APPENDIX U

Vegetation Baseline Study

CENTURY
IRON MINES CORP.

Joyce Lake Direct Shipping Iron Ore Project

Vegetation Baseline Study

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November 2013

GENIVAR

Joyce Lake Direct Shipping Iron Ore Project

Vegetation Baseline Study

Final Version

Approved by:

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EXECUTIVE SUMMARY

Reference to be cited:

GENIVAR. 2013. Joyce Lake Direct Shipping Iron Ore Project. Vegetation Baseline Study. Report prepared for Labec Century Iron Ore. 80 p. and appendices.

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

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

To support the EA process, a Vegetation Baseline Study was undertaken in 2012 to describe the upland and wetland vegetation types, the overall floristic diversity and to determine the presence of rare plant or species of conservation concern within the Study Area. In addition, uplands and wetlands provide a wide variety of habitats which are essential to wildlife in offering areas for foraging, feeding, calving, etc. Therefore, the Vegetation Baseline Study is complementary to the Avifauna Baseline Study as well as the Mamma and Herpetofauna Baseline Study that were also conducted during the summer of 2012.

A reconnaissance survey for plants species at risk and of conservation concern and vegetation communities was conducted on August 4, 2012, and the main field campaign was carried out from August 14 to August 24, 2012. A total of 55 sampling plots were surveyed to cover most of the vegetation types found in the Study Area. In addition, four plots were sampled in different vegetation types outside the Study Area. The various vegetation units (forested ecosystems, bogs, fens, etc.) were identified by helicopter which flew over the Study Area at low altitude. The vegetation communities and plant diversity description were conducted using sampling plots combined with random survey transects. Sampling plots were selected so as to cover part or all of the area of a given vegetation type found within the Study Area. The vegetation was described according to the simplified Braun-Blanquet's phytosociological method. Uplands and wetlands were also photo-interpreted using high-resolution aerial photographs.

Uplands occupy 12,949 ha (85 %) of the total Study Area. Thirteen upland vegetation types were identified by photo-interpretation and information concerning the floristic associations and physical characteristics present in these upland vegetation types was collected from 31 survey plots. Upland was divided into forested and non-forested vegetation types.

Forested vegetation types are the most frequent, occupying 57 % of the Study Area. They are found on moderately to well-drained terrain and are usually situated on gentle slopes. Open spruce-moss and spruce-lichen forests are the most abundant forest types. Closed spruce-moss forests are less common and colonize the richest and less-weathered sites. Birch forests are considered uncommon in the Study Area and only one was found, on a steep slope in the southern part of the Study Area.

Non-forested upland sites occupy 27 % of the Study Area and are dominated by the post-fire regeneration vegetation type, which occur in large patches in the mid portion of the Study Area. Shrubland follows and is generally located on slopes and is transitional between forested sites and more exposed summits. Lichen shrub-barrens colonize more xeric and poor sites. Slightly weathered rock barrens occupy large flatlands and are composed of large-sized fractured rock. Moderately and highly-

weathered rock barrens are found on top of most of the highest mountains in the Study Area and are similar to alpine tundra environments. More marginal vegetation types such as human disturbances, clear cuts and exposed sand and gravel complete the upland plant communities found in the Study Area.

Wetlands occupy 2,298 ha (15 %) of the total Study Area. Ten types of wetland vegetation types were identified by photo-interpretation, and information concerning the floristic associations and physical characteristics present in these wetlands were collected from 24 survey plots.

Wetlands in the Study Area occupy flat, poorly-drained depressions on impermeable substrates and are closely associated with watercourses. Wetlands occur either in large assemblages or small and isolated areas. Peatlands are by far the most abundant wetland type, and account for 1,977 ha (86 %) of all wetlands in the Study Area. Fens are the most abundant peatlands found in the Study Area. They are mostly influenced by the leaching of minerals dissolved from the underlying bedrock which is mostly of sedimentary origin. They occupy mineralized sites, enriched by surface runoff of seepage through the substrate. Swamps are the second most abundant wetland type and are usually found at the edge of lakes and rivers. Bogs occupy a lesser portion of the Study Area and are generally found in depressions fed by rainwater. Temporary ponds and permanent ponds are small in size, isolated and scattered throughout the Study Area.

A wetland ecological function assessment was conducted in an area surrounding the revised project layout, which includes wetlands most likely to be affected by the Project. Nine (9) key wetland functional categories are considered as the most important ecological services provided by wetlands that occur along the proposed Project. These functions are: surface water detention, sediment and other particulate retention, streamflow maintenance, carbon sequestration, shoreline stabilization, provision of fish habitat, stream shading, provision of waterfowl and waterbird habitat, and species of conservation concern habitat. The main functions provided by wetlands in the vicinity of the Project Development Area are the species of conservation concern habitat (100 % of the wetlands), the carbon sequestration (99.8 % of the wetlands), the shoreline stabilization (53.7 % of the wetlands) and the provision of waterfowl and waterbird habitats (55.5 % of the wetlands).

There is no known plant species listed under the federal *Species at Risk Act* or the provincial *Endangered Species Act* within the Study Area based on literature and on field work conducted during the summer of 2012. However, 40 rare or potentially rare vascular plant species were identified during the field work. Two of these occur in the region (bog willow and golden ragwort), while one is threatened (glacial sedge) as per the Québec *Loi sur les espèces menacées ou vulnérables* (LEMV) and two are likely to be designated threatened or vulnerable in Québec (LEMV; Chamisso's arnica and large-leaved avens). Norwegian cudweed, a low priority candidate species as established by Committee on the Status of Endangered Wildlife in Canada, has also been observed in the Study Area.

PRODUCTION TEAM

Labec Century Iron Ore

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

GENIVAR inc.

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Marie-Michèle Lévesque	GIS Specialist
Mélissa Gaudreault	GIS Specialist
Nancy Imbeault	Editing

Stassinu Stantec

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1 INTRODUCTION

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

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

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

1.1 Project Overview

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

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

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

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

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

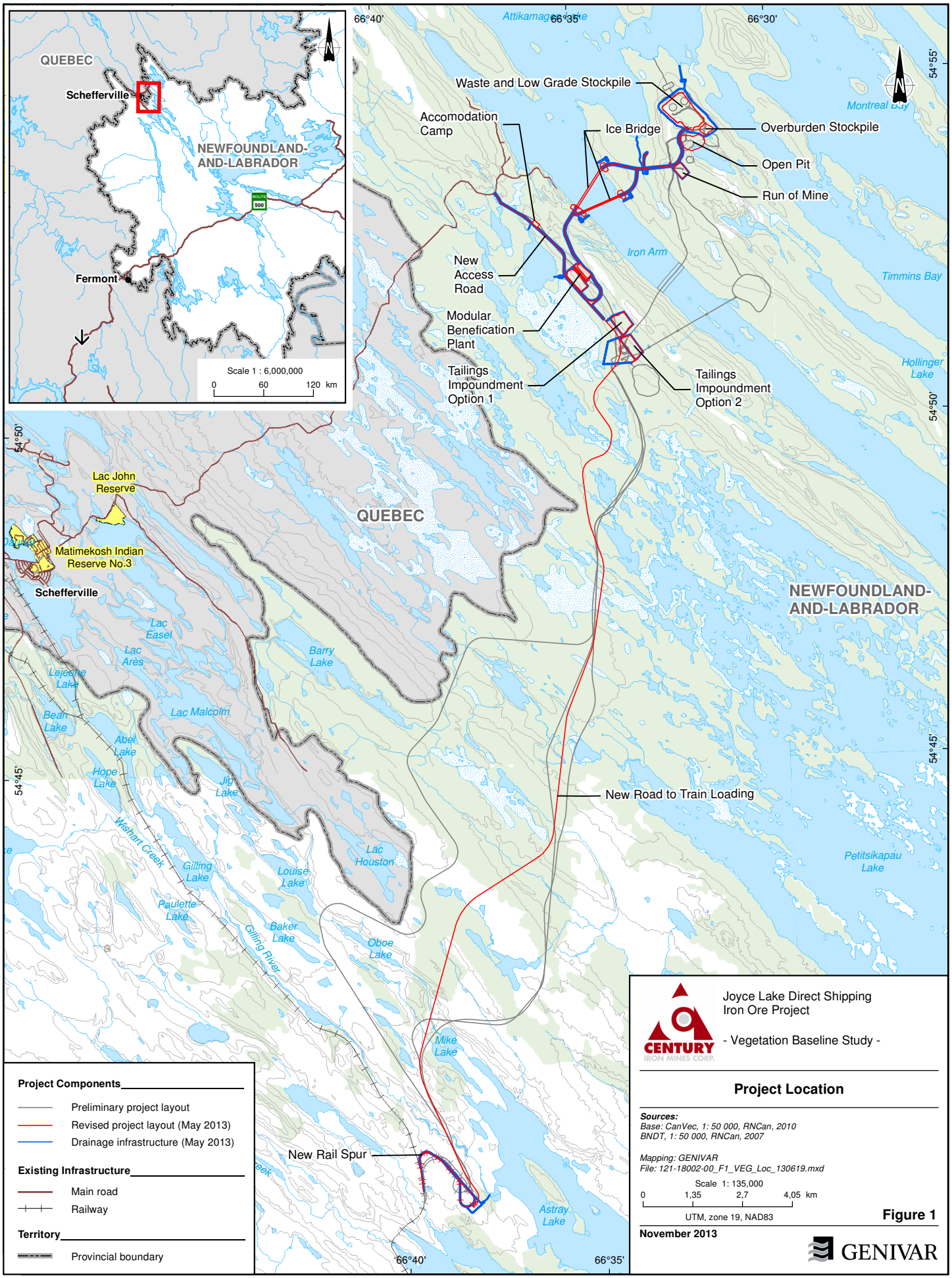
Product	Unit	Estimated Production by Year							
		2014	2015	2016	2017	2018	2019	2020	2021
Phase I Ore (DSO; 60 % Fe)	tonne	-	999,000	1,987,000	1,986,000	1,987,000	TBD[1]	TBD[1]	TBD[1]
Phase II Ore (55 % Fe)	tonne	-	-	-	-	-	TBD[1]	TBD[1]	TBD[1]
Waste Rock Low Grade	tonne	949,000	11,584,000	15,662,000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

[1] TBD: To be determined.

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

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

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


QUEBEC
Schefferville
NEWFOUNDLAND-
AND-LABRADOR
Fermont
Scale 1 : 6,000,000
0 60 120 km
66°40'
66°35'
66°30'
54°55'
54°50'
54°45'
Attikamagen Lake
Montreal Bay
Iron Arm
Timmins Bay
Hollinger Lake
Petitsikapau Lake
Waste and Low Grade Stockpile
Accomodation Camp
Ice Bridge
Overburden Stockpile
Open Pit
Run of Mine
New Access Road
Modular Benefication Plant
Tailings Impoundment Option 1
Tailings Impoundment Option 2
New Road to Train Loading
New Rail Spur
Lac John Reserve
Matimekosh Indian Reserve No.3
Lac Easel
Lac Arès
Barry Lake
Lejeune Lake
Bean Lake
Lac Malcolm
Abel Lake
Hope Lake
Jig Lake
Wishart Creek
Gilling Lake
Louise Lake
Lac Houston
Paulette Lake
Baker Lake
Gilling River
Oboe Lake
Mike Lake
Astray Lake
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Revised project layout (May 2013)
Drainage infrastructure (May 2013)
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Main road
Railway
Territory
Provincial boundary
CENTURY IRON MINES CORP.
Joyce Lake Direct Shipping Iron Ore Project
- Vegetation Baseline Study -
Project Location
Sources:
Base: CanVec, 1: 50 000, RNCan, 2010
BNDT, 1: 50 000, RNCan, 2007
Mapping: GENIVAR
File: 121-18002-00_F1_VEG_Loc_130619.mxd
Scale 1: 135,000
0 1,35 2,7 4,05 km
UTM, zone 19, NAD83
Figure 1
November 2013
GENIVAR

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

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

1.2 Organization of this Baseline Study

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

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

Additional supporting information and documentation is presented in appendices.

2 OBJECTIVES AND RATIONALE

The description of plant communities found within the Study Area aims to document the presence of sensitive habitats, such as wetlands or other potentially rare or uncommon habitats. Such habitats may contain species at risk, of conservation concern or rare plant species. In addition, plant communities provide a wide variety of habitats which are essential to wildlife by offering areas for foraging, feeding, calving, etc. Therefore, the Vegetation Baseline Study is complementary to the Avifauna Baseline Study as well as the Mammal and Herpetofauna Baseline Study that were also conducted during the summer of 2012.

The specific objectives were to:

- identify, distinguish and describe the main vegetation communities, including wetlands associated with the Joyce Lake Study Area;
- classify wetlands within the Study Area and provide an assessment of key wetland functions and an estimate of the contributing area based on wetland classification;
- identify specific vegetation communities with high likelihood for supporting rare plant species, determine their presence / absence (not detected) in the Study Area and note the potential risks as a result of development;
- establish the floristic diversity within the Study Area and compare the local flora to the regional context.

3 METHODS

3.1 Description of the Study Area

Project Development Area

The Project Development Area (PDA) is the most basic and immediate area of the Project. The PDA is limited to the anticipated area of physical disturbance associated with the construction or operation of the Project. For this Project, the mine area lies within two map-staked licences (309 claims) covering 12,665 ha. The PDA includes the mining area, conveyances across Iron Arm, (e.g., barge, ice roads), a beneficiation plant on the mainland, access roads, an accommodation camp, a new 28-km long haul road, and a rail spur near the existing railroad (Figure 1).

Study Area

The Study Area is the maximum area within which Project-related environmental effects can be predicted or measured with a reasonable degree of accuracy and confidence. It includes the PDA and any adjacent areas where Project-related environmental effects may reasonably be expected to occur. The Vegetation Baseline Study Area includes all of the Joyce Lake Peninsula and on the mainland a 1-km buffer around the preliminary and revised project layouts (Figure 2).

3.2 Desktop Research

The search for existing information concerning the history of botanical explorations in the vicinity of the Study Area is the first step to acquiring knowledge of the vascular and non-vascular flora diversity prior to the field work. Information concerning vegetation surveys, floral diversity, wetlands or any other botanical information was searched in existing documents, including scientific journals, governmental reports, and available studies conducted in the Schefferville area.

Information regarding species at risk and of conservation concern was initially collected from the Atlantic Canada Conservation Data Centre (ACCDC) and from the *Centre de données sur le patrimoine naturel du Québec* (CDPNQ) database. A review of existing rare plant literature was also conducted (Waterway and Lei, 1982; Blondeau, 2000; CDPNQ, 2008; Dignard et al., 2009). This information was used to identify species at risk or of conservation concern with potential to be found in the Study Area. The term "species of conservation concern" includes species that are rare, disjunct, or at risk throughout their range or in Newfoundland and Labrador and in need of further research. The term also encompasses species that are listed under the Newfoundland and Labrador *Endangered Species Act* (NL ESA), or that have a special designation by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The following sources of information were also consulted:

- Species at Risk Act (SARA);
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC);
- Newfoundland and Labrador Endangered Species Act;

- Newfoundland and Labrador Species Status Advisory Committee (SSAC);
- Newfoundland and Labrador Department of Environment and Conservation – Wildlife General Status of Wildlife Ranks;
- Québec Loi sur les espèces menacées ou vulnérable (LEMV).

The results of this research were presented in tables and are complementary to the field survey conducted during the summer of 2012.

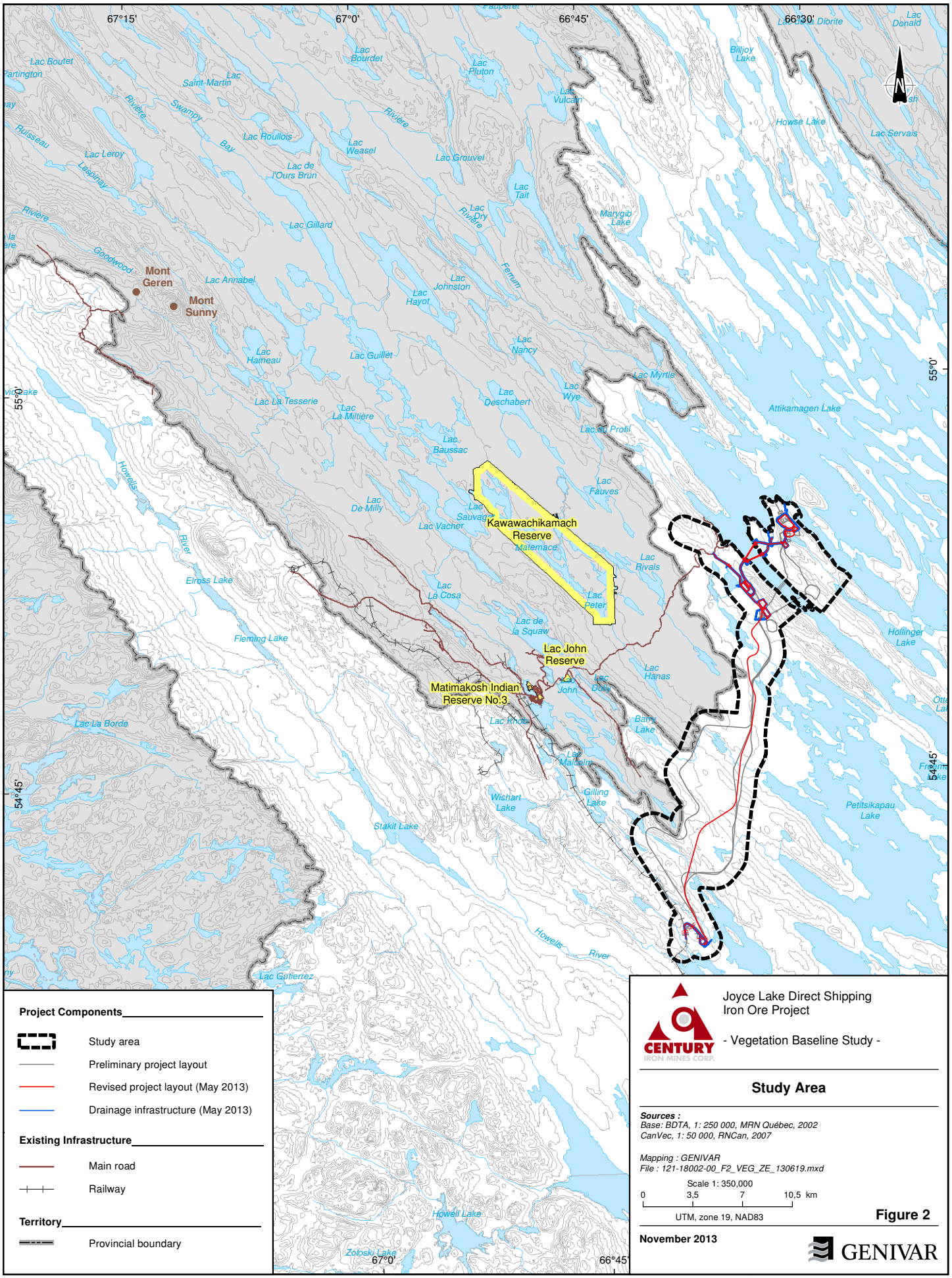
3.3 Field Survey

3.3.1 Pre-Survey Planning

Prior to the field work, a work plan was prepared in collaboration with Stassinu Stantec team members and included the field methods. A list of rare or potentially uncommon plant species potentially present in the Study Area was prepared based on the existing information found during the desktop research. Due to limited information available on the vegetation types found in the Study Area, sampling plots were selected during the field work.

3.3.2 Field Campaign

A reconnaissance survey was conducted on August 4, 2012 to make a rapid search for rare vascular plants and species of conservation concern in specific habitats where such species were most likely to be found. The main field survey was conducted from August 14 to August 24, 2012. During the survey, emphasis was put on wetland characterization and on the search for rare or potentially uncommon plant species within the Project Development Area and vicinity, based on the preliminary project layout. Information was also collected on vegetation in upland habitats. A total of 55 sampling plots were surveyed to cover most vegetation types found in the Study Area (Appendix A). To describe the human disturbed vegetation type, a 46.0-ha zone around Iron Arm camp was inventoried. In addition, four plots were sampled in different vegetation types outside the Study Area. The various vegetation units (forested ecosystems, bogs, fens, etc.) were identified by helicopter which flew over the Study Area at low altitude. The vegetation communities and plant diversity description were conducted using sampling plots combined with random survey transects. Sampling plots were selected so as to cover part or all of the area of a given vegetation type found within the Study Area. The vegetation was described according to the simplified phytosociological method (Braun-Blanquet, 1951). Based on this method, the vegetation, at a given site, was described using a general field survey, which included an exhaustive listing of species found along with the proportion of the area covered by each species. In Appendices A, B, C and D, flowering plants are classified according to the most recent update of the phylogenetic classification (Angiosperm Phylogeny Group, 2009). The presentation order for the fern and lycophyte families follows the sequences proposed by Christenhusz et al. (2011a, b). Within families, species are arranged by alphabetical order. The most recent nomenclature for species names is based on the Vascan database (Brouillet et al. 2010) and on the Flora of North America Editorial Committee (FNA, 1993+).


