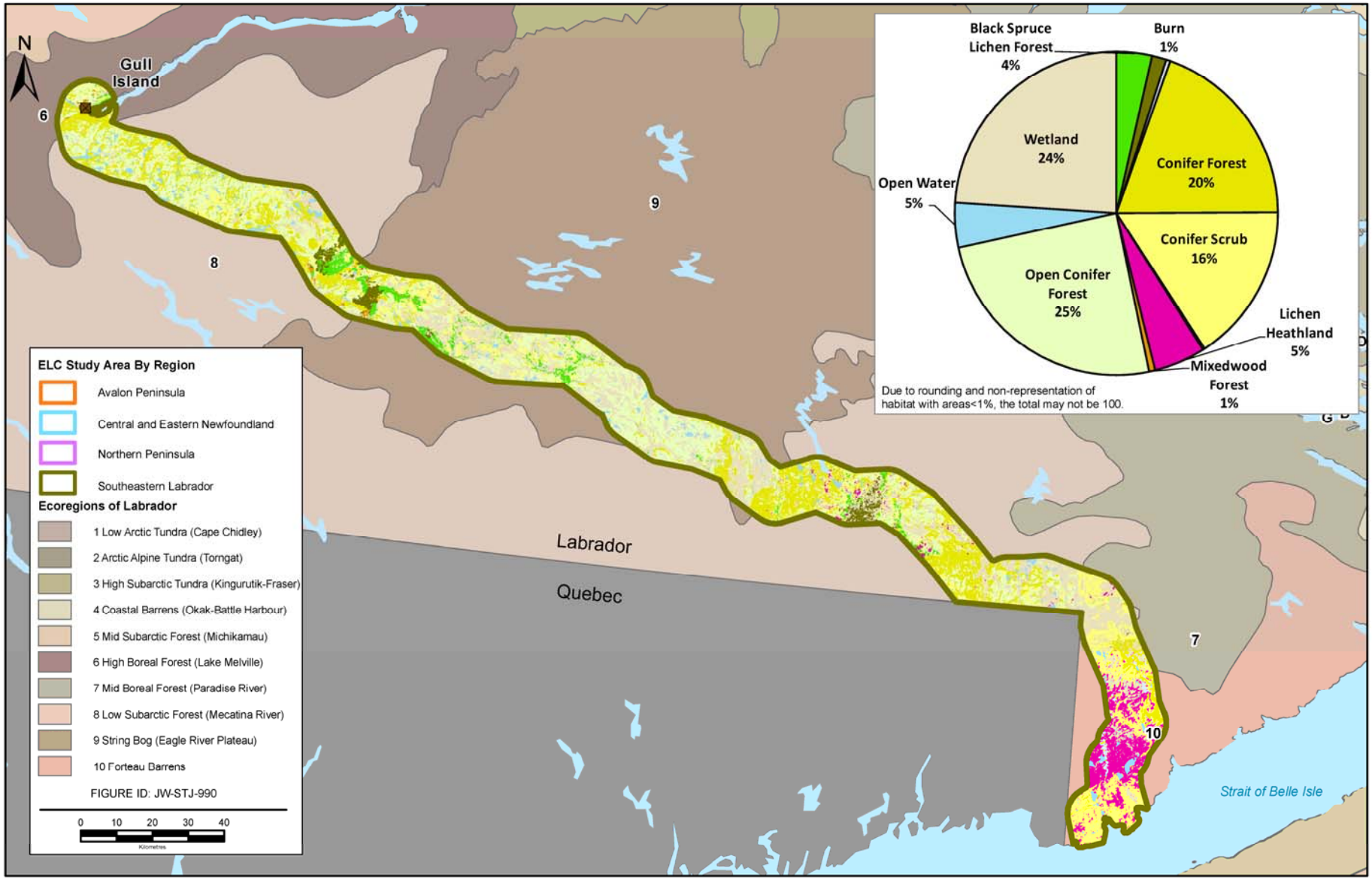


**Figure 3.36 Habitat Type and Non-habitat Area Summary (Transmission Corridor) for Southeastern Labrador**

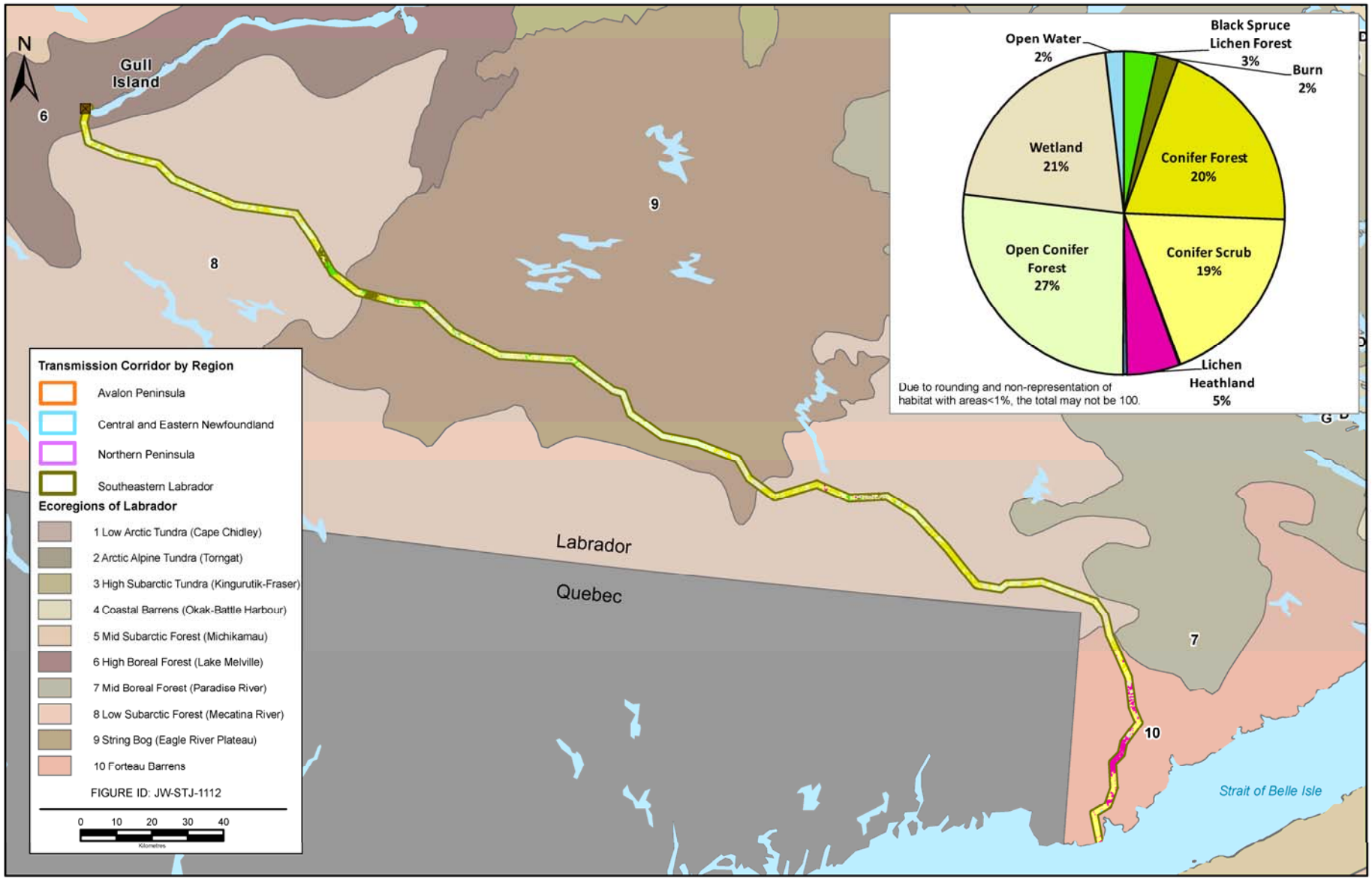


**Table 3.5 Habitat Type and Non-habitat Area within the ELC Study Area by Ecoregion for the Northern Peninsula (Island of Newfoundland)**

| Ecoregion | Habitat Types | | | | | | | | | | Non-habitat Areas | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Alpine Vegetated | Conifer Forest | Conifer Scrub | Cutover | Kalmia Lichen/Heathland | Mixedwood Forest | Open Conifer Forest | Rocky Barrens | Scrub/ Heathland/ Wetland Complex | Wetland | Cloud /Shadow | Exposed Earth/ Anthropogenic/ Cutblock | Exposed Earth/ Anthropogenic | Open Water | |
| Long Range Barrens | 26.5 | 378.2 | 37.7 | 25.5 | 13.5 | 65.4 | 316.0 | 0.0 | 646.4 | 107.8 | 0.0 | 2.3 | 32.7 | 110.6 | 1,762.6 |
| Northern Peninsula Forest | 0.0 | 548.5 | 46.8 | 105.9 | 1.3 | 276.8 | 337.6 | 4.3 | 306.8 | 122.2 | 44.3 | 3.0 | 4.6 | 231.5 | 2,033.6 |
| Strait of Belle Isle | 0.0 | 36.7 | 5.5 | 2.3 | 0.0 | 0.0 | 92.1 | 0.0 | 40.3 | 28.7 | 0.2 | 3.2 | 1.6 | 49.6 | 260.2 |
| Total Area | 26.5 | 963.4 | 90.0 | 133.7 | 14.8 | 342.2 | 745.7 | 4.3 | 993.5 | 258.7 | 44.5 | 8.5 | 38.9 | 391.7 | 4,056.4 |
| **Percent of Northern Peninsula (ELC Study Area)** | **<1.0** | **23.8** | **2.2** | **3.3** | **<1.0** | **8.4** | **18.4** | **<1.0** | **24.5** | **6.4** | **1.1** | **<1.0** | **<1.0** | **9.7** | **100.0** |
| Note: Units are $km^2$ | | | | | | | | | | | | | | | |

**Table 3.6 Habitat Type and Non-habitat Area within the Transmission Corridor by Ecoregion for the Northern Peninsula (Island of Newfoundland)**

| Ecoregion | Habitat Types | | | | | | | | | | Non-habitat Areas | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Alpine Vegetated | Conifer Forest | Conifer Scrub | Cutover | Kalmia Lichen/Heathland | Mixedwood Forest | Open Conifer Forest | Rocky Barrens | Scrub/ Heathland/ Wetland Complex | Wetland | Cloud /Shadow | Exposed Earth/ Anthropogenic/ Cutblock | Exposed Earth/ Anthropogenic | Open Water | |
| Long Range Barrens | 0.7 | 39.1 | 2.6 | 2.5 | 0.9 | 4.6 | 22.5 | 0.0 | 59.2 | 12.0 | 0.0 | 0.0 | 0.9 | 8.2 | 153.2 |
| Northern Peninsula Forest | 0.0 | 90.6 | 3.6 | 19.3 | 0.0 | 31.3 | 48.0 | 0.3 | 43.2 | 19.9 | 7.3 | 0.3 | 0.0 | 22.3 | 286.1 |
| Strait of Belle Isle | 0.0 | 5.8 | 0.8 | 0.2 | 0.0 | 0.0 | 13.8 | 0.0 | 4.6 | 3.7 | 0.0 | 0.5 | 0.1 | 5.0 | 34.5 |
| Total Area | 0.7 | 135.5 | 7.0 | 22.0 | 0.9 | 35.9 | 84.3 | 0.3 | 107.0 | 35.6 | 7.3 | 0.8 | 1.0 | 35.5 | 473.8 |
| **Percent of Northern Peninsula (Transmission Corridor)** | **<1.0** | **28.6** | **1.5** | **4.6** | **<1.0** | **7.6** | **17.8** | **<1.0** | **22.6** | **7.5** | **1.5** | **<1.0** | **<1.0** | **7.5** | **100.0** |
| Note: Units are $km^2$ | | | | | | | | | | | | | | | |

**Figure 3.37 Habitat Type and Non-habitat Area Summary (ELC Study Area) for the Northern Peninsula (Island of Newfoundland)**