67°15'
67°0'
66°45'
66°30'
55°0'
54°45'
Lac Boutet
Lac Saint-Martin
Lac Bourdet
Lac Pluton
Lac Vulcain
Lac Donald
Biljoy Lake
Howse Lake
Lac Servais
Lac Roullois
Lac Weasel
Lac Grouvel
Lac de l'Ours Brun
Lac Leroy
Lac Tait
Lac Dry
Marygib Lake
Lac Gillard
Goodwood
Mont Geren
Mont Sunny
Lac Annabel
Lac Johnston
Lac Hayot
Fenum
Lac Nancy
Lac Hameau
Lac Guillet
Lac Myrtle
Lac Wye
Lac Deschabert
Attikamagen Lake
Lac La Tesserie
Lac La Miltière
Lac St Profil
Lac Baussac
Howells River
Lac Fauves
Lac De Milly
Lac Sauvage
Lac Vacher
Kawawachikamach Reserve
Matemace
Lac Rivals
Elross Lake
Lac La Cosa
Lac Peter
Lac de la Squaw
Fleming Lake
Lac John Reserve
Matimakosh Indian Reserve No.3
Lac John
Lac Hanas
Lac La Borde
Lac Knox
Barry Lake
Lac Malcolm
Gilling Lake
Wishart Lake
Hollinger Lake
Petitsikapau Lake
Stakit Lake
Howells River
Lac Gutierrez
Howell Lake
Zolbski Lake
N
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CENTURY IRON MINES CORP.
Joyce Lake Direct Shipping
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- Vegetation Baseline Study -
Study Area
Sources :
Base: BDTA, 1: 250 000, MRN Québec, 2002
CanVec, 1: 50 000, RNCan, 2007
Mapping : GENIVAR
File : 121-18002-00_F2_VEG_ZE_130619.mxd
Scale 1: 350,000
0 3,5 7 10,5 km
UTM, zone 19, NAD83
Figure 2
November 2013
GENIVAR

In each vegetation type, 20-m radius sampling plots were used to collect additional information. These plots were positioned in order to cover all vegetation types and, as much as possible, they were proportional in number to the surface area covered by a given vegetation type. In these sampling plots, the main species found were identified. The proportion of the area covered by each species was determined and noted using a cover scale (Table 2). In addition, the physical setting of each of these sampling plots was also recorded: plot location, soil type, soil drainage, slope gradient and ground cover type (Table 3). A general cover class was allocated to each vegetation stratum and ground cover category. Species abundance was determined from their ground cover in a given stratum. The physical setting data for each sampling plot are given in Appendix A. A specific electronic field form was developed for this project (Appendix E).

Table 2: Ground Cover Scales

Class[1]	Cover (%)
5	> 75
4	50-75
3	25-50
2	5-25
1	1-5
a	< 1
r	Rare

[1] Based on Braun-Blanquet (1951) and Greig-Smith (1964).

Table 3: Vegetation Stratum and Ground Cover Categories

Stratum[1]	Description
Arborescent	Tall trees more than 5 m
Tall Shrub	Woody plants more than 1 m
Low Shrub	Woody plants less than 1 m
Herb	Plants without woody stems
Moss	Defined entirely by mosses, lichens and liverworts
Bedrock, Rock and Gravel	Exposed Bedrock, rock and gravel
Litter	Litter
Dead Wood	Dead wood
Bare Soil	Bare mineral soil
Water	Water

[1] Modified from Payette and Gauthier (1972).

During the field work, specimens of vascular plants of interest or plants that could not be identified with certainty were collected and preserved using a plant press for

subsequent identification (Appendix D). Jean Deshaye Botanist, Biologist, M. Sc. has reviewed most of the specimens collected during the field campaigns.

Photographs of visited vegetation types complete the information collected on the field (Appendix F). All data were tabulated using a Panasonic U2 Toughbook with an integrated GPS unit.

3.4 Photo-Interpretation

The various vegetation types found in the Study Area were identified and mapped using photo-interpretation. This activity was conducted using digital stereo imaging technology (PurVIEW software, Planar stereoscopic monitor) in combination with ArcGIS to digitize the information and tabulate attributes. This type of equipment allows for a high-level of refinement due to the quality of the 3D georeference and to the on-screen magnification capabilities, which means data can be processed at a scale as precise as 1:500. High-resolution natural colour (RGB) digital aerial photographs, offering a ground resolution of 10 cm/pixel, were available for this project. These aerial photographs were taken in 2012.

The standard terrestrial ecosystem mapping approach used in Labrador is the Ecological Land Classification (ELC), developed by the federal government (Lopoukhine et al., 1978; Wilken, 1986). However, the Labrador territory is only mapped at the regional scale (ecoregion). The photo-interpretation provided a finer-scale mapping of the terrestrial and riparian ecosystems found within the Study Area. The precision of the aerial photographs allowed for a precise delineation of all wetland and upland vegetation types without forest cover found in the Study Area. Uplands with forest cover were mapped with the same precision but sometimes include small patches of other forested types, which may cover less than 2 ha.

The vegetation types were mapped by an experienced photo-interpreter during the fall of 2012, after the field campaign since the aerial photographs were not available before. Therefore, the mapping of upland and wetland vegetation types was validated using data and photographs collected during the field work.

3.5 Wetland Characterization

Wetlands were classified using the Canadian Wetland Classification System (CWCS) (National Wetlands Working Group, 1997). However, in some cases, the classification methods proposed by the MDDEP (2006), Ménard et al. (2006) and Payette and Rochefort (2001) were used as guidelines for characterization in the field.

Wetland classes used are as follows: fens, bogs, swamps and shallow water. Fens were primarily classified using forms (horizontal, riparian and northern ribbed). Forested fens were classified using vegetation physiognomy, this characteristic being a more predominant feature than the relatively uniform surface morphology, surface pattern, water type and morphology characteristics of underlying mineral soil that are mostly associated to the horizontal form of fens. The same classification was applied to bogs in that flat bogs were classified using form and forested bogs using the treed vegetation physiognomy. Because of very similar vegetation

associations, swamp forms were grouped together and were divided into two different types (shrub and forested). The shallow water class was divided into temporary ponds and ponds.

Peatlands (fens and bogs) were classified based on the trophic status based on the character of their vegetation (Garneau, 2001) and on structural properties. This classification appears simple in theory, but in reality peatlands represent a mosaic of different nutrient, drainage and physical properties which influence local plant associations. For this reason, some of the survey plots represent only the local conditions and were part of larger assemblages that were described by photo-interpretation.

3.6 Wetland Ecological Function

Wetland ecological functions are the natural processes that are associated with wetlands independent of considerations of the benefits of those processes to human (Hanson et al., 2008). Wetlands are important and valued because of their biological, biogeochemical and hydrologic functions. These include their role in the natural purification and storage of freshwater, in runoff and flood control, and as habitats for waterfowl, fish and other wildlife. Their protection is also the subject of various federal, provincial and municipal agreements, legislation and policies.

Hanson et al. (2008) reported that, during the last 20 years, approximately 100 different methods have been developed to assess wetland functions, and that no single method is best for all regions and situations in Canada. Despite the methodological problems inherently associated with wetland functional analyses, most researchers and authors generally agree on the major categories of wetland functions, and the validity of this general methodology for assessing potential environmental effects. Overall, hydrology, habitat, biochemical cycling and climate are quite relevant but depending on the wetland ecosystem, other wetland functions can be assessed, such as flood control, groundwater recharge, shoreline and erosion protection, water quality, biological productivity, habitat and nursery, recreational hunting, recreational fishing and biodiversity (Hanson et al., 2008).

For the purpose of this Baseline Study, the interpretation of wetland ecological functions was primarily based on guidelines outlined in Correlating Enhanced National Wetlands Inventory Data with Wetland Functions or Watershed Assessments: A Rationale for Northeastern U.S. (Tiner, 2003), as summarized in NovaWET (NSE, 2011), but was modified to reflect the unique wetland characteristics of the Study Area. The aforementioned guidance documents provide a methodology for predicting a number of key wetland functions based primarily on a wetland's classification, landscape position, landform, and water flow path. Correlations between wetland characteristics and potential wetland functions are based on expert opinion and supported by the published literature and have been developed and used by the US Fish and Wildlife Service for conducting landscape level assessments in the northeast United States. Although the correlations have been developed for wetlands in more southern regions, they are generally considered to be relevant for a wide geographic area (Tiner, 2003). Additional information obtained during both field surveys and desktop assessments were used to modify interpretation, where applicable, and to provide specific context for the functional assessment.

The wetland ecological functions were determined in a smaller zone comprised within the Vegetation Baseline Study Area to include only the wetlands most likely to be affected by the Project. Therefore, wetland ecological function were determined for wetlands completely or partially included within a 0,5-km buffer surrounding the revised project layout. For each of the wetland functions examined, an estimate of the contributing area within the wetland ecological function assessment zone was calculated by summing the wetland polygon area that was considered to contribute to that function. These summations are based on polygons that are often composed of wetlands with multiple forms and types (wetland classes were typically delineated separately however) and do not necessarily take into account considerations related to variation within a wetland.

Nine (9) key wetland functional categories are considered as the most important ecological services provided by wetlands that occur along the proposed Project. These functions are: the surface water detention, the sediment and other particulate retention, the streamflow maintenance, the carbon sequestration, the shoreline stabilization, the fish habitat, the stream shading, the waterfowl and waterbird habitat, and the species of conservation concern habitat.

Groundwater recharge was not considered in the assessment due to the lack of relevant information to determine whether wetlands contribute to the recharge or the discharge. In addition, such functions as the economic benefits and recreation, education and research were not assessed in the Study Area. The main reasons are the lack of information related to the land use, the remoteness and the limited accessibility. In the Study Area, areas most frequented by the local population for activities such as birdwatch, wildlife photography, fishing, furbearer harvest or even berry gathering would likely be Attikamagen Lake, Mike Lake and Astray Lake since roads provide access.

3.7 Rare Plant Survey

For the purpose of the survey, rare vascular plants, including their habitats, were the focus with an emphasis on species listed nationally as “at risk” (endangered, threatened or of special concern) under Schedule 1 of SARA; those listed as endangered, threatened or vulnerable under the NL ESA; assessed as “at risk” by the COSEWIC and the Newfoundland and Labrador Species Status Advisory Committee (SSAC) or those listed threatened, vulnerable or likely to be designated under the Québec *Loi sur les espèces menacées ou vulnérables*.

The DOEC Wildlife Division, through the Atlantic Canada Conservation Data Center (ACCDC), also maintains a comprehensive list of vascular plant species it considers to be rare, unusual or uncommon. The scarcity ranks of these species are SNR (unranked), S1 (extremely rare) and S2 (rare), or a combination thereof. A combined rank (e.g., S1/S2) is given for species whose status is uncertain; the first rank indicates the rarity status given current documentation, and the second rank indicates the rarity status that will most likely be assigned after all historical data and likely habitats have been checked. While S3 species are of concern from a provincial biodiversity perspective, they have not been included as their populations are considered less sensitive. The ranking method used by the ACCDC is based on a system developed by the Nature Conservancy that is used throughout North America (NatureServe, 2013). Therefore, a plant species not designated under one

of the Acts or their associated regulation, but considered unique or unusual, either locally or regionally, by DOEC Wildlife Division as recorded by the ACCDC, is considered rare. That is, all SNR, S1 and S2 species are considered rare.

There is also a provincial General Status assessment process that serves as a first alert tool for identifying species that are potentially at risk. Under this process, the populations of species that are native to the province are classified to be either “At Risk”, “May be at Risk”, “Sensitive” to human activities or natural events, “Secure”, or “Undetermined” should there be insufficient data, information, or knowledge available to access their status. The presence of species whose populations are considered to be “At Risk”, “May be at Risk”, or “Sensitive” is an issue of concern for provincial regulators.

The survey for rare vascular plants was undertaken at the same time as the vegetation type characterization activities, on August 4 and from August 14 to August 24, 2012. A small number of early flowering plant species may have been missed by surveying only in late-summer. However, this number is probably low since a special attention was given to plants in seed or exhibiting only vegetative structures. Constant attention was given to species of concern during the entire field campaign. However, a more thorough survey was conducted in habitats where these species were most likely to be found, such as wetlands (fens), flood plains of slow-moving rivers and streams, and unique rock outcrops and landforms (i.e. calcicolous and chionophilic habitats). In the event a colony of species of conservation concern was found, the following information was collected: number of specimens, plant sociology, and a description of physical setting and habitat as mentioned in Section 3.3.2. Concerning rare plants ranked S1, S2 or SNR by the ACCDC only the ground cover scale and a description of the physical settings and habitat was provided. The survey was mostly conducted in the PDA and vicinity based on the preliminary project layout.

3.8 Floristic Diversity

To establish the floristic diversity in the Study Area and in the Schefferville region a thorough literature review of all major botanical studies was undertaken. The information concerning the number of plants found in the Study Area comes from the data collected during the field survey. For the regional list, in addition to the field surveys, plants species were identified from these studies: Hustich, 1951, 1963, 1965, 1970, 1971 and 1972; Mäkinen and Kallio, 1980; Harper, 1964; Viereck, 1957; Sage Dunnet, 1968; Waterway et al., 1984; Dutilly and Lepage, 1962, 1964; Aecom, 2008 and Groupe Hémisphères, 2009. Appendix C provides a list of species that were not found within the Study Area but identified in the region.

In addition to the total number of species identified in a given vegetation type within the Study Area, the average number of species in each vegetation type was also calculated. The information on domains for the phytogeographical analysis of the regional flora comes from Hultén (1958, 1964, 1968, 1971), Rousseau (1974), Scoggan (1978-79) and FNA (1993+).

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

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

- experienced professionals with a good understanding of the project and its objectives;
- kick-off meeting to present the project and the objectives of the baseline study;
- trained and experienced field teams made up of at least two people;
- use of standard methods, with equipment in good condition and appropriate for the work to be carry out;
- preparation of specific protocols including the field methods, etc.;
- use of field forms;
- use of recent and standard reference documents;
- control of data tabulation;
- conservation of original data and data analysis results (hard copy and electronic);
- revision of all documents produced by qualified professionals.

4 RESULTS

4.1 Vegetation General Description

The Study Area lies within the Mid Subarctic Forest and the High Subarctic Tundra ecoregions (Figure 3). The Mid Subarctic Forest ecoregion is characterised by cold and snowy winters, cool summers with moderate rainfall and a 100-120-day growing season (Department of Natural Resources [NL DONR], 2012). The harsh climate restricts closed-canopy forests to sites protected from the wind. Black spruce (*Picea mariana*), white spruce (*Picea glauca*) and tamarack (*Larix laricina*) are, in general, the only tree species that survive in the northern part of this ecoregion (Groupe Hémisphères, 2009). Black spruce-moss stands are found on moderately drained sites, while stands of spruce and lichens are common on well-drained sites established on thin till deposits. Vast complexes of wetlands are common and peatlands are predominant.

The High Subarctic Tundra ecoregion is characterised by cold and windy winters, cool summers with moderate rainfall and an 80-100-day growing period (NL DONR, 2012). Arborescent vegetation is absent from this ecoregion. The vegetation is mostly dominated by shrubs, low shrubs and grass (Meades, 1990). Wetlands typically cover small areas and are located mostly around lakes and in depressions.

4.2 Uplands

Uplands occupy 12,949 ha, or 85 % of the total Study Area (Table 4). Thirteen (13) upland vegetation types were identified by photo-interpretation and information regarding the floristic associations and physical characteristics present in these habitats were collected in 31 survey plots. Upland was divided into two vegetation types, forested and non-forested.

Forested upland vegetation types are the most frequent, occupying 57 % of the Study Area. They are found on moderately to well-drained terrain and are usually situated on gentle slopes. Open spruce-moss and spruce-lichen forests are the most abundant forested types. Closed spruce-moss forests are less common and colonize the richest and less weathered sites. Birch forests are uncommon in the Study Area, with only one found on a steep slope in the southern part of the Study Area (Figures 4a and 4b).

Non-forested upland sites occupy 27 % of the Study Area and are dominated by the post-fire regeneration vegetation type, which occur in large patches in the mid portion of the Study Area (Figures 4a and 4b). Shrubland follows and is generally located on slopes and are transitional between forested sites and more exposed summits. Lichen shrub-barrens colonize more xeric and poor sites. Slightly weathered rock barrens occupy large flatlands and are composed of large-sized fractured rock. Moderately and highly weathered rock barrens are found on top of most of the highest mountains in the Study Area and are similar to alpine tundra environments. More marginal vegetation types such as human disturbances, clear cuts and exposed sand and gravel complete the upland plant communities found in the Study Area.

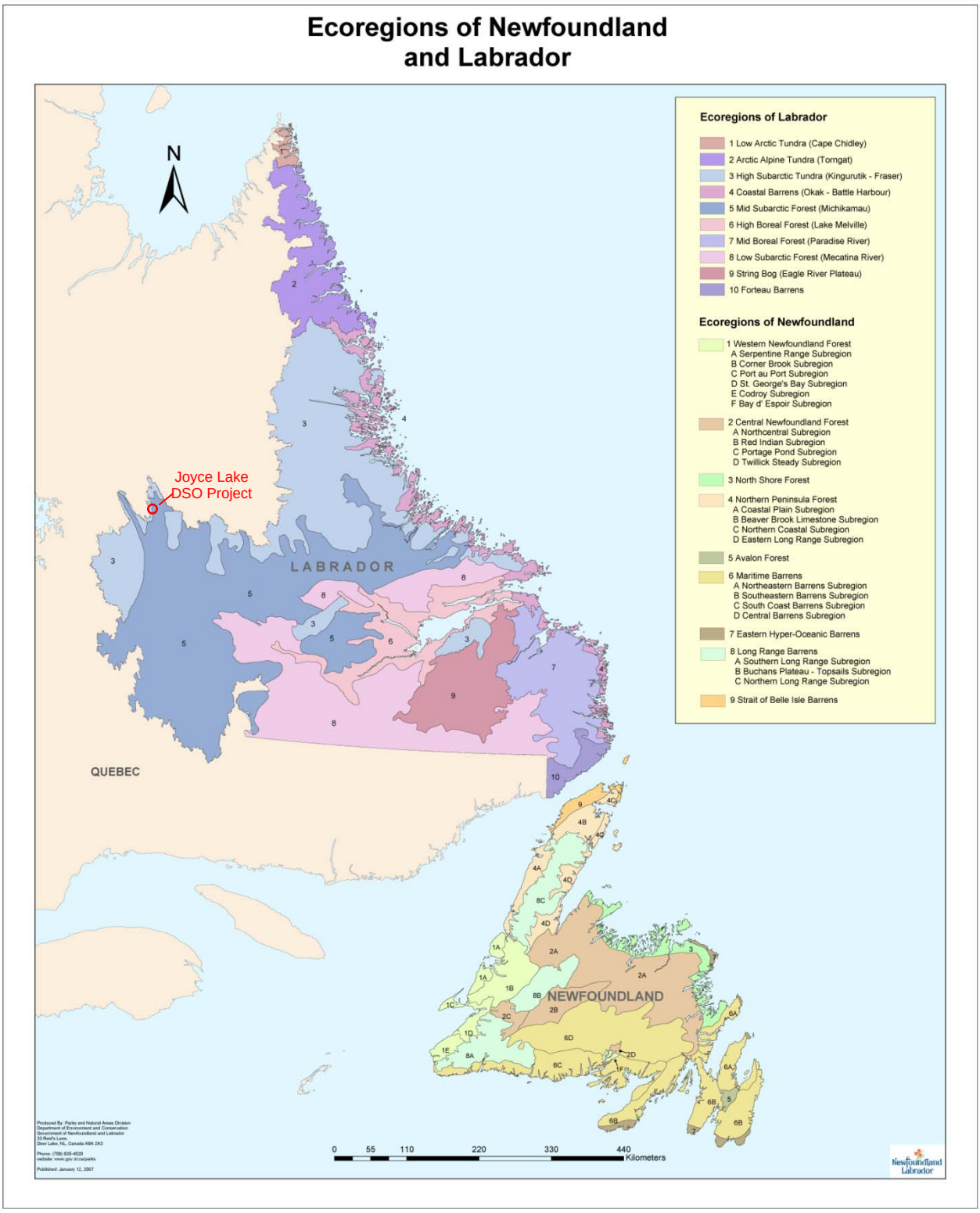


Figure 3: Ecoregions of Newfoundland and Labrador (Adapted from NL DOEC, 2007)

Table 4: Upland Vegetation Types Found in the Study Area and Probability of Finding Rare Plant Species

Upland Vegetation Type	Number of Polygons	Area (ha)	Rare Plant Species Probability[1]
Open Spruce-Moss Forest	246	4,312	Low
Open Spruce-Lichen Forest	318	3,695	Low
Post-Fire Conifer Regeneration	22	1,758	Low
Closed Spruce-Moss Forest	158	1,392	Low
Shrubland	47	699	Low
Lichen-Shrub Barren	51	461	Low
Slightly Weathered Rock Barren	108	353	Medium
Moderately Weathered Rock Barren	65	172	Medium
Clear Cut	3	39	Low
Highly Weathered Rock Barren	35	36	Medium
Human Disturbances	8	30	Low
Birch Forest	2	1.84	Low
Exposed Gravel and Sand	3	0.36	Medium
Total	**1,066**	**12,949**	**---**

[1] The probability of finding rare plant species in a given vegetation type was determined by specific habitat requirements of rare plants, results from the field survey and general knowledge from the field botanist.