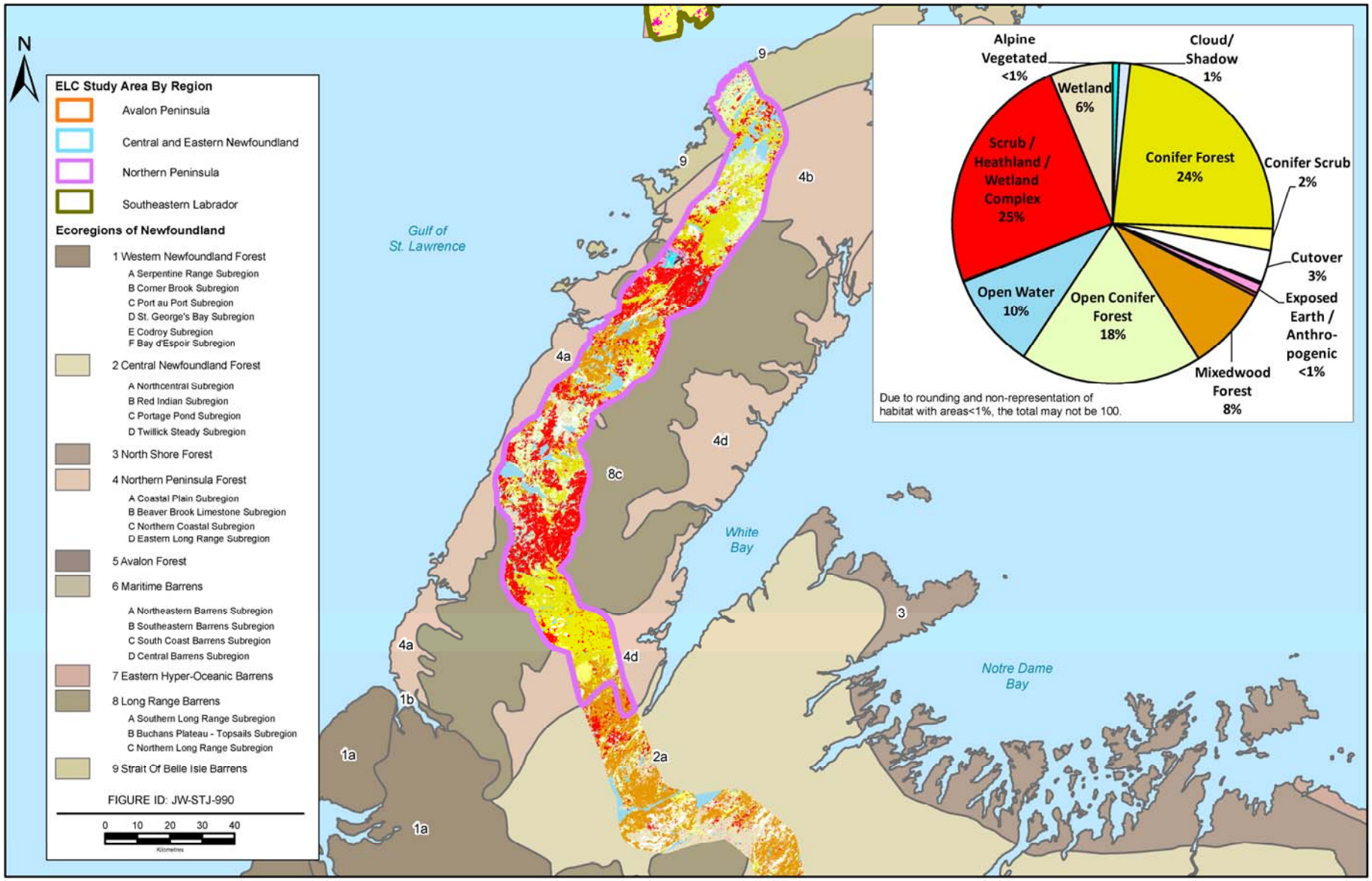


**Figure 3.38 Habitat Type and Non-habitat Area Summary (Transmission Corridor) for the Northern Peninsula (Island of Newfoundland)**

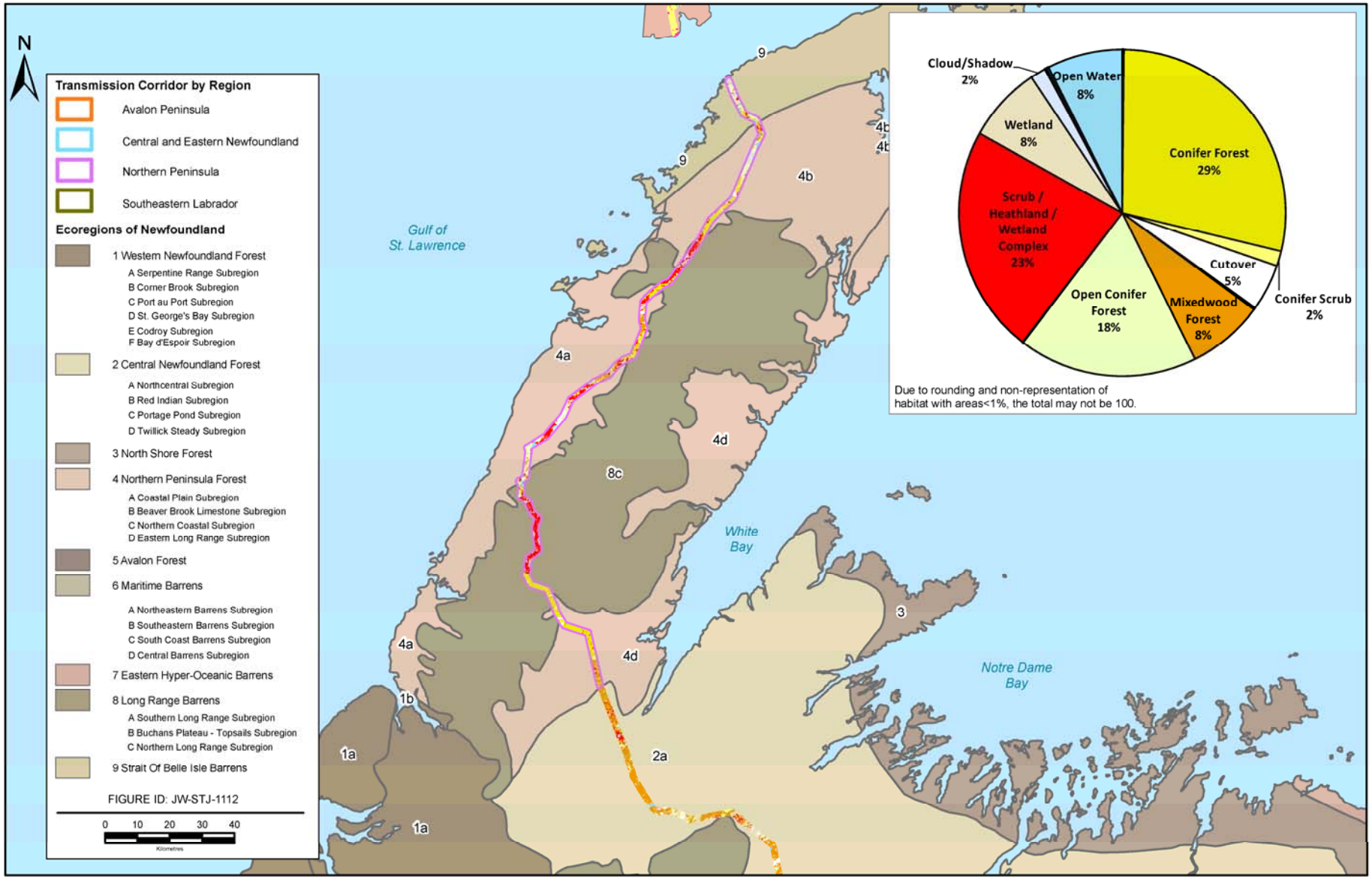


**Table 3.7 Habitat Type and Non-habitat Area within the ELC Study Area by Ecoregion for Central and Eastern Newfoundland (Island of Newfoundland)**

| Ecoregion | Habitat Types | | | | | | | | | | Non-habitat Areas | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Burn | Conifer Forest | Conifer Scrub | Cutover | Kalmia Lichen/ Heathland | Mixedwood Forest | Open Conifer Forest | Rocky Barrens | Scrub/ Heathland/ Wetland Complex | Wetland | Exposed Earth/ Anthropogenic/ Cutblock | Exposed-Earth/ Anthropogenic | Open Water | |
| Central Newfoundland Forest | 10.5 | 241.0 | 119.3 | 758.8 | 49.4 | 1,380.5 | 595.4 | 3.7 | 429.3 | 600.1 | 46.4 | 3.5 | 263.9 | 4,501.8 |
| Long Range Barrens | 0.0 | 0.0 | 4.4 | 2.2 | 0.0 | 2.8 | 3.1 | 0.0 | 4.6 | 84.5 | 3.7 | 3.5 | 5.1 | 113.9 |
| Maritime Barrens | 0.0 | 18.6 | 13.5 | 7.9 | 16.6 | 27.7 | 37.2 | 6.6 | 51.2 | 67.4 | 6.3 | 2.8 | 17.1 | 272.9 |
| Total Area | 10.5 | 259.6 | 137.2 | 768.9 | 66.0 | 1,411.0 | 635.7 | 10.3 | 485.1 | 752.0 | 56.4 | 9.8 | 286.1 | 4,888.6 |
| **Percent of Central and Eastern Newfoundland (ELC Study Area)** | **<1.0** | **5.3** | **2.8** | **15.7** | **1.4** | **28.9** | **13.0** | **<1.0** | **9.9** | **15.4** | **1.2** | **<1.0** | **5.9** | **100.0** |
| Note: Units are $km^2$ | | | | | | | | | | | | | | |

**Table 3.8 ELC Habitat Type and Non-habitat Area within the Transmission Corridor by Ecoregion for Central and Eastern Newfoundland (Island of Newfoundland)**

| Ecoregion | Habitat Types | | | | | | | | | Non-habitat Areas | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Conifer Forest | Conifer Scrub | Cutover | Kalmia Lichen/ Heathland | Mixedwood Forest | Open Conifer Forest | Rocky Barrens | Scrub/ Heathland/ Wetland Complex | Wetland | Exposed Earth/ Anthropogenic/ Cutblock | Exposed-Earth/ Anthropogenic | Open Water | |
| Central Newfoundland Forest | 40.1 | 18.7 | 106.1 | 7.8 | 213.4 | 85.9 | 1.0 | 70.7 | 80.6 | 3.3 | 0.7 | 13.3 | 641.6 |
| Long Range Barrens | 0.0 | 0.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.5 |
| Maritime Barrens | 0.9 | 0.9 | 0.0 | 0.6 | 0.8 | 1.7 | 0.0 | 3.7 | 2.6 | 0.0 | 0.0 | 0.8 | 12.0 |
| Total Area | 41.0 | 19.8 | 106.1 | 8.4 | 214.3 | 87.6 | 1.0 | 74.4 | 83.4 | 3.3 | 0.7 | 14.1 | 654.1 |
| **Percent of Central and Eastern Newfoundland (Transmission Corridor)** | **6.3** | **3.0** | **16.2** | **1.3** | **32.8** | **13.4** | **<1.0** | **11.4** | **12.8** | **<1.0** | **<1.0** | **2.2** | **100.0** |
| Note: Units are $km^2$ | | | | | | | | | | | | | |

**Figure 3.39 Habitat Type and Non-habitat Area Summary (ELC Study Area) for Central and Eastern Newfoundland (Island of Newfoundland)**

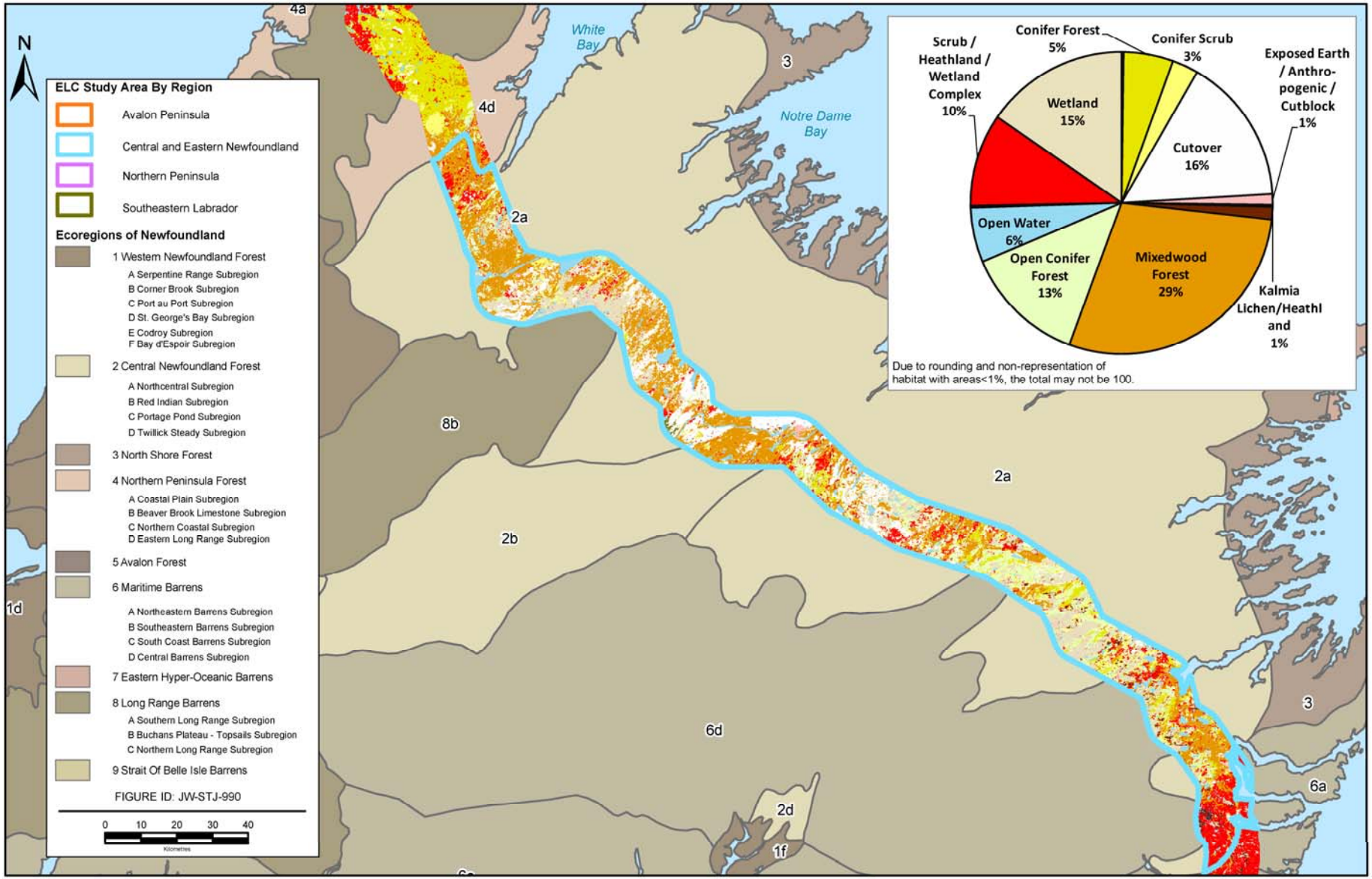


**Figure 3.40 Habitat Type and Non-habitat Area Summary (Transmission Corridor) for Central and Eastern Newfoundland (Island of Newfoundland)**