The Joyce Lake peninsula has a northeast facing slope dominated by shrubland found on glacial till deposits. The central portion of the peninsula is in a NW-SE lineation and is made up of a succession of hills with highly and moderately weathered rock barrens on their summits (Figures 4a and 4b). Colluvial weathered rock barrens are present on slopes near Lake E and on the hillside northeast of Joyce Lake. Closed spruce-moss forests are most common on deep glacial deposits on the gentle southwest-facing slopes of the peninsula. Open lichen and moss-spruce associations are the canvas for all the other upland sites.

On the southern side of Iron Arm, moderately weathered rock barrens bordered by shrublands occupy the highest elevations. Closed spruce-moss forests occupy the base of hills. Open spruce-lichen forests are found in the northwest portion of this area while spruce-moss forests are located in its southeastern part.

The portion of the Study Area that lies at the northeast end of Petitsikapau Lake has a flat northern section, which is composed of slightly weathered rock barrens, and open spruce-lichen forest found on thin soil. The southern section is made up of thin to medium deep soil on thin glacial till. This southern section was divided into northern and southern parts: the northern part has burned and was probably a mixture of closed and open spruce forest types as found in the southern part.

The southern portion of the Study Area is a mosaic of different upland vegetation types. Hillsides are arranged as a horseshoe around Oboe Lake. The thin soil support shrublands and lichen-shrub barrens, and more exposed sites support moderately weathered rock barrens. The area on the summit north of Mike Lake is a post-fire conifer regeneration. The Gilling River meanders through a flat valley bordered by slightly rolling hills with a mixture of closed and open spruce forest types. An uncommon birch stand is present on a hillside overlooking the Gilling River and the existing railroad.

4.2.1 Forested Uplands

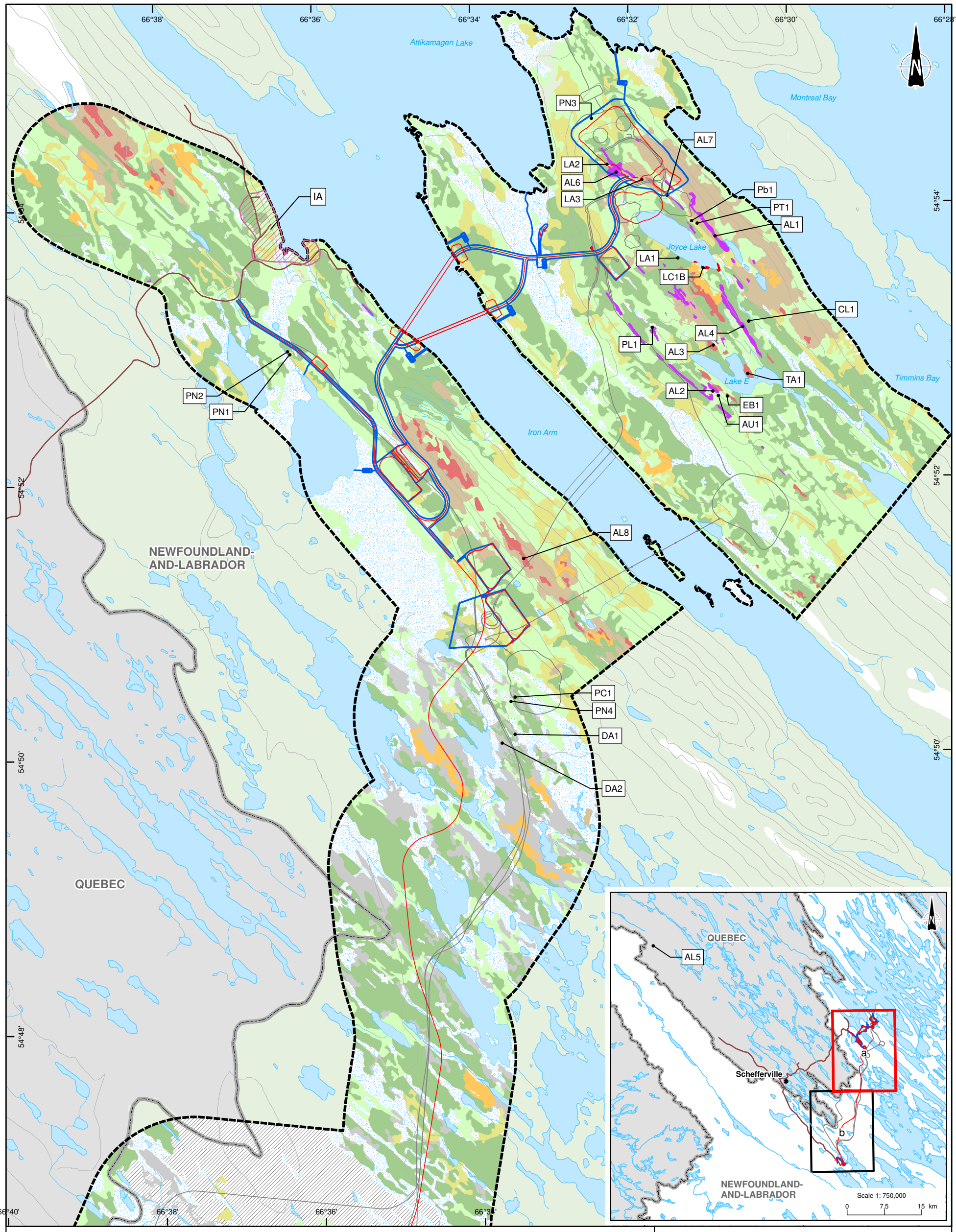
4.2.1.1 Open Spruce-Moss Forest

Open spruce-moss forests cover a large part of the Study Area (28.3 %; Figures 4a and 4b). They colonize moderately drained sites and are mostly found on fine sandy loam soil of glacial origin overlaid by a thin layer of organic material (Appendix F, Photo 1). These stands occupy 4,312 ha, or 33 % of the upland area (Table 4; Figure 5).

Two sampling plots are found in open spruce-moss forests (Plots PN3 and PN4; Figures 4a and 4b, Appendix A). The forest is open with usually less than 50 % of the ground cover occupied by trees. The predominant arborescent species is black spruce with tamarack and, in some areas, with white spruce on slopes where there is enriched soil. Balsam fir (*Abies balsamea*) was found in the vicinity of the PN3 survey plot, this species is considered to be near its northern distribution limit and individuals are of small stature with their tops broken off. The tall shrub stratum is sparse and made up of tea-leaved willow (*Salix planifolia*) and tall specimens of glandular birch (*Betula glandulosa*). Common Labrador tea (*Rhododendron groenlandicum*), black crowberry (*Empetrum nigrum* subsp. *nigrum*), alpine bilberry (*Vaccinium uliginosum*) and glandular birch are the most abundant species found in the well-represented low shrub stratum. The herbaceous layer has a ground cover of 40 % and bunchberry (*Cornus canadensis*), woodland horsetail (*Equisetum sylvaticum*) and palmate coltsfoot (*Petasites frigidus* var. *palmatus*) are the most abundant species encountered. The moss stratum is very well developed and is made up of red-stemmed feather-moss (*Pleurozium schreberi*) and glittering wood-moss (*Hylocomiun splendens*). Moist depressions are colonized by fine bog-moss (*Sphagnum angustifolium*) and red bog-moss (*S. rubellum*).

4.2.1.2 Open Spruce-Lichen Forest

Open spruce-lichen forests cover a large part of the Study Area (Figures 4a and 4b). These forests colonize moderately to well-drained sites and are mostly found on coarse sandy loam (Appendix F, Photo 2). These stands are usually found on small slopes or flat surfaces that overlay rubble. These forests occupy 3,695 ha, or 29 % of the upland area (Table 4; Figure 5).



Project Components

- Study area
- Preliminary project layout
- Revised project layout (May 2013)
- Drainage infrastructure (May 2013)

Existing Infrastructure

- Main road
- Railway

Territory

- Provincial boundary

Vegetation

- Sampling plot
- Sampling zone
- Highly weathered rock barren
- Moderately weathered rock barren
- Post-fire conifer regeneration
- Birch forest
- Clear cut
- Slightly weathered rock barren
- Exposed gravel and sand
- Shrubland
- Lichen-shrub barren
- Wetland
- Closed spruce-moss forest
- Open spruce-lichen forest
- Open spruce-moss forest
- Human disturbances

CENTURY IRON MINES CORP.

Joyce Lake Direct Shipping Iron Ore Project

- Vegetation Baseline Study -

Types of Upland Habitats Found in the Study Area and Sampling Plot Locations

Sources:
Base: BDTA, 1: 250 000, MRN Québec, 2002
CanVec, 1: 50 000, RNCan, 2007

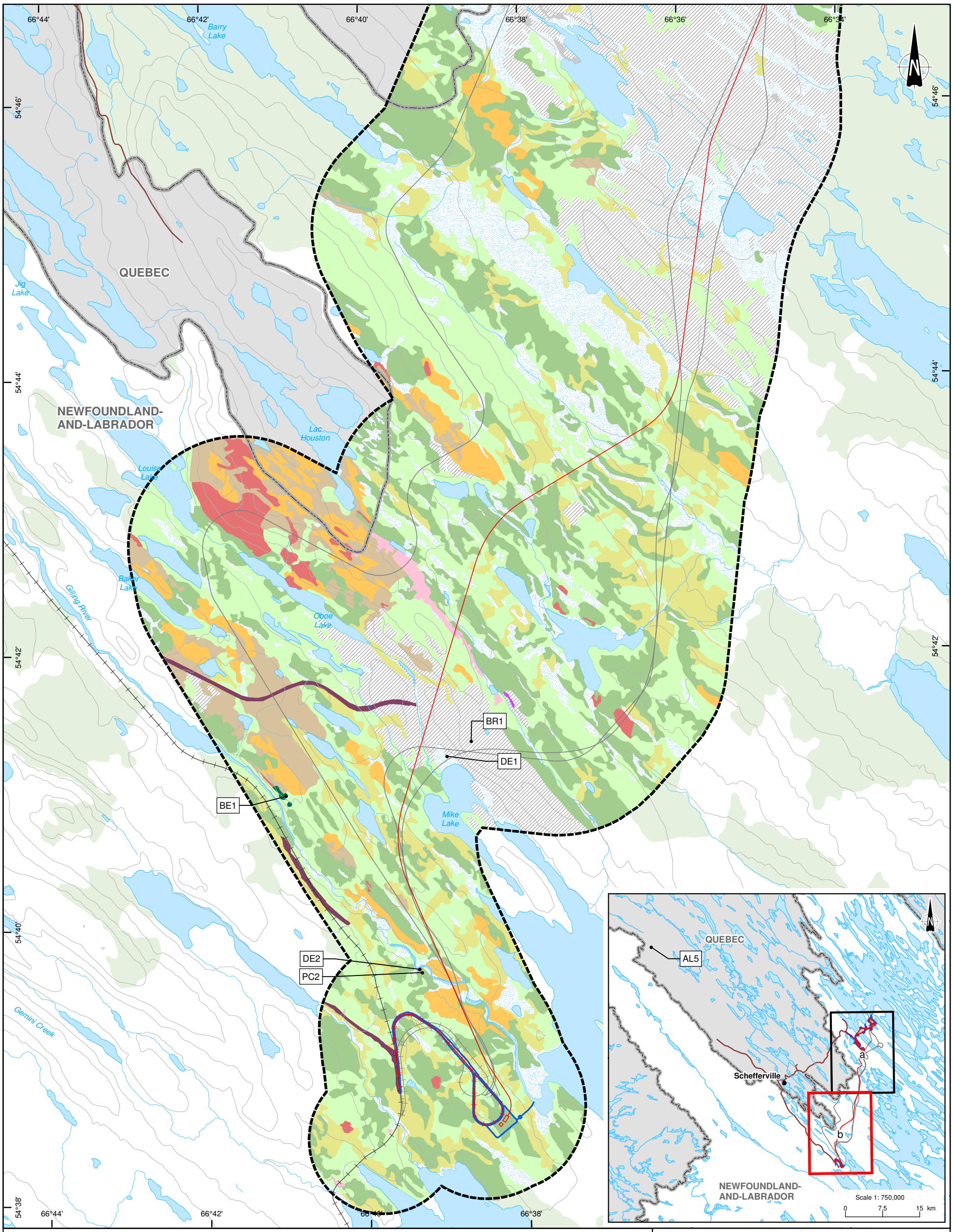
Mapping: GENIVAR
File: 121-18002-00_F4_VEG_mil_terrestre_130619.mxd

Scale 1: 50,000
0 500 1 000 1 500 m
UTM, zone 19, NAD83

Figure 4a

November 2013

GENIVAR



Project Components

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- Closed spruce-moss forest
- Open spruce-lichen forest
- Open spruce-moss forest
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Sources:
Base: BDTA, 1: 250 000, MRN Québec, 2002
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Mapping: GENIVAR
File: 121-18002-00_F4_VEG_mil_terrestre_130619.mxd

Scale 1: 50,000
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UTM, zone 19, NAD83

Figure 4b

November 2013

GENIVAR

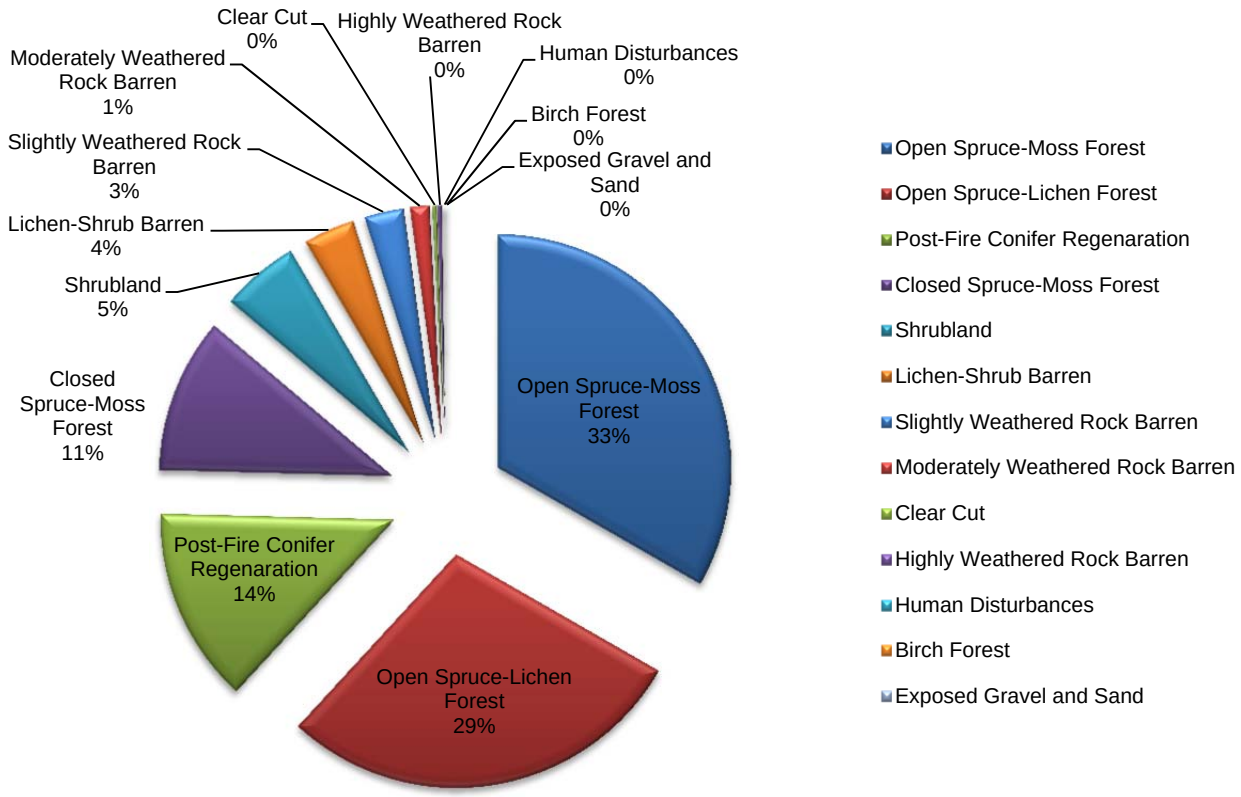


Figure 5: Relative Frequency of Upland Vegetation Types Found in the Study Area

Five sampling plots are found in open spruce-moss forests (Plots PN2, CL1, LA1, LA2, PC1 and PC2; Figures 4a and 4b; Appendix A). The forest is open with usually less than 20 % of ground cover occupied by trees. The main arborescent species are black spruce, white spruce and tamarack. The tall shrub stratum is sparse and composed almost entirely of glandular birch. Common Labrador tea, black crowberry, alpine bilberry, mountain cranberry (*V. vitis-idaea*) and glandular birch are the most abundant species found in the well-represented low shrub stratum. The herbaceous layer is almost non-existent, and bunchberry, northern interrupted club-moss (*Spinulum canadense*) as well as wavy hairgrass (*Deschampsia flexuosa*) are the most common species encountered. The moss stratum is very well developed and consists primarily of lichen. Star reindeer lichen (*Cladina stellaris*), grey reindeer lichen (*Cladina rangiferina*), green reindeer lichen (*Cladina mitis*) and snow lichen (*Stereocaulon sp*.) are prominent and abundant. Red-stemmed feather-moss is also present and found in depressions and sheltered areas at the base of trees.

4.2.1.3 Closed Spruce-Moss Forest

Closed spruce-moss forests are abundant in the Study Area (Figures 4a and 4b). They are commonly found on mid-slopes with moderately drained soil sometimes enriched by minerals that seep through the substrate (Appendix F, Photo 3). The soil is usually made up of coarse sandy loams of glacial origins or formed by the alteration of the underlying bedrock. These soils are often intermixed or overlaid by

a thin layer of organic material. These stands occupy 1,392 ha, or 11 % of the upland area (Table 4; Figure 5).

Two sampling plots are found in closed spruce-moss forests (Plots PB1 and PN1; Figures 4a and 4b; Appendix A). The forest is closed with usually more than 50 % of the ground cover occupied by trees. The main arborescent species are black spruce and white spruce. The tall shrub stratum is sparse, and made up of glandular birch and American green alder (*Alnus viridis* subsp. *crispa*). Common Labrador tea, black crowberry, dwarf bilberry (*V. caespitosum*) and mountain cranberry are the most abundant species found in the well-represented low shrub stratum. The herbaceous layer covers approximately 20 % of the ground and is mostly represented by bunchberry. There is greater diversity in the herb stratum located in mineralized sites (Plot PN1). The moss stratum is very well developed and is made up of red-stemmed feather-moss, glittering wood-moss, ostrich-plume feather-moss (*Ptilium crista-castrensis*), and to a lesser extent star and gray reindeer lichen.

4.2.1.4 Birch Forest

Birch forests are considered uncommon in the Study Area, occupying a very small area and are generally found on hillsides (Appendix F, Photo 4). In the southern portion of the Study Area, there is one stand found on a westerly exposed and moderately steep slope (Figures 4a and 4b). The soil is a rich deep sandy loam and is moderately drained. The colonization by shade-intolerant species like heart-leaved birch (*B. cordifolia*) occurs, in general, after a disruption to the environment, such as a fire. Birch forests occupy 1.84 ha, which is less than 1 % of the total upland area (Table 4; Figure 5).

One sampling plot is found in a birch forest (Plot BE1; Figures 4a and 4b; Appendix A). The canopy is relatively dense and trees found in the stand are heart-leaved birch with white spruce. The tall shrub stratum cover is sparse and mostly made up of American green alder and dwarf white birch (*B. minor*). Early lowbush blueberry (*V. angustifolium*) and dwarf bilberry are the most abundant species found in the well-developed low shrub stratum. The herb cover is moderate and includes bunchberry, large-leaved goldenrod (*Solidago macrophylla*) and stiff clubmoss (*Spinulum annotinum*). Mosses occur in small well-distributed patches, and the two most abundant species are red-stemmed feather-moss and ostrich-plume feather-moss.

4.2.2 Non-Forested Uplands

4.2.2.1 Post-Fire Conifer Regeneration

Post-fire conifer regeneration covers a large area in the southern part of the Study Area (Figures 4a and 4b). This regeneration is the consequence of forest fires that occurred approximately thirty years ago. Two major regeneration zones are found in the Study Area, and smaller zones are also present. These sites are found on well-drained glacial deposits with soil of a sandy-loam texture (Appendix F, Photo 5). This vegetation type occupies 1,758 ha and represents 14 % of the total upland area (Table 4; Figure 5).