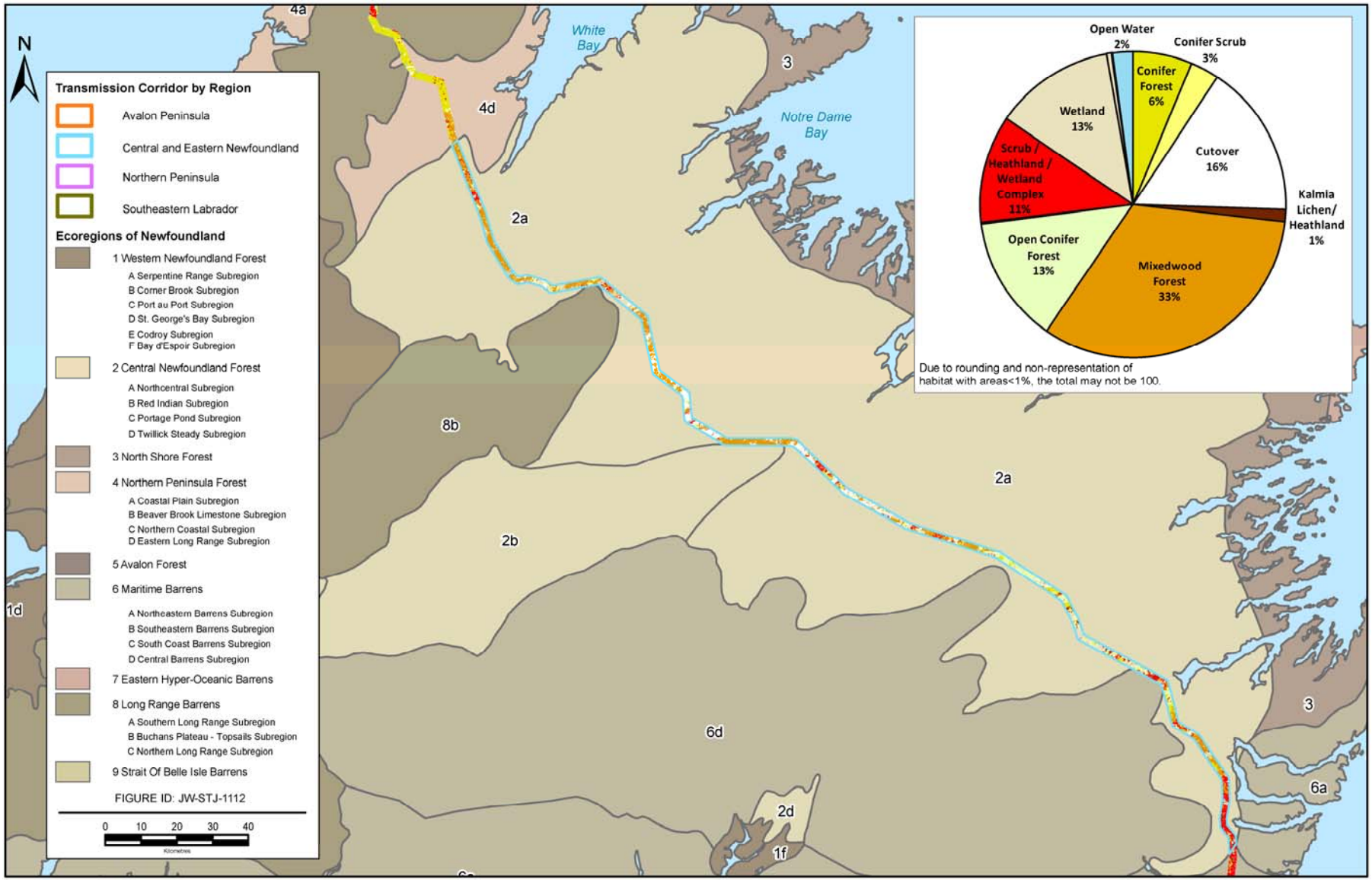


**Table 3.9 Habitat Type and Non-habitat Area within the ELC Study Area by Ecoregion for the Avalon Peninsula (Island of Newfoundland)**

| Ecoregion | Habitat Types | | | | | | | | | Non-habitat Areas | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Burn | Conifer Forest | Conifer Scrub | Cutover | Kalmia Lichen/ Heathland | Mixedwood Forest | Rocky Barrens | Scrub / Heathland / Wetland Complex | Wetland | Exposed Earth/ Anthropogenic/ Cutblock | Exposed Earth/ Anthropogenic | Open Water | |
| Avalon Forest | 0.0 | 14.8 | 0.4 | 27.0 | 1.1 | 87.5 | 0.6 | 65.1 | 3.0 | 1.6 | 0.4 | 31.3 | 232.8 |
| Maritime Barrens | 2.7 | 61.0 | 5.3 | 82.2 | 74.8 | 299.2 | 73.2 | 663.1 | 57.3 | 26.5 | 43.2 | 131.5 | 1,520.0 |
| Total Area | 2.7 | 75.8 | 5.7 | 109.2 | 75.9 | 386.7 | 73.8 | 728.2 | 60.3 | 28.1 | 43.6 | 162.8 | 1,752.8 |
| **Percent of Avalon Peninsula ( ELC Study Area)** | **<1.0** | **4.3** | **<1.0** | **6.2** | **4.3** | **22.1** | **4.2** | **41.5** | **3.4** | **1.6** | **2.5** | **9.3** | **100.0** |
| Note: Units are $km^2$ | | | | | | | | | | | | | |

**Table 3.10 Habitat Type and Non-habitat Area within the Transmission Corridor by Ecoregion for the Avalon Peninsula (Island of Newfoundland)**

| Ecoregion | Habitat Types | | | | | | | | | Non-habitat Areas | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Burn | Conifer Forest | Conifer Scrub | Cutover | Kalmia Lichen/ Heathland | Mixedwood Forest | Rocky Barrens | Scrub / Heathland / Wetland Complex | Wetland | Exposed Earth/ Anthropogenic/ Cutblock | Exposed Earth/ Anthropogenic | Open Water | |
| Avalon Forest | 0.0 | 2.4 | 0.0 | 3.7 | 0.4 | 7.1 | 0.1 | 6.5 | 0.0 | 0.0 | 0.1 | 2.1 | 22.4 |
| Maritime Barrens | 0.4 | 10.6 | 0.4 | 21.7 | 14.7 | 41.8 | 16.1 | 92.1 | 6.8 | 2.3 | 4.7 | 13.7 | 225.3 |
| Total Area | 0.4 | 13.0 | 0.4 | 25.4 | 15.1 | 48.9 | 16.2 | 98.6 | 6.8 | 2.3 | 4.8 | 15.8 | 247.7 |
| **Percent of Avalon Peninsula (Transmission Corridor)** | **<1.0** | **5.2** | **<1.0** | **10.3** | **6.1** | **19.7** | **6.5** | **39.8** | **2.7** | **<1.0** | **1.9** | **6.4** | **100.0** |
| Note: Units are $km^2$ | | | | | | | | | | | | | |

**Figure 3.41 Habitat Type and Non-habitat Area Summary (ELC Study Area) for Avalon Peninsula (Island of Newfoundland)**

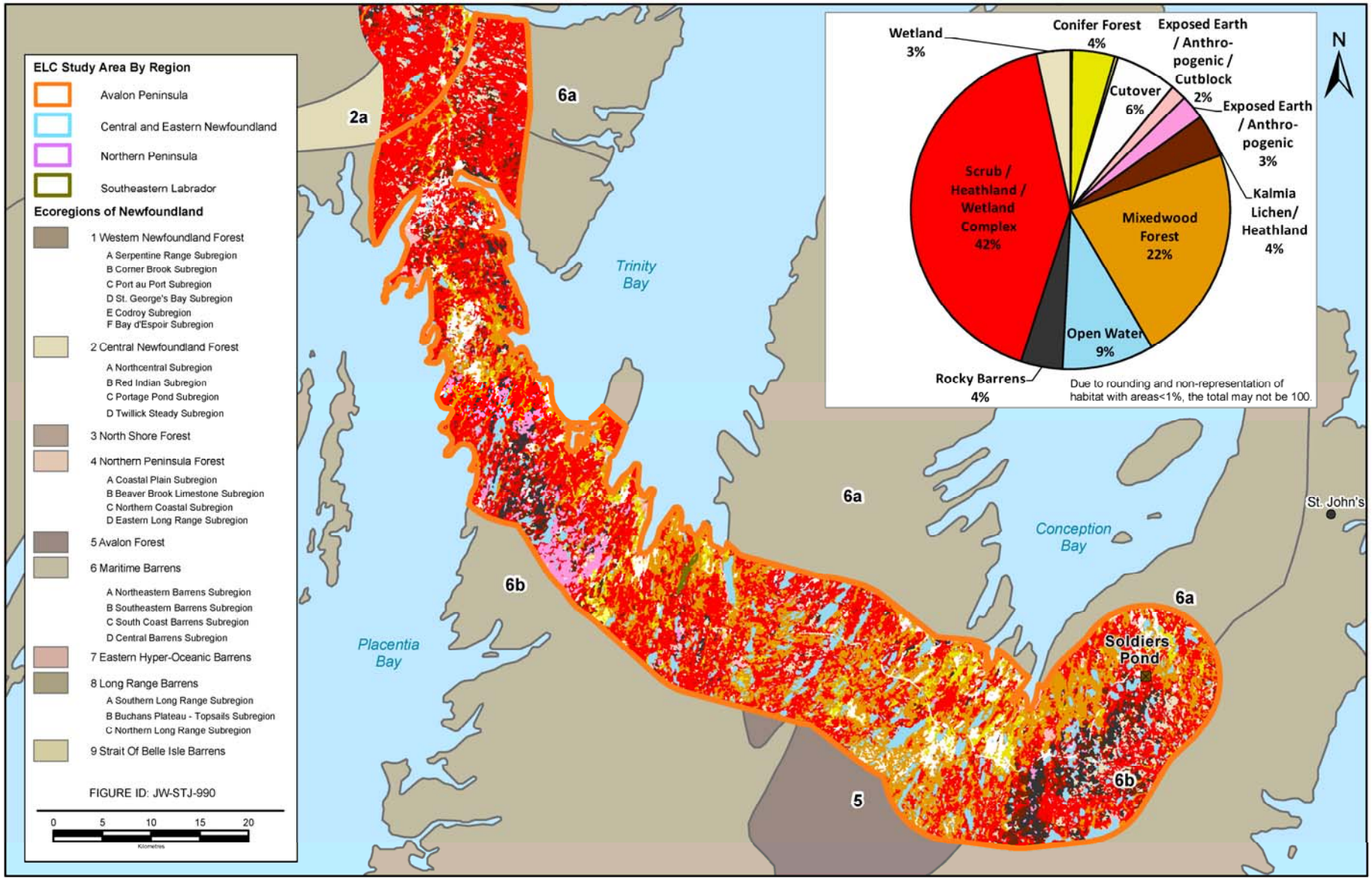
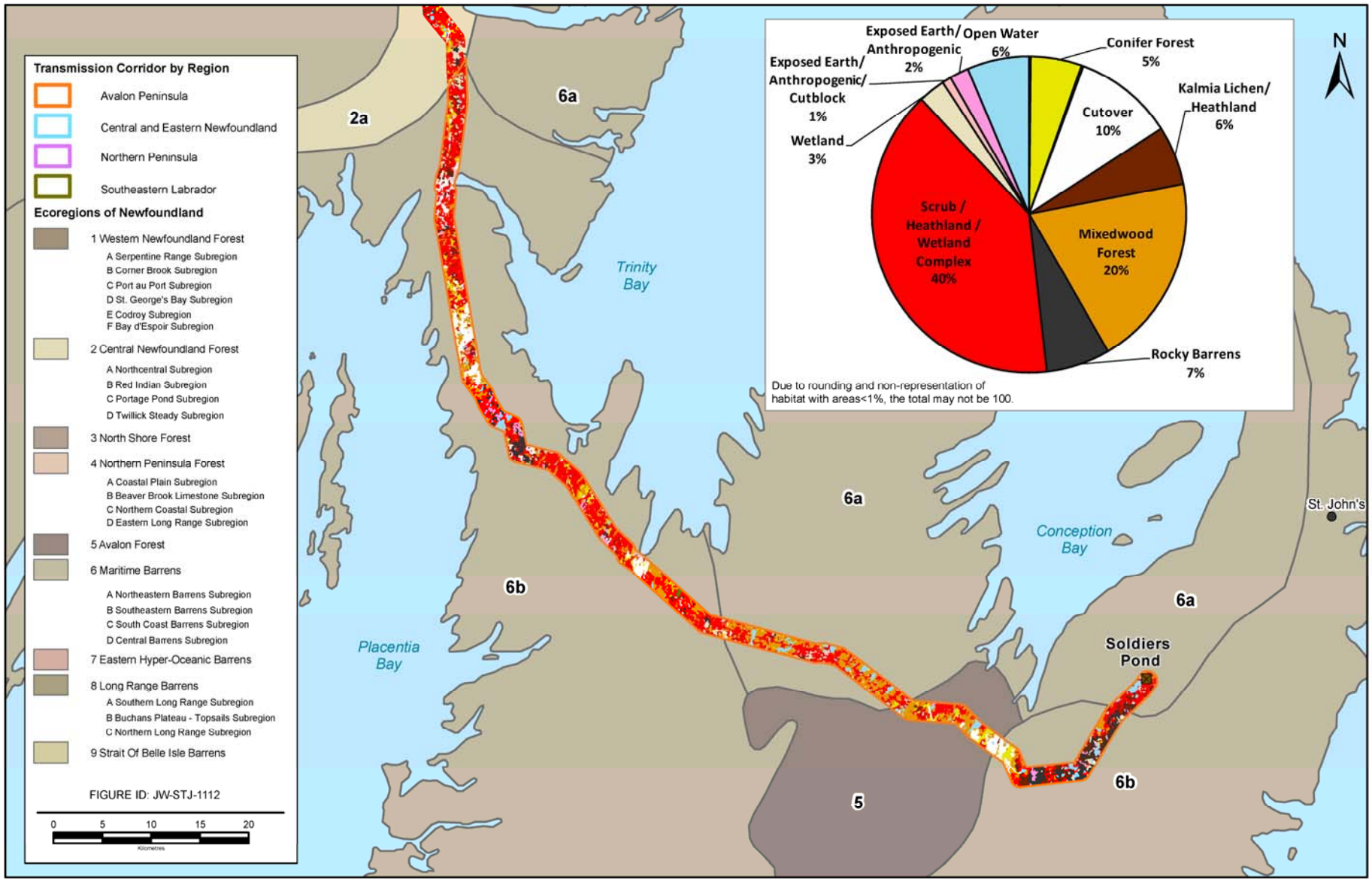


**Figure 3.42 Habitat Type and Non-habitat Area Summary (Transmission Corridor) for Avalon Peninsula (Island of Newfoundland)**



A summary of the total area covered by each ELC Habitat Type and Non-habitat Area within the 15 km wide Study Area by Ecoregion on the Island of Newfoundland is provided in Table 3.11.