One sampling plot is located in open spruce-moss forest (Plot BR1; Figures 4a and 4b; Appendix A). This vegetation type is slowly recovering from forest fires; woody debris is present and the arborescent stratum is non-existent. Eventually, this vegetation type will evolve towards open spruce-lichen forests. Conifers are starting to grow and occupy about 10 % of the low shrub stratum, the main species being black spruce, accompanied by white spruce and tamarack. The low shrub stratum is made up of a fair amount of glandular birch, common Labrador tea, black crowberry, alpine bilberry and mountain cranberry. The herbaceous layer is almost non-existent, bunchberry and northern interrupted club-moss being the most common species encountered. The moss stratum is well developed and is primarily made up of lichen. Grey reindeer and green reindeer lichen are abundant. Red-stemmed feather-moss is also present and found in depressions and sheltered areas at the foot of shrubs.

4.2.2.2 Shrublands

Shrublands are transitional plant communities between forested stands at lower elevations and alpine habitats found on hilltops (Figures 4a and 4b). Some shrubland may also be associated with poorly regenerated post-fire forests. Shrublands colonize slopes on moderately and well-drained sandy-loam textured soil and are more abundant in the Iron Arm area as well as in the southern part of the Study Area (Appendix F, Photos 6 and 7). Shrublands occupy 5 % of uplands, for a total of 699 ha (Table 4; Figure 5).

There are three sampling plots located in shrublands (Plots AU1; PT1 and LA3; Figures 4a and 4b; Appendix A). Trees are almost absent, scarce white or black spruce punctuates the relative uniformity of the landscape of this vegetation type. The tall shrub stratum cover is dense and mostly made up of American green alder and glandular birch. Common Labrador tea, skunk currant (*Ribes glandulosum*), early lowbush blueberry and mountain cranberry are the most common species found in the moderately present low shrub stratum. The herb cover is moderate and comprises bunchberry, large-leaved and stiff clubmoss. Mosses are present and occur in small well distributed patches, the most abundant species is red-stemmed feather-moss. Dead leaves and exposed mineral soil are also present in the understory of the tall shrubs. The transitional nature of these plant communities means that both plants of forested stands and alpine environments can be found in this vegetation type.

4.2.2.3 Lichen-Shrub Barrens

Lichen-shrub barrens are scattered, although more frequent in the southern part of the Study Area (Figures 4a and 4b). These barrens colonize well-drained sites and are mostly found on thin coarse sandy loam (Appendix F, Photo 8). This vegetation type is usually observed on small slopes or flat surfaces that overlay rubble. Some patches of lichen-shrub barren originate from poorly regenerated post-fire areas. Lichen-shrub barrens occupy 461 ha, or 4 % of the upland area (Table 4; Figure 5).

The vegetation is very similar to what is found in the open spruce-lichen forests. The main differences are an almost non-existent arborescent and a reduced high and low shrub stratum. The herbaceous layer is also almost non-existent, and bunchberry, northern interrupted club-moss and wavy hairgrass are the most

common species encountered. The moss stratum is very well developed and is primarily composed of lichen. Star reindeer lichen, grey reindeer lichen, green reindeer lichen and snow lichen are widely distributed and abundant.

4.2.2.4 Slightly Weathered Rock Barrens

Slightly weathered rock barrens are found in the central part of the Study Area and are intermixed with lichen-shrub barrens, upland forest and wetlands (Figures 4a and 4b). They are found on flat terrain and originate from bedrock frost weathering (Appendix F, Photos 9 and 10). The metamorphic rocks in the area have been deformed so that layers originally horizontal now appear vertical. The infiltration of water between the layers and the action of frost causes bedrock to fracture into angular blocks of different sizes. Drainage is complex, and some areas are well-drained while others show an accumulation of water between the boulders. This vegetation type occupies 353 ha, or 3 % of the upland area (Table 4; Figure 5).

Two sampling plots are located in slightly weathered rock barrens (Plots DA1 and DA2; Figures 4a and 4b; Appendix A). The dynamic nature of these plant communities impedes the colonization and growth of vegetation. Most plant species occur between the boulders in areas adjacent to forested cover and wetlands. The central part of this vegetation type supports, in general, crustose lichen which covers most of the boulders. Common Labrador tea, black crowberry and alpine bilberry are scattered and not very dense. The moss stratum is more developed and consists primarily of lichen. Star reindeer lichen, grey reindeer lichen and snow lichen are relatively abundant. Bristly fringe-moss (*Racomitrium heterostichum*) is also present and found in depressions and sheltered areas among the boulders. Depending on the nature of the underlying bedrock, plant diversity can increase, such as in Plot DA1 (Appendix A).

4.2.2.5 Moderately Weathered Rock Barren

Moderately weathered rock barrens are not common in the Study Area and are concentrated around Iron Arm, and to a lesser extend in the southern portion of the Study Area (Figures 4a and 4b). These barrens always occupy exposed summits or the top portion of hillsides (Appendix F, Photos 11 and 12). This habitat is created by the weathering of the bedrock by rain, wind and frost. The substrate is generally made up of fractured bedrock intermixed with boulders and sandy-loam gelisols. Drainage is moderate to fast on steep slopes. The floristic composition is a mixture of sup-alpine and fragments of alpine tundra vegetation. This vegetation type occupies 172 ha, or 1 % of the upland area (Table 4; Figure 5).

Six sampling plots are found in moderately weathered rock barrens (Plots EB1, TA1, AL3, AL7, AL8 and PL1; Figures 4a and 4b; Appendix A). The dynamic nature of these habitats and the climatic extremes found on the hilltops impedes the colonization and growth of vegetation. Most plant species are prostrate and occur in sheltered areas behind boulders or in wind-protected zones. Tall shrubs are almost non-existent. The low shrub layer is well developed and made up of black crowberry, alpine bilberry, mountain cranberry and alpine bearberry (*Arctous alpina*). The herbaceous stratum is scarce and comprises isolated individual of northern bentgrass (*Agrostis mertensii*), Bigelow's sedge (*Carex bigelowii* subsp. *bigelowii*), Greenland stitchwort (*Minuartia groenlandica*) and on calcareous substrates glacier

sedge (*C. glacialis*). The moss stratum is more developed and consists primarily of lichen. Star reindeer lichen, grey reindeer lichen and snow lichen, crinkled snow lichen (*Flavocetraria nivalis*) and green witch's hair lichen (*Alectoria ochroleuca*) are relatively abundant.

4.2.2.6 Clear Cut

Small linear zones totaling 39 ha or less than 1 % of the total uplands are clear cut (Table 4; Figure 5). These zones were cleared along the existing railroad and for the purpose of road construction in the southern part of the Study Area (Appendix F, Photo 13).

4.2.2.7 Highly Weathered Rock Barren

Highly weathered rock barrens are not frequent in the Study Area and are mostly found around Joyce Lake (Figures 4a and 4b). These barrens always occupy exposed summits (Appendix F, Photo 14). This habitat is created in the same way as moderately weathered rock barrens, the difference being that the substrates were further degraded by weathering agents and form a sandy-loam soil. The drainage is moderate and frost wedge polygons are present in this vegetation type. This vegetation type occupies 36 ha, or less than 1 % of the upland area (Table 4; Figure 5).

Six sampling plots are located in highly weathered rock barrens (Plots AL1, AL2, AL4, AL6, DE1 and DE2; Figures 4a and 4b; Appendix A). The floristic composition is very similar to that of moderately weathered rock barrens. Plots DE1 and DE2 located in the southern part of the Study Area present a different composition, with a finer ferruginous substrate, and are more affected by thawing (Appendix F, Photos 15 and 16). The vegetation is also different, with some species being calciphile and others chionophile (associated with snow beds).

4.2.2.8 Human Disturbances

Human disturbances are found adjacent to the access road that leads to seasonal dwellings found around the southern shore of Iron Arm (Appendix F, Photo 17). A quick overview of vegetation found in the vicinity was conducted in order to establish the presence of introduced flora in the region. A list of species was collected (Zone IA; Appendix A). Introduced species were relatively abundant and well established on roadsides and around dwellings. Little or no signs of transgression of introduced alien species were found in untouched natural habitats. In the southern part of the Study Area, mining activities disturbed a 30-ha area (Figures 4a and 4b). Access roads and a railway are also found in this area.

Based on the Labrador General Status ranking, 18 vascular plants found within the Study Area are alien/exotic (Appendix B). Out of these 18 species, only 16 were found only in Zone IA, while two were also found in other vegetation types (*Poa palustris* and *Stellaria graminea*) (Appendix A). In Zone IA, a total of 67 vascular plants species were identified and alien/exotic account for 27 %. Based on the phytogeography, two additional plant species may be considered as introduced in Labrador: Creeping bentgrass (*Agrostis stolonifera*) and Thymeleaf speedwell

(*Veronica serpyllifolia subsp. serpyllifolia*), both of these being found only in Zone IA (Appendix B).

4.2.2.9 Exposed Gravel and Sand

Exposed gravel and sand are found around the western shores of Joyce Lake (Figures 4a and 4b). They occupy a very small portion of the Study Area (Table 4; Figure 5). This habitat is characterised by open sand and gravel, and is transitional between the aquatic and terrestrial habitats surrounding the lake (Appendix F, Photo 18).

One sampling plot is located on exposed gravel and sand (Plot LC1B; Figures 4a and 4b; Appendix A). The vegetation is sparse and the most common species encountered are American green alder, tea-leaved willow, alpine bilberry, black crowberry, rough bentgrass (*A. scabra*), rough cinquefoil (*Potentilla norvegica*) and Labrador violet (*Viola labradorica*). Norwegian cudweed (*Omalotheca norvegica*) a low-priority candidate species, as established by COSEPAC (2012), was found on the gravely shore of Joyce Lake (Figures 4a and 4b).

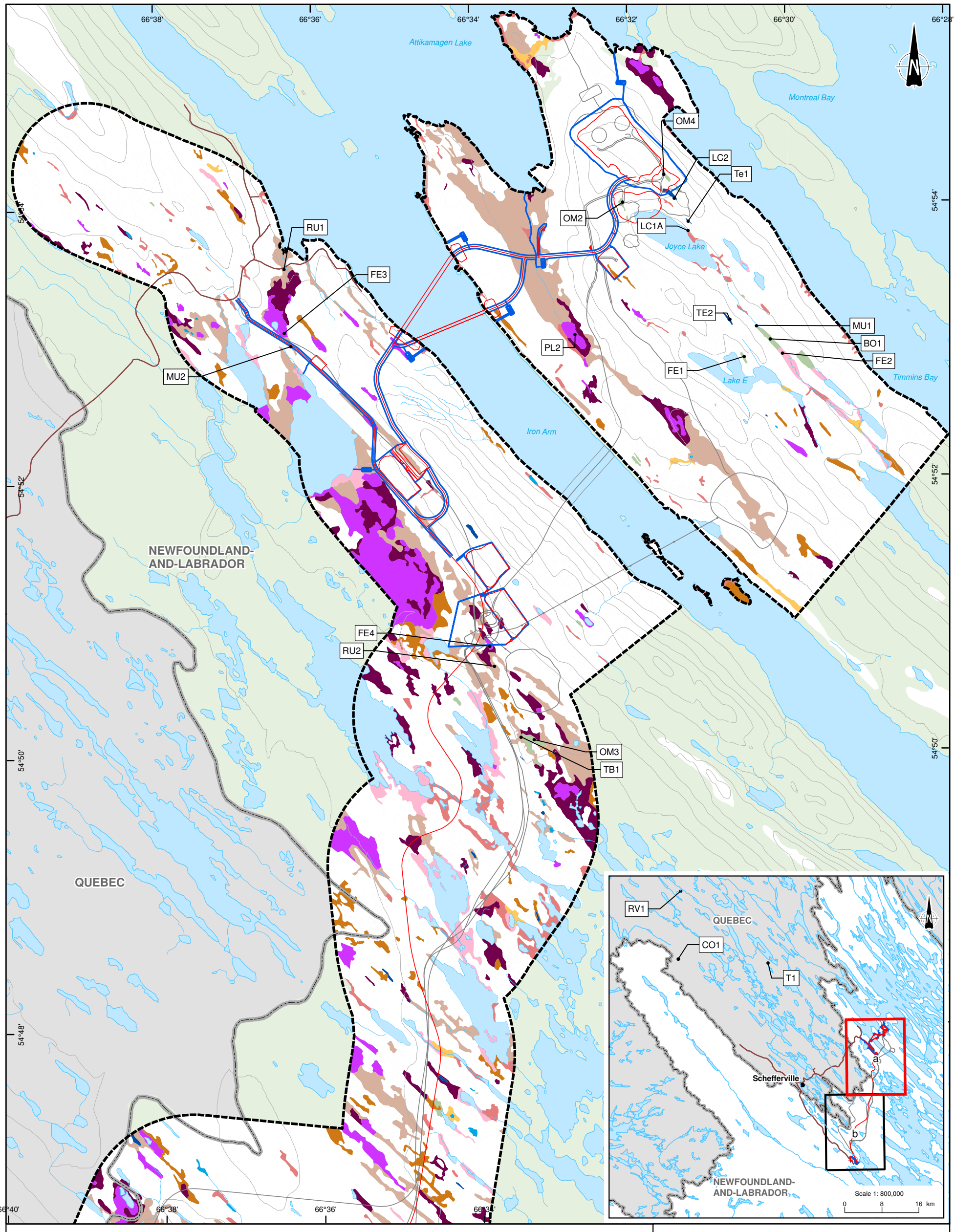
4.3 Wetlands

Wetlands occupy 2,298 ha, or 15 % of the total Study Area (Table 5). Ten types of wetland vegetation types were identified by photo-interpretation and information regarding the floristic associations and physical characteristics present in these wetlands were collected from 24 survey plots.

Wetlands in the Study Area occupy flat, poorly-drained depressions on impermeable substrates and are closely associated with watercourses (Figure 6). Wetlands occur either in large assemblages or small and isolated areas. Peatlands are by far the most abundant wetland type, and account for 1,977 ha or 86 % of the total wetlands in the Study Area. In the Québec-Labrador peninsula, this type of habitat represents 10 to 15 % of the surface area (Allington, 1961).

Fens (forested, horizontal, northern ribbed and riparian) are the most abundant peatlands found in the Study Area. Unlike bogs, which receive water primarily from precipitation with relatively little water from surface flows and discharge only through groundwater, fens receive both surface and subsurface water and have both surface and subsurface outflows. As a result fens tend to reflect the chemistry of the underlying bedrock and are mostly influenced by the leaching of dissolved minerals. As a result these areas can be quite alkaline when fed from limestone sources similar to that which occur throughout portions of the Study Area and which are reflected in the diversity of vegetation present (i.e., occurrence of calcicolous plants). Swamps are the second most abundant wetland type and area usually found at the edge of lakes and rivers. Bogs occupy a lesser portion of the Study Area and are generally found in depressions fed by rainwater. Temporary ponds and ponds are small in size, isolated and scattered throughout the Study Area.

The Joyce Lake peninsula is mostly made up of upland ecosystems. In the northeastern portion of the peninsula, long linear fen-bog complexes and temporary ponds bordered by hills are found (Figures 6a and 6b). Forested, horizontal and northern ribbed fens occupy lowlands adjacent to Iron Arm.



Project Components

- Study area
- Preliminary project layout
- Revised project layout (May 2013)
- Drainage infrastructure (May 2013)

Existing Infrastructure

- Main road
- Railway

Territory

- Provincial boundary

Wetlands

- Sampling plot
- Pond
- Temporary pond
- Forested swamp
- Shrub swamp
- Forested fen
- Riparian fen
- Northern ribbed fen
- Horizontal fen
- Forested bog
- Flat bog

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Joyce Lake Direct Shipping Iron Ore Project

- Vegetation Baseline Study -

Type of Wetland Habitats Found in the Study Area and Sampling Plot Locations

Sources:
Base: BDTA, 1: 250 000, MRN Québec, 2002
CanVec, 1: 50 000, RNCan, 2007

Mapping: GENIVAR
File: 121-18002-00_F6_VEG_mil_humide_130619.mxd

Scale 1: 50,000
0 500 1 000 1 500 m
UTM, zone 19, NAD83

Figure 6a

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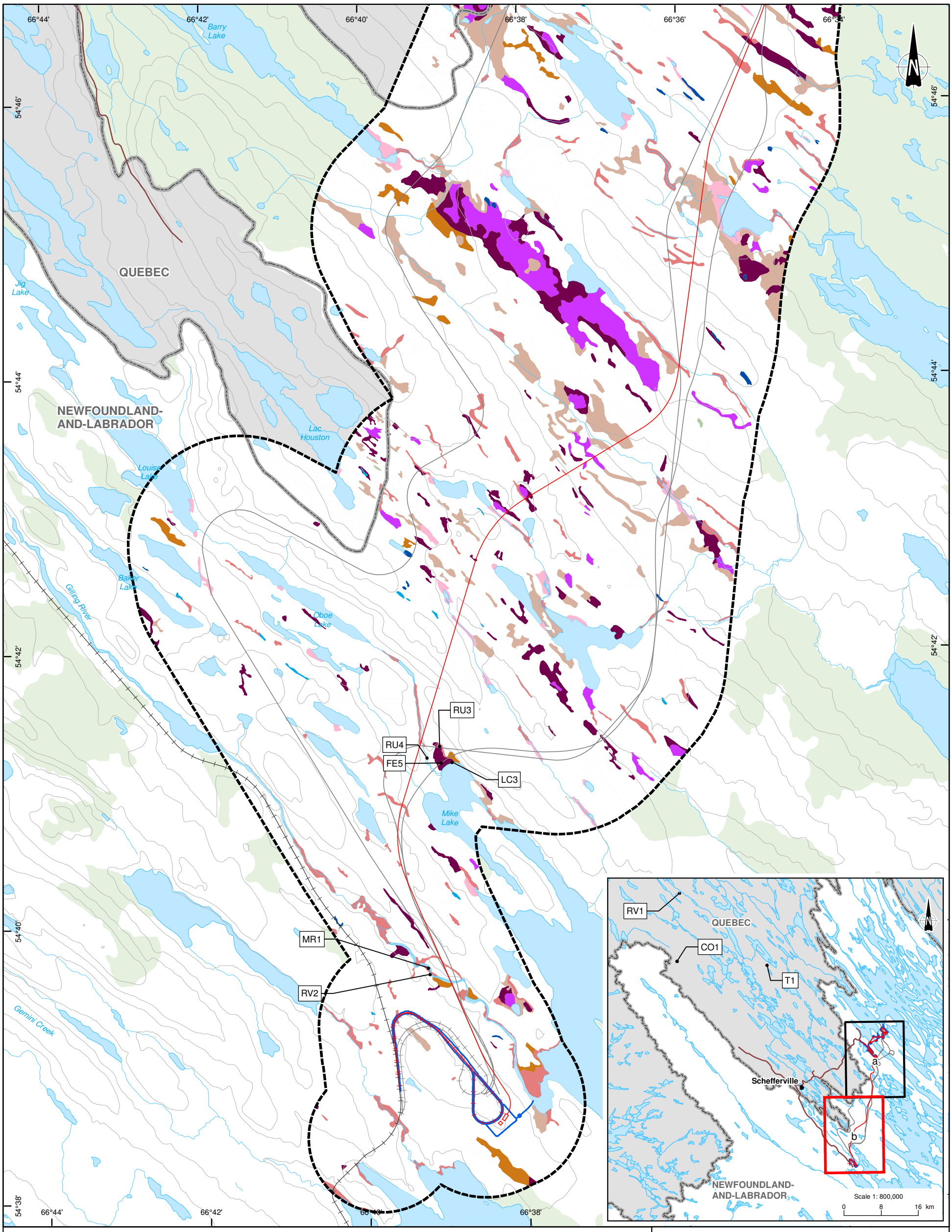

Project Components

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CENTURY IRON MINES CORP.

Joyce Lake Direct Shipping Iron Ore Project

- Vegetation Baseline Study -

Type of Wetland Habitats Found in the Study Area and Sampling Plot Locations

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Mapping: GENIVAR
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Scale 1: 50,000
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UTM, zone 19, NAD83

Figure 6b

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On the south side of Iron Arm, the topography is characterized by a high hill with a relatively large area of flat terrain on its southwestern side. Directly at the foothill lies a large mosaic of northern ribbed, horizontal, forested fens and shallow lakes. An identical wetland configuration is found farther south.

The area to the northwest of Petitsikapau Lake is made up of dispersed medium and small-sized riparian fens, shrub swamps, forested fens and forested bogs.

The valley in the southern part of the Study Area is made up of a few small-sized rich horizontal fens bordering lakes. Riparian shrub swamps, seepage cliffs and silty solifluction bowls (i.e., mass wasting of waterlogged sediment slowly downslope over impermeable surface material) are found on highly weathered fine ferruginous soil bordering the Gilling River.

Table 5: Wetland Vegetation Types Found in the Study Area and Potential of Containing Rare Plant Species

Vegetation Type	Number of Polygons	Area (ha)	Rare Plant Species Potential[1]
Forested Fen	148	781	Medium
Horizontal Fen	165	441	Medium
Northern Ribbed Fen	81	390	Medium
Shrub Swamp	210	276	Low to Medium
Forested Bog	79	189	Low
Riparian Fen	79	160	Medium
Forested Swamp	9	22	Low
Flat Bog	21	16	Low
Temporary Pond	33	14	Medium
Pond	29	9	Low
Total	**854**	**2,298**	**---**

[1] The probability of finding rare plant species in a given vegetation type was determined by specific habitat requirements of rare plants, results from the field survey and general knowledge from the field botanist.