**Table 3.11 Habitat Type and Non-habitat Area within the ELC Study Area by Ecoregion on the Island of Newfoundland (Total)**

| Ecoregion | Habitat Types | | | | | | | | | | | Non-habitat Areas | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Alpine Vegetated | Burn | Conifer Forest | Conifer Scrub | Cutover | Kalmia Lichen/Heathland | Mixedwood Forest | Open Conifer Forest | Rocky Barrens | Scrub / Heathland / Wetland Complex | Wetland | Cloud/Shadow | Exposed Earth/ Anthropogenic/ Cutblock | Exposed-Earth/ Anthropogenic | Open Water | |
| Avalon Forest | 0.0 | 0.0 | 14.8 | 0.4 | 27.0 | 1.1 | 87.5 | 0.0 | 0.6 | 65.1 | 3.0 | 0.0 | 1.6 | 0.4 | 31.3 | 233 |
| Central Newfoundland Forest | 0.0 | 10.5 | 241.0 | 119.3 | 758.8 | 49.4 | 1,380.5 | 595.4 | 3.7 | 429.3 | 600.1 | 0.0 | 46.4 | 3.5 | 263.9 | 4,501 |
| Long Range Barrens | 26.5 | 0.0 | 378.2 | 42.2 | 27.7 | 13.5 | 68.1 | 319.1 | 0.0 | 651.0 | 192.3 | 0.0 | 6.1 | 36.2 | 115.7 | 1,877 |
| Maritime Barrens | 0.0 | 2.7 | 79.6 | 18.8 | 90.1 | 91.4 | 326.8 | 37.2 | 79.8 | 714.3 | 124.8 | 0 | 32.8 | 46.1 | 148.6 | 1,793 |
| Northern Peninsula Forest | 0.0 | 0.0 | 548.5 | 46.8 | 105.9 | 1.3 | 276.8 | 337.6 | 4.3 | 306.8 | 122.2 | 44.3 | 3.0 | 4.6 | 231.5 | 2,034 |
| Strait of Belle Isle | 0.0 | 0.0 | 36.7 | 5.5 | 2.3 | 0.0 | 0.0 | 92.1 | 0.0 | 40.3 | 28.7 | 0.2 | 3.2 | 1.6 | 49.6 | 260 |
| Total Area | 26.5 | 13.2 | 1,298.8 | 233.0 | 1,011.8 | 156.7 | 2,139.7 | 1,381.4 | 88.4 | 2,206.8 | 1,071.1 | 44.5 | 93.1 | 92.4 | 840.6 | 10,698 |
| **Percent of Island of Newfoundland (Total) ELC Study Area** | **<1.0** | **<1.0** | **12.1** | **2.2** | **9.5** | **1.5** | **20.0** | **12.9** | **<1.0** | **20.6** | **10.0** | **<1.0** | **<1.0** | **<1.0** | **7.9** | **100.0** |
| Note: Units are $km^2$ | | | | | | | | | | | | | | | | |

A summary of the total area covered by each ELC Habitat Type and Non-habitat Areas within the 2 km wide transmission corridor by Ecoregion on the Island of Newfoundland is provided in Table 3.12.

**Table 3.12 Habitat Type and Non-habitat Area within the Transmission Corridor by Ecoregion on the Island of Newfoundland (Total)**

| Ecoregion | Habitat Types | | | | | | | | | | | Non-habitat Areas | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Alpine Vegetated | Burn | Conifer Forest | Conifer Scrub | Cutover | Kalmia Lichen/Heathland | Mixedwood Forest | Open Conifer Forest | Rocky Barrens | Scrub / Heathland / Wetland Complex | Wetland | Cloud/Shadow | Exposed Earth/ Anthropogenic/ Cutblock | Exposed-Earth/ Anthropogenic | Open Water | |
| Avalon Forest | 0 | 0 | 2.4 | 0 | 3.7 | 0.4 | 7.1 | 0 | 0.1 | 6.5 | 0.0 | 0 | 0 | 0.1 | 2.1 | 22 |
| Central Newfoundland Forest | 0 | 0 | 40.1 | 18.7 | 106.1 | 7.8 | 213.4 | 85.9 | 1.0 | 70.7 | 80.6 | 0 | 3.3 | 0.7 | 13.3 | 642 |
| Long Range Barrens | 0.7 | 0 | 39.1 | 2.8 | 2.5 | 0.9 | 4.7 | 22.5 | 0 | 59.2 | 12.2 | 0 | 0 | 0.9 | 8.2 | 154 |
| Maritime Barrens | 0 | 0.4 | 11.5 | 1.3 | 21.8 | 15.3 | 42.6 | 1.7 | 16.1 | 95.9 | 9.4 | 0 | 2.3 | 4.7 | 14.5 | 238 |
| Northern Peninsula Forest | 0 | 0 | 90.6 | 3.6 | 19.3 | 0.0 | 31.3 | 48.0 | 0.3 | 43.2 | 19.9 | 7.3 | 0.3 | 0.0 | 22.3 | 286 |
| Strait of Belle Isle | 0 | 0 | 5.8 | 0.8 | 0.2 | 0 | 0 | 13.8 | 0 | 4.6 | 3.7 | 0 | 0.5 | 0.1 | 5.0 | 34 |
| Total Area | 0.7 | 0.4 | 189.5 | 27.2 | 153.6 | 24.4 | 299.1 | 171.9 | 17.5 | 280.1 | 125.8 | 7.3 | 6.4 | 6.5 | 65.4 | 1,376 |
| **Percent of Newfoundland (Total) Transmission Corridor** | **<1.0** | **<1.0** | **13.8** | **2.0** | **11.2** | **1.8** | **21.7** | **12.5** | **1.3** | **20.4** | **9.1** | **<1.0** | **<1.0** | **<1.0** | **4.8** | **100.0** |
| Note: Units are $km^2$ | | | | | | | | | | | | | | | | |

A summary of the total area of Habitat Types and Non-habitat Area for the entire 15 km Study Area and 2 km Transmission Corridor are provided in Tables 3.13 to 3.14.

**Table 3.13 Habitat Type and Non-habitat Area within the Entire 15 km wide ELC Study Area (Newfoundland and Labrador)**

| Ecoregion | Habitat Types | | | | | | | | | | | | | | | Non-habitat Areas | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Alpine Vegetated | Black Spruce Lichen Forest | Burn | Conifer Forest | Conifer Scrub | Cutover | Hardwood Forest | Lichen Heathland | Kalmia Lichen/ Heathland | Mixedwood Forest | Open Conifer Forest | Rocky Barrens | Scrub/Heathland/Wetland Complex | Wetland | Exposed Bedrock | Cloud/Shadow | Exposed Earth/ Anthropogenic/ Cutblock | Exposed-Earth/ Anthropogenic | Open Water | |
| Labrador Area | 0.0 | 220.0 | 89.7 | 1,206.8 | 983.6 | 0.0 | 8.8 | 318.8 | 0.0 | 38.0 | 1,537.9 | 0.0 | 0.0 | 1,483.0 | 0.8 | 26.0 | 2.3 | 0.0 | 277.1 | 6,193 |
| Island of Newfoundland Area | 26.5 | 0.0 | 13.2 | 1,298.7 | 230.0 | 1,011.8 | 0.0 | 0.0 | 156.7 | 2,139.7 | 1,381.4 | 88.4 | 2,206.8 | 1,071.1 | 0.0 | 44.5 | 93.1 | 92.4 | 840.6 | 10,697 |
| Total Area (Rounded) | 27 | 220 | 103 | 2,506 | 1,217 | 1,012 | 9 | 319 | 157 | 2,178 | 2,919 | 88 | 2,207 | 2,554 | 1 | 71 | 95 | 92 | 1,118 | |
| **Percent of ELC Study Area** | **<1.0** | **1.3** | **<1.0** | **14.8** | **7.2** | **6.0** | **<1.0** | **1.9** | **<1.0** | **12.9** | **17.3** | **<1.0** | **13.1** | **15.1** | **<1.0** | **<1.0** | **<1.0** | **<1.0** | **6.6** | **100.0** |

Note: Units are $km^2$
Rounding errors less than 1 percent occur in final total

**Table 3.14 Habitat Types and Non-habitat Areas within the Entire 2 km wide Transmission Corridor (Newfoundland & Labrador)**

| Ecoregion | Habitat Types | | | | | | | | | | | | | | | Non-Habitat Areas | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Alpine Vegetated | Black Spruce Lichen Forest | Burn | Conifer Forest | Conifer Scrub | Cutover | Hardwood Forest | Lichen Heathland | Kalmia Lichen/ Heathland | Mixedwood Forest | Open Conifer Forest | Rocky Barrens | Scrub/Heathland/ Wetland Complex | Wetland | Exposed Bedrock | Cloud/Shadow | Exposed Earth/ Anthropogenic/ Cutblock | Exposed-Earth/ Anthropogenic | Open Water | |
| Labrador Area | 0 | 27.9 | 17.2 | 167.5 | 155.2 | 0.0 | 1.0 | 43.7 | 0.0 | 3.3 | 222.5 | 0.0 | 0.0 | 176.9 | 0.0 | 0.1 | 0.0 | 0.0 | 15.3 | 831 |
| Island of Newfoundland Area | 0.7 | 0.0 | 0.4 | 189.5 | 27.2 | 153.6 | 0.0 | 0.0 | 24.4 | 299.1 | 171.9 | 17.5 | 280.1 | 125.8 | 0.0 | 7.3 | 6.4 | 6.5 | 65.4 | 1,376 |
| Total Area (Rounded) | 1 | 28 | 18 | 357 | 183 | 154 | 1 | 44 | 24 | 302 | 394 | 18 | 280 | 303 | 0 | 7 | 7 | 7 | 81 | |
| **Percent of Transmission Corridor** | **0.0** | **1.3** | **0.8** | **16.2** | **8.3** | **7.0** | **0.0** | **2.0** | **1.1** | **13.7** | **17.9** | **0.8** | **12.7** | **13.7** | **0.0** | **0.3** | **0.3** | **0.3** | **3.7** | **100.0** |

Note: Units are $km^2$
Rounding errors less than 1 percent occur in final total

# 4.0 SUMMARY AND CONCLUSIONS

Nalcor Energy is proposing to develop the *Labrador – Island Transmission Link*, an 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 in support of the Project's EA, a regional ELC was completed in order to present information on regional vegetation communities and habitats in the area of, and which may interact with, the proposed Project, as environmental baseline information for use in the EA.

This report presents the results of the ELC, which was completed for a 15 km wide regional Study Area encompassing the proposed transmission corridor and a number of identified alternative corridor segments and their adjacent areas. The ELC is based on site information gathered during a 2008 field program and other existing datasets, as well as high-resolution satellite images and aerial photographs, which were incorporated into a computer-based GIS and used to define and delineate the regional vegetation communities and habitats within the ELC Study Area. A total of fifteen (15) ELC Habitat Types (as defined by plant species presence and abundance) were identified, mapped and analyzed for both the overall 15 km wide ELC Study Area and the 2 km wide transmission corridor itself.

The ELC will serve as an essential and integral component of the EA, and provides the key and core information that will be used in assessing and quantifying the Project's potential interactions with aspects of the terrestrial environment (vegetation and wildlife).

The ELC has also formed the basis for detailed wildlife habitat suitability analysis and mapping for caribou, other large mammals, furbearers and small mammals and avifauna along and adjacent to the transmission corridor, which has been presented in various other Component Studies prepared and submitted under the EA process for the Project.

# 5.0 REFERENCES

Damman, A.W. 1983. An Ecological Subdivision of the Island of Newfoundland. Pp. 163-206. In: R. South. (ed.). Biography of the Island of Newfoundland. D.W. Junk Publishers, London, UK.

Gateway Pipeline Limited Partnership. 2005. Preliminary Information Package Enbridge Gateway Project. Calgary AL. Report + Appendices

Kitimat LNG Inc. 2005. Kitimat LNG Environmental Assessment Certificate Application. Kitimat, BC. Report + Appendices

Marshall, I.B. and P.H. Shutt. 1999. Ecosystems Science Directorate, Environment Canada, and the A National Ecological Framework for Canada - Overview. Research Branch, Agriculture and Agri-Food Canada. 34 pp.

Meades, S.J. 1990. Natural Regions of Newfoundland and Labrador. Report prepared for the Protected Areas Association, St. John's, NL.

Meades, S.J., S.G. Hay and L. Brouillet. 2000. Annotated Checklist of the Vascular Plants of Newfoundland and Labrador.

Minaskuat Inc. 2008a. Regional Ecological Land Classification. Prepared for the Lower Churchill Hydroelectric Generation Project, Nalcor Energy, St. John's, NL.

Minaskuat Inc. 2008b. Study Area Ecological Land Classification. Prepared for the Lower Churchill Hydroelectric Generation Project, Nalcor Energy, St. John's, NL.

Minaskuat Inc. 2009a. Ecological Land Classification Baseline Report (Aurora Michelin Project). Prepared for Aurora Energy, St. John's, NL. 83 pp + Appendices

Natural Resources Canada. 2007. The Atlas of Canada. http://atlas.nrcan.gc.ca/site/ english/index.html.

Parks and Natural Areas Division. 2008. Protected Areas in Newfoundland and Labrador. Department of Environment and Conservation, Government of Newfoundland and Labrador. http://www.env.gov.nl.ca/parks.

Stantec Consulting Ltd. 2010. Wetlands Inventory and Classification. Labrador – Island Transmission Link. Final Report. Prepared for Nalcor Energy, St. John's, NL.

Wilkin, E.B. 1986. Terrestrial Ecozones of Canada. Ecological Land Classification, Series No. 19. Environment Canada. Hull, PQ.