4.3.1.1 Forested Fens

Forested fens are abundant in the Study Area and are commonly associated with or adjacent to other types of wetlands (Figure 6). They are found on poorly-drained sites enriched by minerals seeping through the substrate (Appendix F, Photo 19). The soil is usually made up of well-decomposed organic material that lies on an impermeable layer of fine sand and silt. This vegetation type occupies 781 ha, or 34 % of the total wetlands (Table 5; Figure 7).

Two sampling plots are located in forested fens (Plots MU2 and RU2; Figure 6; Appendix A). Forested fens usually have over 25 % of the ground cover occupied by trees and have high floristic diversity. The main arborescent species are black

spruce and tamarack, sometimes accompanied by white spruce on more mineralized and mesic areas. The tall shrub stratum is sparse and made up of northern bog birch (*B. pumila* var. *glandulifera*), tea-leaved willow and beautiful willow (*S. glauca* var. *cordifolia*). Common Labrador tea, Ball's willow (*S. ballii*) and hairy willow (*S. vestita*) are the most abundant species found in the well-represented low shrub stratum. The herbaceous layer covers approximately 50 % of the ground and is mostly represented by sheated sedge (*C. vaginata*), cloudberry (*Rubus chamaemorus*), woodland horsetail and numerous other species (Appendix A). The moss stratum is very well-developed and is made up of sphagnum moss, brown moss, glittering wood-moss and woolly feather-moss (*Tomentypnum nitens*).

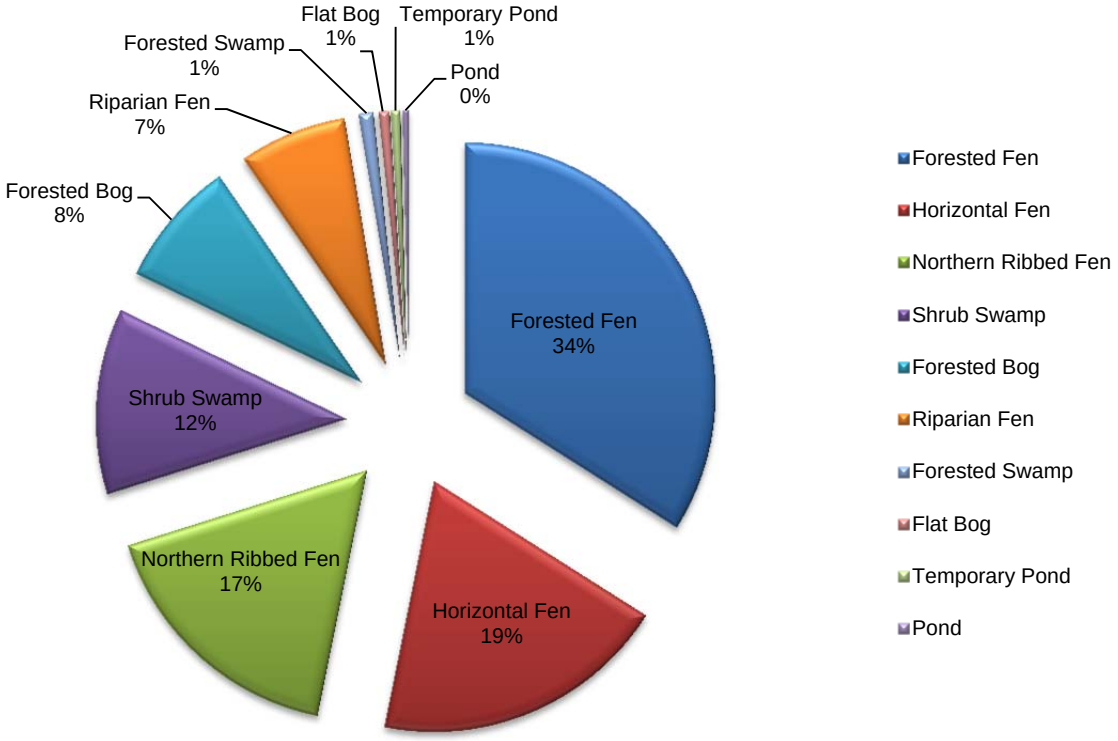


Figure 7: Relative Frequency of Wetland Vegetation Types Found in the Study Area

4.3.1.2 Horizontal Fen

Horizontal fens are fairly common in the Study Area and are isolated or bordered by northern ribbed fens (Figure 6). These fens are flat and uniform, and sedges are the predominant plant species in this vegetation type. Horizontal fens are found on poorly-drained terrain enriched with minerals seeping through the substrate (Appendix F). The soil is usually made up of a thick layer of moderately decomposed organic material. These horizontal fens occupy 441 ha, or about 19 % of the total wetlands area in the Study Area (Table 5; Figure 7).

One sampling plot is located in a horizontal fen (Plot FE5; Figure 6; Appendix A). The arborescent, tall and low shrub stratums are almost non-existent and made up of northern bog birch and occasional small tamarack. The herbaceous layer covers approximately 80 % of the ground and is mostly represented by water sedge (*C. aquatilis* var. *aquatilis*), lesser panicled sedge (*C. diandra*), northern bog sedge (*C. gynocrates*) and three-leaved false Solomon's seal (*Maianthemun trifolium*). The moss stratum is very well developed and is made up of Warnstorf's bog-moss (*S. warnstorfii*), red bog-moss, woolly feather-moss and tufted fen-moss (*Paludella squarrosa*).

4.3.1.3 Northern Ribbed Fens

Northern ribbed fens are common in the Study Area, occupy large areas in depressions and are generally associated with other type of wetlands to form a complex mosaic of habitats (Appendix F, Photos 21, 22 and 23; Figure 6). Northern ribbed fens are characterized by the presence of dissolved minerals provided by groundwater or surface water runoff. These fens have subparallel, low peat ridges (strings) which enclose elongated wet hollows or shallow ponds. The ridges and hollows are oriented perpendicular to the direction of surface flow (National Wetlands Working Group, 1997). The soil is usually made up of a very thick layer of moderately decomposed organic material. In the Study Area, these northern ribbed fens occupy 390 ha, or about 17 % of the total wetlands area (Table 5; Figure 7).

Three sampling plots are located in northern ribbed fens (Plots FE3, FE4 and PL2; Figure 6; Appendix A). The arborescent and tall shrub stratums are non-existent. The low shrub layer is present and made up of sweet gale (*Myrica gale*), shrubby cinquefoil (*Dasiphora fruticosa*), glaucous-leaved bog rosemary (*Andromeda polifolia* var. *latifolia*) and leatherleaf (*Chamaedaphne calyculata*). The herbaceous layer covers approximately 70 % of the ground surface. Species that colonize the peat ridges are meagre sedge (*C. exilis*), mud sedge (*C. limosa*) and alpine clubrush (*Trichophorum alpinum*). The wet depressions and hollows are occupied by livid sedge (*C. livida*), bog buckbean (*Menyanthes trifoliata*) and swollen beaked sedge (*C. rostrata*). The moss stratum, mostly found in wet hollows, is very well developed and is composed of sphagnum moss, woolly feather-moss and hooked scorpion-moss (*Scorpidium scorpioides*).

4.3.1.4 Shrub Swamps

Shrub swamps are evenly distributed throughout the Study Area. These swamps occupy the edges of streams and lakes, and are also found adjacent to other wetlands (Appendix F, Photo 24; Figure 6). Likely subject to seasonal flooding, the vegetation is dominated by shrubs rather than trees. These riparian swamps are also characterized by dissolved mineral-enriched water. They differ from riparian fens by the mineral nature of the underlying substrate. These shrub swamps occupy 276 ha, or about 12 % of the total wetlands area (Table 5; Figure 7).

Two sampling plots are located in shrub swamps (Plots LC1A and MR1; Figure 6; Appendix A). The structure and composition of the vegetation in swamps located in the Study Area are heterogeneous, mostly due to the differences found in the bank substrate and the water regime of the watercourses they border. The arborescent stratum is made up of a few white spruce and tamarack that punctuate the

landscape. The tall shrub layer is dense and made up of American green alder, tea-leaved willow and Labrador willow (*S. argyrocarpa*). The low shrub layer is present but sparse and made up of sweet gale, skunk currant and alpine bilberry. The herbaceous layer covers 50 % of the ground surface. Water sedge, bluejoint (*Calamagrostis canadensis* var. *canadensis*) and rough bentgrass are the most common species found in the herbaceous layer. Depending on the richness of the plant communities, the number of species in the herb layer is variable and diversity can be quite high in some of these swamps (Plot MR1). The moss stratum, mostly found in wet hollows, is scarce and made up of sphagnum moss, woolly feather-moss and hooked scorpion-moss.

4.3.1.5 Forested Bogs

Forested bogs are scattered throughout the Study Area and are commonly associated with or adjacent to other types of wetlands (Appendix F, Photo 25; Figure 6). They are found on poorly-drained stations. The soil is usually made up of poorly-decomposed organic material overlying an impermeable layer of fine sand and silt. They differ from forested fens by the lack of dissolved minerals seeping through the substrate. Forested bogs occupy 189 ha, or about 8 % the total wetlands area (Table 5; Figure 7).

Two sampling plots are located in forested bogs (Plots MU1 and TB1; Figure 6; Appendix A). Forested bogs usually have over 25 % of the ground cover occupied by trees and have medium floristic diversity. The main arborescent and tall shrub species are black spruce and tamarack. Common Labrador tea, alpine bilberry, leatherleaf and black crowberry are the most abundant species found in the well-represented low shrub stratum. The herbaceous layer covers approximately 30 % of the ground and is mostly represented by boreal bog sedge (*C. magellanica* subsp. *irrigua*), cloudberry, three-leaved false Solomon's seal and silvery sedge (*C. canescens* subsp. *canescens*). The moss stratum is very well developed and is made up of fine bog-moss, red bog-moss, rusty bog-moss (*S. fuscum*) and red-stemmed feather-moss on higher ground.

4.3.1.6 Riparian Fens

Riparian fens are well dispersed in the Study Area and are almost entirely associated with or adjacent to watercourses (Appendix F, Photos 26 and 27; Figure 6). They are found on poorly-drained stations enriched with minerals provided by bordering watercourses. The soil is usually made up of well-decomposed organic material that lies on an impermeable layer of fine sand and silt. These riparian fens occupy 160 ha, around 7 % the area occupied by wetlands (Table 5; Figure 7).

Five sampling plots are located in riparian fens (Plots FE2, RU1, RU3, RV2 and LC3; Figure 6; Appendix A). This vegetation type is transitional between aquatic and upland habitats and has high floristic diversity. The arborescent stratum is sparse but can be locally abundant. The main arborescent species are white spruce and tamarack. The tall shrub stratum is sparse and made up of northern bog birch and tea-leaved willow. Hairy willow, sweet gale, alpine bilberry and shrubby cinquefoil are the most abundant species found in the well-represented low shrub stratum. The herbaceous layer covers approximately 50 % of the ground and is mostly

represented by sheated sedge, water sedge, purple marshlocks (*Comarum palustre*) and numerous other species. The moss stratum is very well-developed and is composed of Warnstof's bog-moss, fine bog-moss, red bog-moss and woolly feather-moss.

4.3.1.7 Forested Swamp

Forested swamps are uncommon in the Study Area, occupying the edge of streams, lakes and wetlands (Appendix F, Photo 28; Figure 6). Likely subject to seasonal flooding, the vegetation is dominated by trees and shrubs. These forested swamps are also characterized by water enriched with dissolved minerals. They differ from forested fens by their proximity to a watercourse and the mineral nature of the underlying substrate. These forested swamps occupy 22 ha, or about 1 % of the total wetlands area (Table 5; Figure 7).

One sampling plot is located in a forested swamp (Plot RU4; Figure 6; Appendix A). The arborescent stratum is made up of a fairly high density of white spruce and tamarack which can reach considerable diameters and heights. The tall shrub layer is dense and made up of American green alder and tea-leaved willow. The low shrub layer is present but sparse and composed of sweet gale, skunk currant and Ball's willow. The herbaceous layer covers 70 % of the ground surface. Purplestem aster (*Symphyotrichum puniceum* var. *puniceum*), common cowparsnip (*Heracleum maximum*), Canadian burnet (*Sanguisorba canadensis*), dwarf red blackberry (*R. pubescens*) and red currant (*R. triste*) are the most common species found in the herbaceous layer. Due to seasonal flooding, the moss stratum is scarce and made up of glittering wood-moss and red-stemmed feather-moss.

4.3.1.8 Flat Bogs

Flat bogs are uncommon and scattered throughout the Study Area (Appendix F, Photos 29 and 30; Figure 6). They receive water exclusively from precipitation (National Wetlands Working Group, 1997). Since precipitation does not contain dissolved minerals and is mildly acidic, and that the mineral soil is unavailable to plants due to peat thickness, bogs develop into very acidic and poor habitats. This category of peatland is dominated by sphagnum moss and ericaceous shrubs. Stunted black spruces and tamaracks are often present. They occupy 16 ha, which represents 1 % of the total wetlands surface (Table 5; Figure 7).

Five sampling plots are located in bogs (Plots OM2, OM3, OM4, BO1 and FE1; Figure 6; Appendix A). The substrate is made up of organic matter more than 1 m thick and the water table is at or slightly below the bog surface. Plant diversity is quite low in the plots surveyed. The arborescent stratum is absent while the shrub layer is mainly made up of ericaceous species such as leatherleaf, bog laurel (*Kalmia polifolia*), glaucous-leaved bog rosemary, common Labrador tea and small cranberry (*V. oxycoccos*). The herbaceous stratum is scarce and the main species found are loose-flowered alpine sedge (*C. rariflora* var. *rariflora*), three-leaved false Solomon's seal and mud sedge. Sphagnum mosses, especially rusty bog-moss, red bog-moss, Linberg's bog-moss (*S. lindbergii*) and golden bog-moss (*S. pulchrum*) form most of the muscinal layer, which covers a large proportion of the ground.

4.3.1.9 Temporary Ponds

Temporary ponds are uncommon within the Study Area, occupying depressions between higher terrain (Appendix F, Photo 31; Figure 6). The substrate is made up of compacted coarse to fine sand. Subject to periodic drought and flooding, these ponds support a peculiar flora. These temporary ponds occupy 14 ha, or about 1 % of the total wetlands area (Table 5, Figure 7).

Three sampling plots are located in temporary ponds (Plots LC2, TE1 and TE2; Figure 6; Appendix A). In temporary ponds, the aquatic vegetation tends to be replaced by helophilous species, which support periodic flooding and require a water-saturated substrate but not standing water. The arborescent stratum is absent but the margins are colonized by a mixture of white spruce, black spruce and tamarack. The tall and low shrub layer is very dense and borders the ponds. The most common species found in these ponds are tea-leaved willow, common Labrador tea and alpine bilberry. The herbaceous layer is scarce and made up of thread rush (*Juncus filiformis*), rough bentgrass and Labrador violet. The moss cover is abundant and almost exclusively made up of common haircap (*Polytrichum commune*).

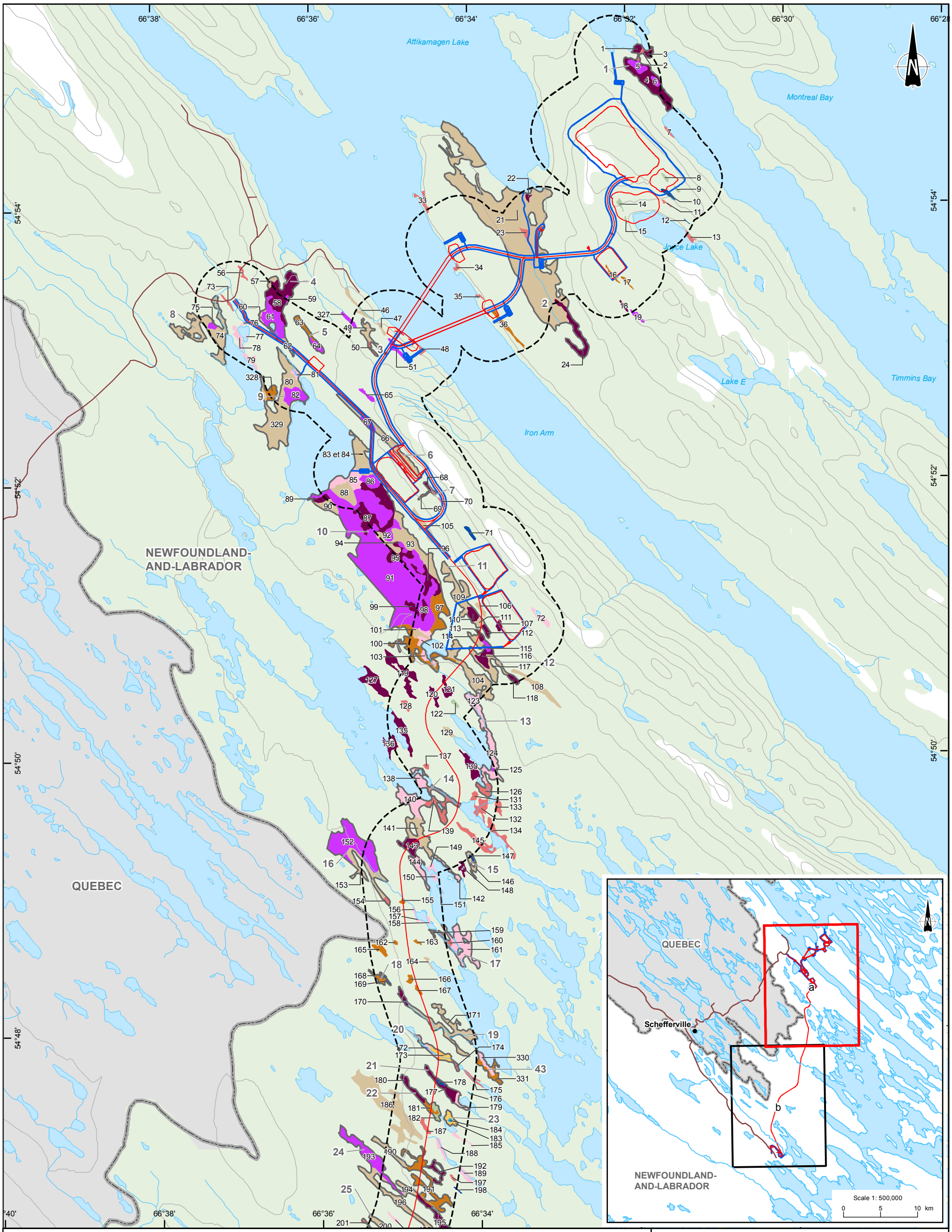
4.3.1.10 Ponds

Approximately 30 ponds or shallow waters were identified in the Study Area (Appendix F, Photo 2; Figure 6). These ponds occupy 9 ha, or less than 1 % of the total wetlands area (Table 5; Figure 7). These ponds have permanent standing water, but contrary to lakes, their water depth is less than 2 m in mid-summer (National Wetlands Working Group, 1997). In the Study Area, ponds are often found at the edge of bogs and fens or within their limits. Their flora is usually made up of hygrophilous plants similar to those found in the most humid portions of peatlands.

4.3.2 Wetlands Ecological Functions

Due to several changes in the project layout since the 2012 field campaign was conducted, the Vegetation Baseline Study Area includes all preliminary project layouts as well as the revised project layout. For this reason, the Study Area covers a much larger area than what might be affected by the Project. To conduct the wetland ecological function assessment, a smaller zone was delineated in order to put emphasis on wetlands most likely to be impacted by the Project. This zone surrounds the revised project layout (500 m buffer). The wetland ecological function assessment zone includes a total of 312 wetland polygons, which cover 1,325 ha (Figure 8). Table 6 provides a summary of the number of wetlands and wetland area contributing to each the nine selected functions. More details are presented in Appendix G.

Because functions were assigned at the level of wetland polygons, they do not necessarily reflect the range of conditions that are represented therein (i.e., wetland complexes may encompass multiple forms and these may differ in their functional characteristics). As such, estimated contributing areas are likely to be an overrepresentation where functions have been assigned based on the presence of



Project Components

- Revised project layout (May 2013)
- Drainage infrastructure (May 2013)

Existing Infrastructure

- Main road
- Railway

Territory

- Provincial boundary

Wetland Ecological Function

- 317 — Wetland identification number
- 42 — Wetland complex identification number
- Wetland complex
- Assessment zone

Wetlands

- Pond
- Temporary pond
- Forested swamp
- Shrub swamp
- Forested fen
- Riparian fen
- Northern ribbed fen
- Horizontal fen
- Forested bog
- Flat bog

CENTURY IRON MINES CORP.

Joyce Lake Direct Shipping Iron Ore Project

- Vegetation Baseline Study -

Wetland Ecological Function Assessment Zone

Sources:
Base: BDTA, 1: 250 000, MRN Québec, 2002
CanVec, 1: 50 000, RNCan, 2007

Mapping: GENIVAR
File: 121-18002-00_F8_VEG_fct_eco_MH_131128.mxd

Scale 1: 50,000
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UTM, zone 19, NAD83

Figure 8a

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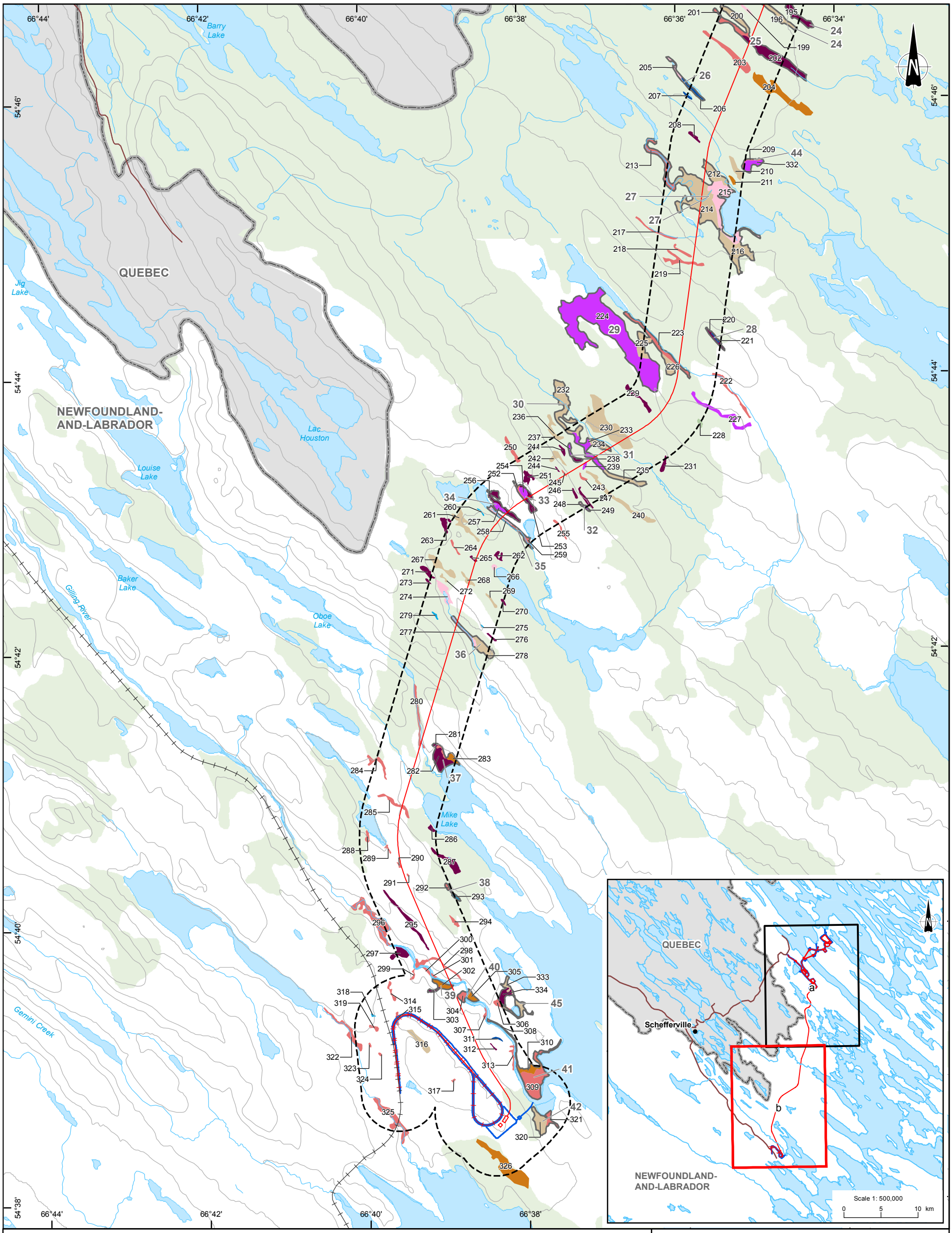

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CENTURY IRON MINES CORP.

Joyce Lake Direct Shipping Iron Ore Project

- Vegetation Baseline Study -

Wetland Ecological Function Assessment Zone

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Base: BDTA, 1: 250 000, MRN Québec, 2002
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Mapping: GENIVAR
File: 121-18002-00_F8_VEG_fct_eco_MH_131128.mxd

Scale 1: 50,000
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UTM, zone 19, NAD83

Figure 8b

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selected wetland forms or other features. For example, entire wetland polygons were identified as contributing to the function of shoreline stabilization when they bordered waterbodies although only a small proportion of their area would have comprised the shoreline itself. Due to inherent difficulties in assessing wetland functions, results are best considered qualitative in nature.

Table 6: Estimated Number of Contributing Wetland Polygons and Area for each Key Functions

Function	Number of Contributing Wetland Polygons	Contributing Wetland Area	
		(ha)	(%)
Surface Water Detention	67	377	28.5
Sediment and Other Particulate Retention	51	233	17.6
Streamflow Maintenance	101	494	37.3
Carbon Sequestration	308	1,323	99.8
Shoreline Stabilization	104	712	53.7
Provision of Fish Habitat	98	580	43.7
Fish Habitat (Stream Shading)	97	574	43.3
Provision of Waterfowl and Waterbird Habitat	160	736	55.5
Species of Conservation Concern Habitat	312	1,325	100,0

Surface Water Detention

The function of surface water detention refers to wetland capabilities to store water at the surface. Because of their low topographic position relative to uplands, wetlands store and slowly release surface water rain, snowmelt, groundwater and flood water (Sipple, 2002 In Sheldon et al., 2005). As a result, peak flows in watercourses are directly related to the area of wetlands in the watershed (National Research Council, 1995). The function of surface water detention reduces the risk of severe flooding. All peatlands contribute to a certain extent to this function since peat has high water detention capabilities and their water tables are at or near the surface. However, wetlands with open water retained at the surface during the growing season (such as ribbed form and terrene pond) and wetland types that have the capability to retard flows (such as vegetated wetlands), are generally associated to this function. Lentic and lotic marshes are generally considered to provide a high level of performance for this function (Tiner, 2003; NSE, 2011). Fens and bogs have a moderate capability to provide surface water detention and it depends on characteristics such as their slope, size of associated basin and the volume of water input.

Wetlands contributing to surface water detention were therefore selected based on the following criteria:

- fens with ribbed forms;

- swamps, fens and bogs associated with a terrene pond landscape position;
- other wetlands with surface water features.

As such, 67 of the wetland polygons, accounting for 377 ha of wetland area were considered to contribute to the function of surface water detention (Table 6).

Sediment and Other Particulate Retention

Sediment and other particulate may enter wetlands in direct runoff flow from surrounding areas, as windblown dust or in watercourses that flow through the wetlands. Sediment is removed from the surface water by settling in wetlands, thus improving the water quality to downstream aquatic habitats. This function can be accomplished if sediment actually enters the wetland. Considering the small amount of disturbed areas and exposed soils, the potential for wetlands to be subject to sediment delivery is probably low. Wetland properties influencing sediment or particulate retention include, among others, the residence time of the water, wind and wave actions and size and amount of incoming sediment, and vegetation (Sheldon et al., 2005). In general, seasonally flooded wetlands that are located on the banks of waterbodies or watercourses are considered to have high value for the retention of sediments and other particulate matter, whereas those that are only temporarily flooded are regarded as having moderate value (Tiner, 2003; NSE, 2011). As such, lotic and lentic marshes are generally considered be have high importance for contributing to this function (Tiner, 2003; NSE, 2011).

Wetlands contributing to sediment and other particulate retention were selected based on the following criteria:

- all lentic and lotic wetlands with riparian vegetation (most shrub swamps and riparain fens).

As such, 51 of the wetland polygons, accounting for 233 ha of wetland area were considered to contribute to the function of sediment and other particulate retention (Table 6).

Streamflow Maintenance

Wetlands have the potential to absorb water during high precipitation or runoff events and slowly release the water stored during drier periods. The maintenance of natural streamflow patterns is important to riparian vegetation as well as to resident aquatic species, and altering those patterns can negatively impact local biodiversity (Cowell and Stoudt, 2002 In Tiner, 2011). Wetlands most likely to accomplish this function are those in a headwater position (Tiner, 2003, 2011; NSE, 2011). In addition, lotic wetlands along stream of first order and lentic wetlands associated with outflow lakes contribute to this function (Tiner, 2011).

Wetlands contributing to streamflow maintenance were selected based on the following criteria:

- all lentic landscape position;
- headwater wetlands;

- position outflow and throughflow;
- all wetlands with the capacity to store and release water over a long period.

As such, 101 of the wetland polygons, accounting for 494 ha of wetland area, were considered to contribute to the function of streamflow maintenance (Table 6).

Carbon Sequestration

Concern over rising global temperatures and climate change has directed attention to wetlands since they are recognized as important carbon sinks (Tiner, 2011). Wetlands can act as both sinks and sources for greenhouse gases and therefore may contribute to the mitigation of global climate change if the fixation of atmospheric carbon (carbon dioxide) through photosynthesis exceeds the release of carbon to the atmosphere through the decomposition of organic material (carbon dioxide, methane), on a long term basis (greater than one year). In wetlands, organic matter accumulates in the soils as well as in vegetation. Woody plants, thereby, store carbon for longer periods than annual herbaceous plants. While the above-ground biomass of perennial herbs is released back into the aquatic ecosystem seasonally, the below-ground biomass remains in the substrate and contributes to longer-term storage. Although individual wetlands can vary widely in their annual net carbon balances, those with peat formation and woody vegetation are typically attributed this function, as these features represent long-term storage of sequestered carbon.

The rate of peat production within wetlands is directly linked to that of carbon sequestration. Bogs and fens can be important carbon sinks by storing large volumes of organic matter. Swamps may also be important for sequestering carbon, although their ability to do so depends on the hydrological regime (Tiner 2003; NSE 2011). Swamp that are saturated throughout the year tend to act as carbon sinks, while in contrast, swamps with large seasonal water level fluctuations are typically poor at sequestering carbon, since exposure of the substrate to air during drawdown periods promotes rapid decomposition of organic matter deposited in the sediment.

Wetlands contributing to carbon sequestration were selected based on the following criteria:

- all fens and bogs;
- most swamps, excepted those with a high carbon release (with a lentic landscape position).

As such, 308 of the wetland polygons, accounting for 1,323 ha of wetland area, were considered to contribute to the function of carbon sequestration (Table 6).

Shoreline Stabilization

Vegetation colonizing banks and shorelines stabilizes the soil or substrate and reduces wave action, thereby reducing shoreline erosion potential and increasing bank stability. Vegetated wetlands along all watercourses or waterbodies provide the function of shoreline stabilization at high levels (Tiner, 2011) by slowing the flow of surface water, stabilizing soil, and dispersing energy in a way that reduces the erosive forces of surface water. Vegetated wetlands along ponds have a moderate

potential to provide this function while island wetlands, surrounded by water, are not considered significant for this function (Tiner, 2011).

Wetlands contributing to carbon sequestration were selected based on the following criteria:

- wetlands with lentic or lotic landscape position, excluding those with an island landform;
- wetlands bordering the bank of a waterbody or a watercourse.

As such, 104 of the wetland polygons, accounting for 712 ha of wetland area, were considered to contribute to the function of shoreline stabilisation (Table 6). Because this estimate has been based on the total size of wetland polygons, it may be considered an overestimation of the actual contributing area. For example, the portions of wetlands that bordered water bodies are typically small fragments of their overall area.

Provision of Fish Habitat and Stream Shading

Fish use wetlands to varying degrees depending upon the species involved. The value of wetlands for providing fish habitat is generally related to their connectivity with deep-water habitats. As such, wetlands are considered to have high value for fish if they provide spawning/nursery habitat or refuge for native fish species in adjacent estuaries, lakes, rivers, or streams (NSE, 2011). For example, northern pike (*Esox lucius*) use well-flooded or ponded wetlands as spawning and nursery areas.

In addition, wetlands may intermittently support populations of certain fish species as a result of colonization during flood events, and some isolated but permanently flooded wetlands can support native populations of species such as minnows. Wetlands that are isolated and are not permanently flooded do not generally support fish populations. However, those that do not directly support fish may still be important for maintaining their habitat by improving the quality of downstream water (e.g., by providing shade to maintain water temperature in adjacent waterbodies or watercourses).

Shading by trees and tall shrubs moderates water temperatures for streams (Ghermandi et al. 2009 and Wilkerson et al. 2006 In Tiner, 2011). Since water temperature is an important factor influencing fish use of streams as well as providing food for aquatic organisms that are an important part of the diet of juvenile and some adult fishes, forested and shrub wetlands along streams have been rated as moderate for fish. The streamside wetlands also serve as vital buffers that help maintain good water quality.

Wetlands contributing to provision of fish habitat were selected based on the following criteria:

- wetlands contiguous with a permanent waterbody or watercourse lentic and lotic

As such, 98 of the wetland polygons, accounting for 580 ha of wetland area, were considered to contribute to the function of provision of fish habitat (Table 6).

Concerning stream shading, wetlands contribution to this function were selected based on the following criteria:

- wetlands containing trees and shrubs adjacent to a waterbody or a watercourse or located upstream from a fish habitat.

As such, 97 of the wetland polygons, accounting for 574 ha of wetland area, were considered to contribute to the function of stream shading (Table 6).

Because this estimate has been based on the total size of wetland polygons, it may be considered an overestimation of the actual contributing area. For example, the portions of wetlands that bordered water bodies are typically a small fragment of their overall area.

However, because only a portion of many of these wetlands were actually accessible to fish or bordering a stream, the area values presented here would be an overestimation of the actual area that directly contributed to these functions.

Provision of Waterfowl and Waterbird Habitat

Species of waterfowl and other waterbirds that were recorded in the vicinity of wetlands during the 2012 surveys include (in order of decreasing abundance): Canada Goose (*Branta canadensis*), American Black Duck (Anas rublipes), Ring-necked Duck (Aythya collaris), Lesser Scaup (*Aythya affinis*), Hooded Merganser (Lophodytes cucullatus), Surf Scoter (Melanitta perspicillata), Red-Breasted Merganser (*M. serrator*), White-Winged Scoter (*Melanitta fusca*), Mallard (Anas platyrhynchos), Common Merganser (*Mergus merganser*), Common Goldeneye (Bucephala clangula), Bufflehead (Bucephala albeola), Northern Pintail (Anas acuta), American Green-winged Teal (Anas crecca), Solitary Sandpiper (*Tringa solitaria*), Greater Yellowlegs (*T. melanoleuca*), Lesser Yellowlegs (*T. flavipes*), Least Sandpiper (*Calidris minutilla*), Short-billed Dowitcher (*Limnodromus griseus*), Spotted Sandpiper (*Actitis macularius*), Wilson's Snipe (*Gallinago delicata*) and Red-necked Phalarope (*Phalaropus lobatus*). Such species are likely to use wetland habitats for a variety of purposes, including staging, feeding, nesting, breeding, and brood rearing. Other species of waterbirds that were recorded in proximity to wetlands, such as Tern (*Sterna sp*.) and Herring Gull (*Larus argentatus*), are not likely to use wetlands to any substantive degree, being more associated with large open waterbodies such as Attikamagen and Petitsikapau Lake.

The ability of wetlands to provide habitat for waterfowl and other waterbirds varies according to their position relative to waterbodies and watercourses, the presence and character of open water, and the availability of appropriate vegetation for foraging and nesting opportunities. Wetlands designated as important for waterfowl and waterbirds are generally those used for nesting, reproduction, or feeding. The emphasis is on the wetter wetlands and those that are frequently flooded for long periods (Tiner, 2011).

Wetlands contributing to provision of waterfowl and waterbird habitat were selected based on the following criteria:

- all wetlands with a lentic and lotic landscape position;

- all wetlands with a surface water feature;
- ponds, temporary ponds.

As such, 160 of the wetland polygons, accounting for 736 ha of wetland area, were considered to contribute to the function of providing waterfowl and waterbird habitat (Table 6).

Species of Conservation Concern Habitat

Information on the presence of species at risk and other species of conservation concern were obtained with reference to environmental baseline studies being prepared for the Project, including the fish and fish habitat, avifauna, mammal and herpetofauna, and the vegetation survey. Although no mammal, fish, or herpetile species of conservation concern are likely to depend on wetland habitats within the Study Area, a single federally and provincially protected bird, the rusty blackbird was identified to have wetland associations (GENIVAR, 2013). In addition, although no federally or provincial designated plant species at risk were identified in the Study Area, a total of 30 other rare vascular plant species were found to be associated with wetland habitats (Section 4.4).

Wetlands contributing to species of conservation concern habitat were selected based on the following criteria:

- all wetland habitats.

As such, 312 of the wetland polygons, accounting for 1,325 ha of wetland area, were considered to contribute to the function of providing habitat for species of conservation concern (Table 6).

4.4 Rare Plants

In the Study Area, the upland vegetation types where rare plants, including species at risk and of conservation concern are most likely to be found are weathered rock barrens and exposed gravel and sand ecosystems. Areas where dolomite and highly carbonated rocks are found also offer greater potential for finding such species. In wetlands, rare plants are likely to be found in rich fens and temporary pond ecosystems. In the Study Area, the rich horizontal fens and the shrub marshes bordering the Gilling River and other smaller watercourses are habitats where rare plants could potentially be found.

According to the Atlantic Canada Conservation Data Centre, there are no known occurrences of plant species listed under the federal *Species at Risk Act* or the provincial *Endangered Species Act* within the Study Area. The ACCDC provided a list of two rare vascular plant species and 18 rare non-vascular species that could potentially be found within the Study Area (Table 7). The vascular species are golden ragwort (*Packera aurea*) and bog willow (*Salix pedicellaris*), two species ranked S2S4 in Labrador. Among the non-vascular plants mentioned in the list only Warnstorf's bog-moss was observed during the surveys, it was found mostly in fens and in richer portions of bogs (Appendix A).

Table 7: List of Rare Plant Species Present within the Study Area or in Vicinity (Source: ACCDC, 2012)

LB ID	Scientific Name	English Name	G Rank[1]	N Rank[2]	SRank[3]	General Status	Observation Year	Site Name	Survey Site	Accuracy (m)
Vascular Species										
742230	*Packera aurea*	Golden ragwort	G5	NNR	S2S4	Undetermined	1963	Knob Lake (NF)	Knob Lake (NF)	1000
743136	*Salix pedicellaris*	Bog willow	G5	NNR	S2S4	Sensitive	1967	Hope Lake (NF)	Hope Lake (NF)	1000
Non-Vascular Species										
741979	*Sphagnum warnstorfii*	Warnstorf's bog-moss	G5	NNR	S2		1967	Schefferville (QC)	NE end of Astray Lake; SE of Mike Lake	1000
741979	*Sphagnum warnstorfii*	Warnstorf's bog-moss	G5	NNR	S2		1967	Schefferville (QC)	NE end of Astray Lake; SE of Mike Lake	1000
741979	*Sphagnum warnstorfii*	Warnstorf's bog-moss	G5	NNR	S2		1967	Attikamagen Lake (NF)	Schefferville area; SW shore of Attikamagen Lake	1000
742024	*Abietinella abietina*	Moss	G4G5	NNR	S2		1967	24	Schefferville area, east shore of Slimy Lake	1000
741769	*Bryum pallescens*	Moss	G5	NNR	S1		1967	24	Schefferville area, east shore of Slimy Lake	1000
741770	*Bryum pseudotriquetrum*	Moss	G5	NNR	S2		1967	49	Schefferville area, northeast end of Astray Lake, southeast of Mike Lake	1000
741775	*Bryum weigelii*	Moss	G4G5	NNR	S1		1967	49	Schefferville area, northeast end of Astray Lake, southeast of Mike Lake	1000
741780	*Calliergon giganteum*	Moss	G5	NNR	S2		1967	49	Schefferville area, northeast end of Astray Lake, southeast of Mike Lake	1000
741806	*Dicranella schreberiana*	Moss	G5	NNR	S1		1967	50	Schefferville area, southwest shore of Attikamagen Lake	1000
741835	*Encalypta procera*	Moss	G4G5	NNR	S1		1967	24	Schefferville area, east shore of Slimy Lake	1000
741836	*Encalypta rhaptocarpa*	Moss	G4G5	NNR	S2		1967	24	Schefferville area, east shore of Slimy Lake	1000
741876	*Hypnum recurvatum*	Moss	G3G5	NNR	S1		1967	24	Schefferville area, east shore of Slimy Lake	1000
741875	*Hypnum vaucheri*	Moss	G3G5	N3N5	S1		1967	24	Schefferville area, east shore of Slimy Lake	1000
741896	*Myurella tenerrima*	Moss	G3G4	NNR	S1		1967	24	Schefferville area, east shore of Slimy Lake	1000
741927	*Pohlia wahlenbergii*	Moss	G5	NNR	S1		1967	49	Schefferville area, northeast end of Astray Lake, southeast of Mike Lake	1000
741929	*Polytrichum longisetum*	Slender Hairy-Cap	G5	NNR	S2		1967	50	Schefferville area, southwest shore of Attikamagen Lake	1000
742044	*Rhizomnium magnifolium*	Moss	G4G5	NNR	S2		1967	49	Schefferville area, northeast end of Astray Lake, southeast of Mike Lake	1000
742041	*Rhizomnium pseudopunctatum*	Moss	G5	NNR	S2		1967	49	Schefferville area, northeast end of Astray Lake, southeast of Mike Lake	1000
742041	*Rhizomnium pseudopunctatum*	Moss	G5	NNR	S2		1967	50	Schefferville area, southwest shore of Attikamagen Lake	1000
742004	*Tortella tortuosa*	Moss	G5	NNR	S2		1967	24	Schefferville area, east shore of Slimy Lake	1000
742006	*Tortula ruralis*	Moss	G5	NNR	S2		1967	24	Schefferville area, east shore of Slimy Lake	1000

Source: Atlantic Canada Conservation Data Center (ACCDC)

[1] Global Conservation Status Rank

[2] National Conservation Status rank

[3] Subnational (or Provincial) Conservation Status Rank

[4] There is no General Status given by DOEC to non-vascular species.

Golden ragwort is a small, 30 to 60 cm tall, perennial with yellow flowers. It is moderately calcicolous and found in damp and swampy places in woodlands, meadows, along gravel banks, and streambeds. It is considered abundant and widespread throughout eastern Canada (FNA, 2006). Its status is undetermined in Labrador (ACCDC, 2012). It occurs regionally and has been mentioned by Dutilly and Lepage 1962, Viereck 1957 and Hustich 1965. In the study area golden ragwort was found in a forested swamp adjacent to a small stream on a coarse sandy loam substrate of alluvial origin (Appendix A, Plot RU4; Figure 10), close to 25 distinct plants were observed in this vegetation type.

Bog willow is a small shrub found in sphagnum bogs, fens and black spruce treed bogs (FNA, 2010). It is considered of sensitive status in Labrador (ACCDC, 2012). It occurs regionally and has been mentioned by Dutilly and Lepage 1962, 1964 and Hustich 1965. It has also been observed during the 2012 surveys on the shores of the Swampy Bay River (Plot RV1; Figure 6) and on peat substrate in a northern ribbed fen (Plot TO1; Figure 6). Waterway et al. (1984) consider this shrub to be common in the Schefferville area. In the Study Area, it was found on peat in a riparian fen (Plot FE2; Figure 10), in forested fen (Plots MU2 and RU2; Figure 10), in a northern ribbed fen (Plot FE4; Figure 10), in a flat bog (Plot OM3; Figure 10) and in a humid depression of a slightly weathered rock barren (Plot DA1; Figure 9).

In addition, the *Centre de données sur le patrimoine naturel du Québec* (CDPNQ) provided a list of 10 vascular plant species found in the Schefferville region that are likely to be designated threatened or vulnerable (Table 8). None of these species are SSAC candidate species (SSAC, no date). However, Norwegian cudweed a Low Priority COSEWIC candidate species (COSEWIC, 2012) was found in the Study Area.

During the field campaign, Norwegian cudweed, was found on the gravelly shore of Joyce Lake (Figure 10). Only one basal rosette was found and the viability of this specimen is very low due to the erosive area where it was found. Similar habitats suitable for this species were not found in the Study Area. The Norwegian cudweed is an herbaceous plant of the aster family. This species is 15 to 40-cm high, tomentose and whitened with a compact inflorescence (Appendix F, Photos 33 and 34). Humid prairies, snow patches and shores of subalpine streams are the preferred habitats for this species. In the province of Québec, it is found in only 15 known localities (Dignard et al., 2009). In Labrador, Norwegian cudweed is ranked S2S3 and its general status is “Sensitive”. In the region, Norwegian cudweed was found in the Sunny and Geren Mountain areas by Viereck (1957) and Harper (1964).

Two species ranked by the CDPNQ are found in the region and are highly likely to be found in the Study Area (Table 8). Incised large-leaved avens (*Geum macrophyllum* var. *perincisum*) is an herbaceous plant that was found by Hustich and Kallio (Hustich, 1965) near Knob Lake and Burnt Creek to the northwest of Schefferville. The plant was also collected near the Town of Schefferville in 1999 by Blondeau (2000). Chamisso’s arnica (*Arnica chamissonis*) was found by Blondeau in 1999 to the northeast of Schefferville on a vacant lot where houses were demolished. This herbaceous species is isolated from the main population in eastern North America and was also found in a similar location near the abandoned mining town of Gagnon (Blondeau and Dignard, 2003).

Among the vascular plant species identified during the field work conducted during the summer of 2012 in the Study Area, four species are ranked S1S3, five are ranked S2S3 and 11 are ranked S2S4 (Table 9). For many of these, the Labrador General Status is undetermined, which means some of these may end up as "Secure" in Labrador, especially those ranked S2S4. Glacial sedge, Norwegian cudweed, lapland buttercup (*Coptidium lapponicum*), slender stinging nettle (*Urtica dioca* subsp. *gracilis*) and bog willow have a "Sensitive" status, while northern green orchid (*Platanthera aquilonis*) has a "May be at Risk" status. Glacial sedge is listed as a threatened species under the Québec *Loi sur les espèces menacées ou vulnérable*. Five vascular species are ranked S3 and all of them have a "Sensitive" status. Kotzebue's grass of Parnassus (*Parnassia kotzebuei*) is ranked S3S4 and has a "Sensitive" status. Twelve (12) species found in the Study Area are ranked SNR in Labrador and the Siberian water-milfoil has a "May be at Risk" status while the rest is "Undetermined". Finally, two species found in the Study Area are ranked SNA. Two species are considered by Hustich (1971) to be introduced species in Labrador: creeping bentgrass (*Agrostis stolonifera*) and toad rush (*Juncus bufonius*), these species were observed near the camps at Iron Arm (Plot IA, Figure 9) and are both ranked S2S4 in Labrador. Among the 40 rare or potentially rare vascular plant species found in the Study Area, northern water-starwort (*Callitriche hermaphroditica*) would be a new record for Labrador and two species have not been seen at a regional level: indianpipe (*Monotropa uniflora*) and narrow-leaved small pondweed (*Potamogeton pusillus* subsp. *tenuissimus*). Figures 9 and 10 show where rare plants were found in the Study Area during the summer of 2012.The following sections provide a general description of the rare vascular plant species found in the Study Area, especially those ranked S1S3 as well as those determined as "May be at Risk".

Richardson's Pondweed

Richardson's pondweed (*Potamogeton richardsonii*) is an aquatic plant that grows in alkaline waters of lakes, streams and rivers (FNA, 2005). In Labrador, it was ranked S1S3 with an undetermined status by the DOEC. Regionally, it is mentioned by Dutilly and Lepage (1962) and was found during the field surveys in the Swampy Bay River area (Plot RV1; Figure 6). It was also found by Hustich (1965) in the Schefferville and Grand Falls areas. In the Study Area, Richardson's pondweed was found as relatively extensive populations in Mike Lake area (Plot LC3; Figure 10) and in the Gilling River area (Plot RV2; Figure 10).

Narrow-Leaved Small Pondweed

Narrow-leaved small pondweed (*Potamogeton pusillus* subsp. *tenuissimus*) is an aquatic plant that grows in shallow waters of lakes, streams (FNA, 2005). In Labrador, it was ranked S1S3 with an undetermined status by the DOEC. It has never been mentioned regionally. In the Study Area, narrow-leaved small pondweed was found as relatively extensive populations in Mike Lake area (Plot LC3; Figure 10).

Sticky False Asphodel

Sticky false asphodel (*Triantha glutinosa*) is a small sticky plant of the lily family. It grows in marshes, wet meadows on calcareous soil (FNA, 2005). In Labrador, it was ranked S1S3 with an undetermined status by the DOEC. It has been noted in the

region by Dutilly and Lepage (1962) and by Hustich (1963) for the Knob Lake and Twin Falls areas. Waterway et al. (1984) mention that sticky false asphodel are characteristic of fens of the Schefferville region. In the Study Area, a fairly high number of plants were found in a northern ribbed fen (Plot FE3; Figure 10).

Kidney-Leaved Violet

Kidney-leaved violet (*Viola renifolia*) is a small perennial with kidney shaped leaves. It is calcicolous and generally found in moss and cool protected areas at the foot of small cliffs. In Labrador, it was ranked S1S3 with an undetermined status by the DOEC. Regionally, it has been found at Sunny Mountain by Harper (1964) and Viereck (1957). It has also been noted by Hustich (1965) in the Grand Falls area. In the Study Area, a small population of 10 individuals was found in moss at the foot of a small calcareous cliff in a moderately weathered rock barren (Plot TA1; Figure 9).

Northern Green Orchid

Northern green orchid (*Platanthera aquilonis*) is a robust plant of the orchid family with a spike of yellow green flowers. It grows in wet meadows, tundra, marshes, fens, stream banks, shores, ditches, seeping slopes, roadsides and borrow pits (FNA, 2003). In Labrador, it was ranked S2S3 with a “May be at Risk” status by the DOEC. It has been mentioned to the north of Knob Lake area by Hustich (1965). In the Study Area, a small colony of five plants was observed near a small runoff on a flat uniform portion of a northern ribbed fen (Plot FE3; Figure 10).

Siberian Water-Milfoil

Siberian water-milfoil (*Myriophyllum sibiricum*) is an aquatic plant that grows in alkaline waters of lakes, streams and rivers. In Labrador, it was ranked SNR with a “May be at Risk” status by the DOEC. Regionally, it is mentioned to occur in the Schefferville area by Hustich (1965). In the Study Area, Siberian water-milfoil was found as relatively extensive populations in Mike Lake area (Plot LC3; Figure 10) and in the Gilling River area (Plot RV2; Figure 10).

Glacial Sedge

Finally, glacial sedge (*Carex glacialis*) found in the Study Area during the summer survey has a rank of S2S3 and has a “Sensitive” status in Labrador. However, this species is listed as “threatened” in Québec (Table 9). The status mentioned for the province of Québec concern three small southern populations in Havre St-Pierre, Tadoussac and at the head of the Magpie River. This species is considered secure and frequent in northern parts of Québec.

Glacial sedge is a small calcicolous grass like plant usually forming dense cespitose tussocks. It grows in dry rocks, gravel, sand, talus slopes and eskers (FNA, 2002). Regionally it has been found to be frequent by Dutilly and Lepage (1962). Hustich (1965) notes the plant for Knob and Astray Lakes. Glacial sedge was found during the survey in Plot AL5 in the Sunny Mountain region, Viereck (1957) also observed the plant in the same location. In the Study Area the plant was observed near calcareous dolomitic rocks in moderately and highly weathered rock barrens (Plots AL1, AL4, AL6 and AL8; Figure 9). In general, populations were small with less than 10 individuals.

Table 8: List of Rare Vascular Plants Potentially Present within the Study Area with their Preferred Habitat and Québec Priority Rank (Source: CDPNQ, 2008)

Scientific Name	English Name	Status[1]	Québec Priority Rank[2]	Habitat	Potential of Presence[3]
Agoseris aurantiaca var. *aurantiaca*	Orange agoseris	SDMV	G5T4T5/NNR/S1	Subalpine swamps and prairies (calcicolous)	Moderate
Alchemilla glomerulans	Clustered lady's mantle	SDMV	G3G5/NNR/S1	Swamps, humid prairies and sandy shores	Low
Antennaria rosea subsp. *confinis*	Frontier rosy pussitoe	SDMV	G5T4T5/NNR/S1	Dunes, rock ledges, sand and exposed gravel (calcicolous)	Low
Antennaria rosea subsp. *pulvinata*	Cushion rosy pussitoe	SDMV	G5T5?/NNR/S3	Rocky and gravel shores, rock ledges and exposed gravel (calcicolous)	Low
Arnica chamissonis	Chamisso's arnica	SDMV	G5/NNR/S1	Humid prairie and vacant lots	High
Calamagrostis purpurascens	Purple reedgrass	SDMV	G5?/NNR/S2	Rock ledges, sand and exposed gravel (calcicolous)	Low
Carex petricosa var. *misandroides*	Man-hater sedge	SDMV	G4T1T2/N1N2/S2	Rock ledges, sand and exposed gravel (calcicolous)	Moderate
Cirsium muticum var. *monticola*	Mountain swamp thistle	SDMV	G5T?/N5/S2	Alpine tundra and rich fens	Low
Geum macrophyllum var. *perincisum*	Large-leaved avens	SDMV	G5T5/N5/S2	Swamps and mixed conifer forests	High
Hedysarum boreale subsp. *mackenziei*	Mackenzie's hedysarum	SDMV	G5T5?/N5?/S2	Arctic tundra and rocky and gravel shores (calcicolous)	Low

[1] Status of species in Québec: SDMV: Likely to be designated threatened or vulnerable.

[2] Priority Rank as established by NatureServe corresponds to a combination of letters and number indicating, respectively, scale and priority: G: Global Rank; N: National Rank; S: Subnational Rank; T: criteria for a subspecies or variety; NNR: National or Subnational Rank not evaluated; 1: High risk; 2: Risky; 3: Moderate risk; 4: Apparently not at risk; 5: Not at risk; (?) Ranks difficult to ascertain.

[3] The potential of presence within the study area was determined based on specific habitat characteristics required by these plants and on the experience of the botanist.

IA
Agrostis stolonifera (S2S4)
Calamagrostis canadensis var. canadensis (SNR)
Juncus bufonius (S2S4)
Populus balsamifera (S3)
Rhinanthus minor subsp. groenlandicus (SNR)

PN3
Calamagrostis canadensis var. canadensis (SNR)

AL6
Carex glacialis (S2S3)

LA3

LA2

Pb1

PT1

AL7

AL1
Carex glacialis (S2S3)

LC1B
Calamagrostis canadensis var. canadensis (SNR)
Taraxacum lapponicum (S3)

LA1

PL1

CL1
Diphasiastrum sabinifolium (SNA)

AL4
Carex glacialis (S2S3)

AL2

AL3
Diphasiastrum sabinifolium (SNA)
Huperzia appressa (SNR)

AU1

EB1

PN2

PN1
Moehringia macrophylla (SNR)

TA1
Calamagrostis canadensis var. langsdorfii (SNR)
Huperzia appressa (SNR)
Moehringia macrophylla (SNR)
Viola renifolia (S1S3)

AL8
Arenaria humifusa (S3)
Carex glacialis (S2S3)
Huperzia appressa (SNR)

PC1
Calamagrostis canadensis var. canadensis (SNR)

PN4
Calamagrostis canadensis var. canadensis (SNR)

DA1
Calamagrostis canadensis var. canadensis (SNR)
Huperzia appressa (SNR)
Salix pedicellaris (S2S4)

DA2

BR1
Diphasiastrum sabinifolium (SNA)

DE1

BE1

DE2
Fragaria virginiana subsp. glauca (SNR)
Huperzia appressa (SNR)
Pedicularis groenlandica (S2S4)
Vahlodea atropurpurea (S2S4)

PC2

Attikamagen Lake
Joyce Lake
Timmins Bay
Lake
Iron Arm
Hollinger Lake
QUEBEC
NEWFOUNDLAND-AND-LABRADOR
Barry Lake
Lac Houston
Louise Lake
Baker Lake
Oboe Lake
Gilling River
Mike Lake
Petitsikapau Lake
Dyke Lake

66°42' 66°40' 66°38' 66°36' 66°34' 66°32' 66°30' 66°28' 66°26' 66°24'
54°54' 54°52' 54°50' 54°48' 54°46' 54°44' 54°42' 54°40' 54°38'

Project Components
- Study area
- Preliminary project layout
- Revised project layout (May 2013)
- Drainage infrastructure (May 2013)

Vegetation
- Sampling plot
- Sampling zone
- Sampling plot / zone identification (e.g. BR1 Diphasiastrum sabinifolium (SNA); Rare vascular plant species; Status rank)
- Highly weathered rock barren
- Moderately weathered rock barren
- Post-fire conifer regeneration
- Birch forest
- Clear cut
- Slightly weathered rock barren
- Exposed gravel and sand
- Shrubland
- Lichen-shrub barren
- Wetland
- Closed spruce-moss forest
- Open spruce-lichen forest
- Open spruce-moss forest
- Human disturbances

Existing Infrastructure
- Main road
- Railway

Territory
- Provincial boundary

CENTURY IRON MINES CORP.

Joyce Lake Direct Shipping Iron Ore Project

- Vegetation Baseline Study -

Rare Vascular Plant Species Found in the Study Area - Upland Habitats

Sources:
Base: BDTA, 1: 250 000, MRN Québec, 2002
CanVec, 1: 50 000, RNCan, 2007

Mapping: GENIVAR
File: 121-18002-00_F9_VEG_Espece_MilTerrestre_131128.mxd

Scale 1: 85,000
0 850 1 700 2 550 m
UTM, zone 19, NAD83

Figure 9

November 2013

GENIVAR

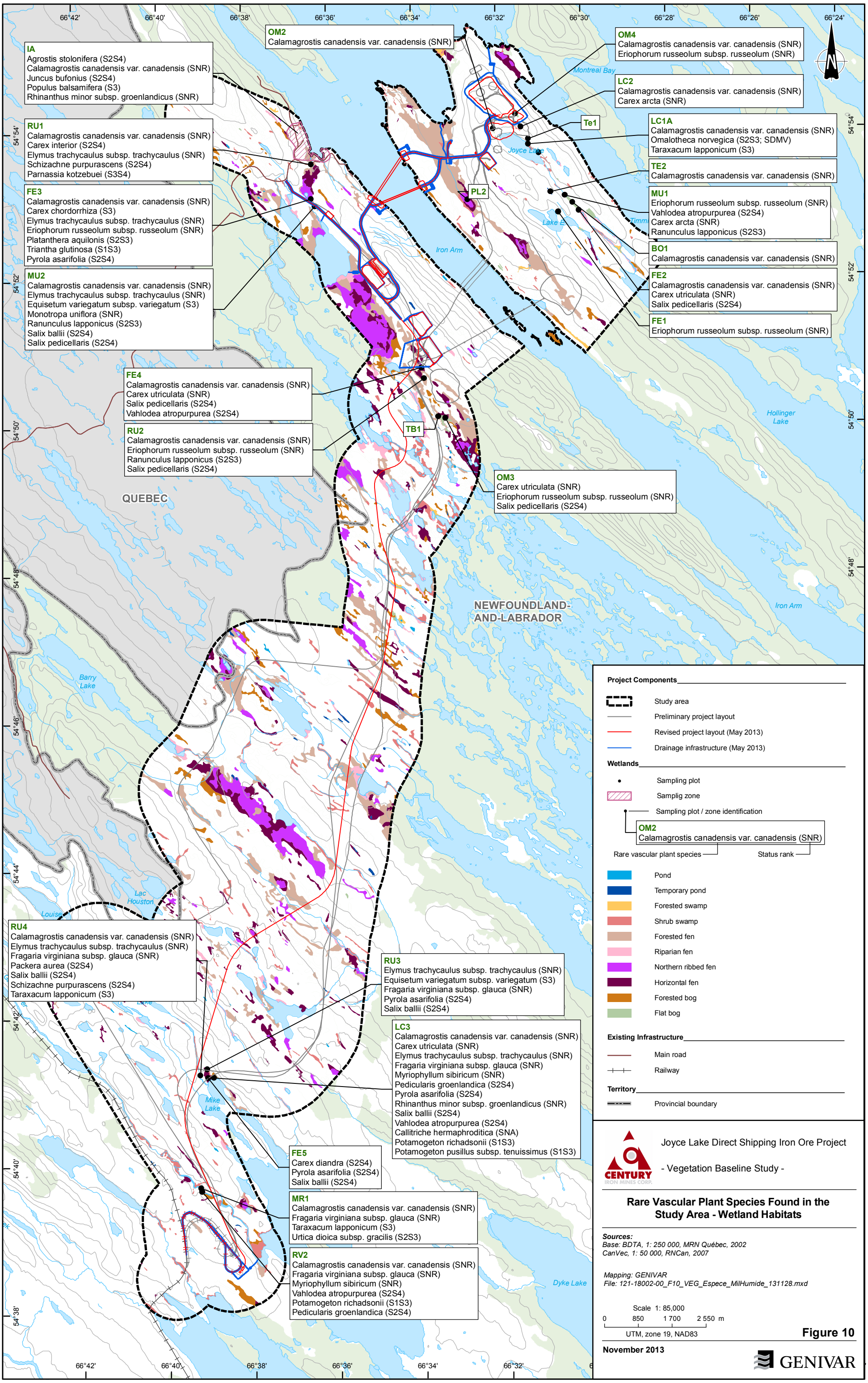
Table 9: List of Rare Vascular Plant Species Present in the Study Area and in the Schefferville Region

Scientific Name	English Name	Study Area	Region[1]	GRANK[2]	NRANK[2]	SRANK[2]	Labrador General Status	COSEWIC	LEMVQ[3]
Potamogeton richardsonii	Richardson's pondweed	X	c, i	G5	N5	S1S3	Undetermined		
Triantha glutinosa	Sticky false asphodel	X	c, i	G4G5	NNR	S1S3	Undetermined		
Viola renifolia	Kidney-leaved violet	X	c, d	G5	NNR	S1S3	Undetermined		
Potamogeton pusillus subsp. *tenuissimus*	Narrow-leaved small pondweed	X		G5T5	NNR	S1S3	Undetermined		
Carex glacialis	Glacial sedge	X	c, d, i	G5	NNR	S2S3	Sensitive		Threatened
Omalotheca norvegica	Norwegian Arctic-cudweed	X	d, h	G5	N2N3	S2S3	Sensitive	Low Priority	
Platanthera aquilonis	Northern green orchid	X	c	G5	N5	S2S3	May be at risk		
Coptidium lapponicum	Lapland buttercup	X	c, j	G5	NNR	S2S3	Sensitive		
Urtica dioica subsp. *gracilis*	Slender stinging nettle	X	c	G5T5	N5	S2S3	Sensitive		
Agrostis stolonifera	Creeping bentgrass	X	k	G5	N5	S2S4	Undetermined		
Carex diandra	Lesser panicled sedge	X	i	G5	N5	S2S4	Undetermined		
Carex interior	Inland sedge	X	c	G5	N5	S2S4	Undetermined		
Juncus bufonius	Toad rush	X	k	G5	N5	S2S4	Undetermined		
Packera aurea	Golden ragwort	X	c, d, g	G5	NNR	S2S4	Undetermined		
Pedicularis groenlandica	Elephanthead lousewort	X	a, c, d, j	G4G5	NNR	S2S4	Undetermined		
Pyrola asarifolia	Liverleaf wintergreen	X	c, d	G5	NNR	S2S4	Undetermined		
Salix ballii	Ball's willow	X	c, i	G5?	NNR	S2S4	Undetermined		
Salix pedicellaris	Bog willow	X	a,c,g,i,j	G5	NNR	S2S4	Sensitive		
Schizachne purpurascens	False melic	X	c, i, j	G5	N5	S2S4	Undetermined		
Vahlodea atropurpurea	Mountain hairgrass	X	a, c, i	G5	NNR	S2S4	Undetermined		
Arenaria humifusa	Creeping sandwort	X	c, d	G4	NNR	S3	Sensitive		
Carex chordorrhiza	Creeping sedge	X	c, i, j	G5	N5	S3	Sensitive		
Equisetum variegatum subsp. *variegatum*	Variegated scouring rush	X	c	G5T5	N5	S3	Sensitive		
Populus balsamifera	Balsam poplar	X	a, c, i	G5	N5	S3	Sensitive		
Taraxacum lapponicum	Lapland dandelion	X	c, d, i, j	GNR	NNR	S3	Sensitive		
Parnassia kotzebuei	Kotzebue's grass of	X	c, i, j	G5	N5	S3S4	Sensitive		
Callitriche hermaphroditica	Northern water-starwort	X		G5	NNR	SNA	Not ranked		
Diphasiastrum sabinifolium	Cedar like club-moss	X	j	G4	NNR	SNA	Not ranked		
Calamagrostis canadensis var. *canadensis*	Bluejoint	X	c, d, i, j	G5T5	N5	SNR	Undetermined		
Calamagrostis canadensis var. *langsdorfii*	Bluejoint	X	c, d, i, j	G5T5	N5	SNR	Undetermined		
Carex arcta	Northern cluster sedge	X	c, j	G5	N5	SNR	Undetermined		
Carex utriculata	Northwest Territory sedge	X	c, j	G5	N5	SNR	Undetermined		
Elymus trachycaulus subsp. *trachycaulus*	Slender wheatgrass	X	a, c, i, j	G5T5	N5	SNR	Undetermined		
Eriophorum russeolum subsp. *russeolum*	Russet cotton-grass	X	a, i, j	G5	NNR	SNR	Not ranked		
Fragaria virginiana subsp. *glauca*	Virginia strawberry	X	a, c, i	G5T5?	N5?	SNR	Undetermined		
Huperzia appressa	Mountain fir-moss	X	c, d, i, j	G4G5	N4N5	SNR	Undetermined		
Moehringia macrophylla	Largeleaf sandwort	X	c, i, j	G5	NNR	SNR	Undetermined		
Monotropa uniflora	Indianpipe	X		G5	N5	SNR	Undetermined		
Myriophyllum sibiricum	Siberian water-milfoil	X	c	G5	NNR	SNR	May be at risk		
Rhinanthus minor subsp. *groenlandicus*	Arctic rattlebox	X	a, c, i	G5T5?	N5?	SNR	Undetermined		
Arnica chamissonis	Chamisso's arnica		b, h	G5	NNR	Not	Not ranked		SDMV
Equisetum palustre	Marsh horsetail		a, d	G5	N5	S1	May be at risk		
Polystichum lonchitis	Northern hollyfern		e, h	G5	NNR	S1	May be at risk		
Cystopteris montana	Mountain bladder fern		c, d	G5	NNR	S1S2	May be at risk		
Antennaria alpina	Alpine pussytoes		c	G5	NNR	S3	Sensitive		
Barbarea orthoceras	American yellowrocket		c, d	G5	NNR	S3	Sensitive		
Glyceria canadensis var. *canadensis*	Rattlesnake mannagrass		c, j	G5	N4N5	S1S3	Undetermined		
Primula egaliksensis	Greenland primrose		c, d	G4	NNR	S1S3	Undetermined		
Carex leptonervia	Nerveless woodland sedge		a, j	G4	NNR	S2S3	Sensitive		
Alchemilla filicaulis subsp. *filicaulis*	Thinstem lady's mantle		a, c, i	G4	N3?	S2S4	Undetermined		
Carex media	Closed-head sedge		c, d	G5T5?	NNR	S2S4	Undetermined		
Salix bebbiana	Bebb willow		c, f	G5	NNR	S2S4	Undetermined		
Geum macrophyllum var. *perincisum*	Large-leaved avens		c, h	G5	N5	S3S4	Undetermined		SDMV
Juncus subtilis	Greater creeping rush		c	G4	N4	SNR	Undetermined		
Carex garberi	Elk sedge		c	G5	NNR	SNR	Undetermined		
Danthonia spicata	Poverty oatgrass		a	G5	N5	SNR	Undetermined		
Eriophorum brachyantherum	Closed-sheath cotton-grass		c	G5	N5	SNR	Undetermined		
Eriophorum gracile	Slender cottongrass		a	G5	N5	SNR	Undetermined		
Packera indecora	Elegant groundsel		a, i	G5	N5	SNR	Undetermined		

[1] Letter refers to the source of the information: a: NML, 2009; b: Blondeau, 2000; c: Hustich, 1963 and 1965; d: Viereck, 1957 and Harper, 1964; e: Waterway et al., 1982; f: LIM, 2009; g: ACCDC, 2012; h: CDPNQ, 2008; i: Dutilly and Lepage, 1962; j: Dutilly and Lepage, 1964; k: Hustich, 1971.

[2] Priority rank as established by the ACCDC (2010) for Labrador species.

[3] Loi sur les espèces menacées et vulnérables du Québec: SDMV: Likely to be designated threatened or vulnerable.


66°42'
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54°52'
54°50'
54°48'
54°46'
54°44'
54°42'
54°40'
54°38'
N
IA
Agrostis stolonifera (S2S4)
Calamagrostis canadensis var. canadensis (SNR)
Juncus bufonius (S2S4)
Populus balsamifera (S3)
Rhinanthus minor subsp. groenlandicus (SNR)
RU1
Calamagrostis canadensis var. canadensis (SNR)
Carex interior (S2S4)
Elymus trachycaulus subsp. trachycaulus (SNR)
Schizachne purpurascens (S2S4)
Parnassia kotzebuei (S3S4)
FE3
Calamagrostis canadensis var. canadensis (SNR)
Carex chordorrhiza (S3)
Elymus trachycaulus subsp. trachycaulus (SNR)
Eriophorum russeolum subsp. russeolum (SNR)
Platanthera aquilonis (S2S3)
Triantha glutinosa (S1S3)
Pyrola asarifolia (S2S4)
MU2
Calamagrostis canadensis var. canadensis (SNR)
Elymus trachycaulus subsp. trachycaulus (SNR)
Equisetum variegatum subsp. variegatum (S3)
Monotropa uniflora (SNR)
Ranunculus lapponicus (S2S3)
Salix ballii (S2S4)
Salix pedicellaris (S2S4)
FE4
Calamagrostis canadensis var. canadensis (SNR)
Carex utriculata (SNR)
Salix pedicellaris (S2S4)
Vahlodea atropurpurea (S2S4)
RU2
Calamagrostis canadensis var. canadensis (SNR)
Eriophorum russeolum subsp. russeolum (SNR)
Ranunculus lapponicus (S2S3)
Salix pedicellaris (S2S4)
OM2
Calamagrostis canadensis var. canadensis (SNR)
OM4
Calamagrostis canadensis var. canadensis (SNR)
Eriophorum russeolum subsp. russeolum (SNR)
LC2
Calamagrostis canadensis var. canadensis (SNR)
Carex arcta (SNR)
Te1
LC1A
Calamagrostis canadensis var. canadensis (SNR)
Omalotheca norvegica (S2S3; SDMV)
Taraxacum lapponicum (S3)
TE2
Calamagrostis canadensis var. canadensis (SNR)
PL2
MU1
Eriophorum russeolum subsp. russeolum (SNR)
Vahlodea atropurpurea (S2S4)
Carex arcta (SNR)
Ranunculus lapponicus (S2S3)
BO1
Calamagrostis canadensis var. canadensis (SNR)
FE2
Calamagrostis canadensis var. canadensis (SNR)
Carex utriculata (SNR)
Salix pedicellaris (S2S4)
FE1
Eriophorum russeolum subsp. russeolum (SNR)
TB1
OM3
Carex utriculata (SNR)
Eriophorum russeolum subsp. russeolum (SNR)
Salix pedicellaris (S2S4)
QUEBEC
NEWFOUNDLAND-
AND-LABRADOR
Montreal Bay
Joyce Lake
Lake E
Timmi
Iron Arm
Hollinger
Lake
Barry
Lake
Lac
Houston
Louise
Mike
Lake
Dyke Lake
RU4
Calamagrostis canadensis var. canadensis (SNR)
Elymus trachycaulus subsp. trachycaulus (SNR)
Fragaria virginiana subsp. glauca (SNR)
Packera aurea (S2S4)
Salix ballii (S2S4)
Schizachne purpurascens (S2S4)
Taraxacum lapponicum (S3)
RU3
Elymus trachycaulus subsp. trachycaulus (SNR)
Equisetum variegatum subsp. variegatum (S3)
Fragaria virginiana subsp. glauca (SNR)
Pyrola asarifolia (S2S4)
Salix ballii (S2S4)
LC3
Calamagrostis canadensis var. canadensis (SNR)
Carex utriculata (SNR)
Elymus trachycaulus subsp. trachycaulus (SNR)
Fragaria virginiana subsp. glauca (SNR)
Myriophyllum sibiricum (SNR)
Pedicularis groenlandica (S2S4)
Pyrola asarifolia (S2S4)
Rhinanthus minor subsp. groenlandicus (SNR)
Salix ballii (S2S4)
Vahlodea atropurpurea (S2S4)
Callitriche hermaphroditica (SNA)
Potamogeton richadsonii (S1S3)
Potamogeton pusillus subsp. tenuissimus (S1S3)
FE5
Carex diandra (S2S4)
Pyrola asarifolia (S2S4)
Salix ballii (S2S4)
MR1
Calamagrostis canadensis var. canadensis (SNR)
Fragaria virginiana subsp. glauca (SNR)
Taraxacum lapponicum (S3)
Urtica dioica subsp. gracilis (S2S3)
RV2
Calamagrostis canadensis var. canadensis (SNR)
Fragaria virginiana subsp. glauca (SNR)
Myriophyllum sibiricum (SNR)
Vahlodea atropurpurea (S2S4)
Potamogeton richadsonii (S1S3)
Pedicularis groenlandica (S2S4)
Project Components
Study area
Preliminary project layout
Revised project layout (May 2013)
Drainage infrastructure (May 2013)
Wetlands
Sampling plot
Samplig zone
Sampling plot / zone identification
OM2
Calamagrostis canadensis var. canadensis (SNR)
Rare vascular plant species
Status rank
Pond
Temporary pond
Forested swamp
Shrub swamp
Forested fen
Riparian fen
Northern ribbed fen
Horizontal fen
Forested bog
Flat bog
Existing Infrastructure
Main road
Railway
Territory
Provincial boundary
CENTURY
IRON MINES CORP.
Joyce Lake Direct Shipping Iron Ore Project
- Vegetation Baseline Study -
Rare Vascular Plant Species Found in the Study Area - Wetland Habitats
Sources:
Base: BDTA, 1: 250 000, MRN Québec, 2002
CanVec, 1: 50 000, RNCan, 2007
Mapping: GENIVAR
File: 121-18002-00_F10_VEG_Espece_MilHumide_131128.mxd
Scale 1: 85,000
0 850 1 700 2 550 m
UTM, zone 19, NAD83
Figure 10
November 2013
GENIVAR

4.5 Floristic Diversity

4.5.1 History of Botanical Exploration

The first botanical explorations were conducted in 1894 when Alfred P. Low surveyed the immediate region around Schefferville. Low (1896) mentioned the geology of the region, especially in the areas of Swampy Bay River and Attikamagen Lake. He also mentioned the introduced flora at the abandoned site of Fort Nascaupee on Petitsikapau Lake.

In 1948, the Finnish botanist Ilmari Hustich conducted a forest and floristic analysis in the Knob Lake area. He returned to Schefferville in 1963 with Paavo Kallio and again in 1967. Several papers were produced by Hustich and synthesize the floristic diversity in the area (Hustich, 1951, 1963, 1965, 1970, 1971 and 1972). Two other botanists from Finland explored the Schefferville region: Paavo Kallio in 1963-67 and 68, and Yrjö Mäkinen in 1967 (Mäkinen and Kallio, 1980). In 1953, Francis Harper botanized near Knob and Attikamagen Lake and other areas in the vicinity of Schefferville (Harper, 1964).

In 1954, the creation of the University of McGill Subarctic Research Station in Schefferville lead to the realization of a multitude of research projects in the region (Allington, 1957; Viereck, 1957; Davis, 1962; Sage Dunnet, 1968; Wassen, 1969; Waterway et al*.*, 1984). Additional surveys were conducted in the immediate region of Schefferville heading north on the Swampy Bay River in 1961 and to the south in 1963 (Dutilly and Lepage, 1962, 1964).

The most recent vegetation studies were related to mining projects in the ore-rich Labrador trough. Aecom (2008) produced a vegetation baseline study of the James and Redmond properties for Labrador Iron Mines Limited, while Groupe Hémisphères (2009) produced a detailed mapping of the terrestrial ecosystems and surface deposits of the Elross Lake region for New Millennium Capital Corp.

4.5.2 Diversity

The field campaign conducted in the summer of 2012 provided information to determine the floristic diversity in the Study Area and regionally. A total of 231 vascular plant species were found in the Study Area during the surveys (Appendix B). In the region, the information concerning the species found during previous botanical explorations (Section 4.5.1) and from four sampling plots provided an additional 170 species (mostly calciphile, alpine and chionophile) for a total of 401 vascular plants found within the region (Appendix C; Figures 4a, 4b, 6a and 6b). This total is similar to the 381 species mentioned by Mäkinen and Kallio (1980) and to the 320 species reported by Blondeau and Dignard (2000) for the Schefferville region. For a region at this latitude, the flora is unusually rich. This fairly high richness could be due to the complex surface geology made up of calcium and magnesium rich metamorphosed sedimentary rock (Waterway et al*.,* 1984) and to its geographic location (the Study Area being found within both the Mid Subarctic Forest and the High Subarctic Tundra Ecoregions; Figure 3).

In the Study Area, the floristic diversity fluctuates depending on the vegetation type encountered (Table 10). In uplands, diversity is usually at its lowest, and on average 16 to 29 vascular species are found per vegetation type. Diversity is usually highest on open and mineralized terrain. The number of species in exposed gravel and sandy vegetation types is 42 on average. On weathered rock barrens, the number of species on the most enriched stations is twice as high as on less mineralized stations (Appendix A; Plots DA1, TA1 and DE2). In plant communities disturbed by human activity, openings in the canopy, bare soil and the introduction of species may explain the much higher diversity and more complex floristic associations.

Wetlands are much more diversified environments, often forming a mosaic of different vegetation types, and frequently harbouring a high number of terrestrial species. In the Study Area, northern ribbed, forested and riparian fens were the most diversified wetlands counting 52 vascular plants on average (Table 10). A northern ribbed fen characterized outside the Study Area exhibits the same properties as those found within, and a total of 43 species were identified (Plot T1; Figures 6a and 6b). Swamps were almost as diversified as northern ribbed fens, with an average of 43 species. In horizontal fens, the number of species found was slightly lower (33 species) which was mostly due to the uniform topography. Bogs had the lowest number of species found with 26 and 32 species found on average in flat bogs and forested bogs respectively. Finally, the temporary ponds were the least diversified, mostly due to the disturbed environment. The species found in these temporary ponds were mostly site-specific.

Regionally, vegetation types were similar to those found within the Study Area, but additional types were also observed: alpine tundra, snow patches, calcareous outcrops and other alpine habitats. These vegetation types were located northwestern to the Study Area. The floristic diversity is higher in this area due to these additional types, highlighted by the fact that it has been the subject of the highest number of botanical studies conducted in the area. Approximately one third of the species found outside the Study Area have a wetland status indicator and a little more than 10 % are calciphile vascular plants (Appendix C).

In the Schefferville region, rich outcrops on the shores of Swampy Bay River were visited, and these exhibit a very diverse and unique flora with a large number of calcicolous, chionophilic and arctic-alpine species (Appendix F, Photo 35; Plot RV1; Appendix A). Alpine tundra on Sunny Mountain was also visited and is characterised by sparse and less-diverse arctic-alpine and calciphilic species (Plot AL5; Appendix A; Appendix F, Photo 36). In the same general location, a snow patch was also surveyed and most vascular plants in this plot are arctic-alpine and chionophile species (Appendix F, Photo 37; Plot CO1; Figures 6a and 6b; Appendix A).

In the Study Area, three features are likely to provide a greater diversity and different floral association. Dolomite bedrock and erratic blocks are scattered within the Study Area and could potentially be colonized by calciphilic species (Appendix F, Photo 38). These microhabitats were systematically investigated during the survey when they were encountered. The Gilling River valley is a mosaic of upland and aquatic environments, and geological features are also well-diversified in this area (Appendix F, Photo 39). The vast peatlands south of Iron Arm offer a mixture of various types of wetlands and are capable of sheltering a multitude of plant communities (Appendix F, Photo 40).

Table 10: Floristic Diversity in Upland and Wetland Sites Found in the Study Area and Regionally

Vegetation Type	Mean Number of Species Found	Total Species Found
Upland Sites		
Human Disturbances	67	67
Exposed Gravel and Sand	42	42
Birch Forest	26	26
Open Spruce-Moss Forest	29	37
Closed Spruce-Moss Forest	22	32
Slightly Weathered Rock Barren	23	34
Open Spruce-Lichen Forest	21	41
Post-Fire Conifer Regeneration	21	21
Highly Weathered Rock Barren	18	60
Moderately Weathered Rock Barren	15	47
Shrubland	16	25
Lichen-Shrub Barren	n/a	n/a
Clear Cut	n/a	n/a
Wetlands		
Northern Ribbed Fen	54	71
Forested Fen	53	72
Riparian Fen	50	120
Shrub Swamp	44	70
Forested Swamp	41	41
Horizontal Fen	33	33
Forested Bog	32	48
Flat Bog	26	53
Temporary Pond	17	38
Pond	n/a	n/a
Regional		
Swampy Bay River	75	75
Northern Ribbed Fen	43	43
Snow Patch	41	41
Alpine Summit	32	32

4.5.3 Phytogeography

A phytogeographical analysis of the flora based on a bioclimatic and geographical approach was conducted (Table 11). The bioclimatic approach is based on a latitudinal gradient, while the geographical approach is based on a longitudinal gradient. As we move farther north, plants with arctic and circumhemispheric affinities become more abundant.

Table 11: Phytogeographical Analysis of the Regional Study Area

Domain	Number of Species Present	Relative Abundance (%)
Bioclimatic Approach		
Polar	56	14
Arctic-alpine	27	7
Boreal	265	66
Temperate	10	3
Introduced	43	11
Total	**401**	**100**
Geographic Approach		
Northeastern America	40	10
Amphi-atlantic	27	7
Cordilleran	3	1
North America	104	26
North America and east Asia	14	3
North America and west Europe	1	0
Circumhemispheric	169	42
Introduced	43	11
Total	**401**	**100**

Outside the Study Area, the relative abundance of boreal-affinity species is 66 %, while it is 21 % for polar and arctic-alpine species combined. Polar and arctic-alpine plants are mostly found in the northeastern mountain range outside the Study Area. Blondeau and Dignard (2001) mentioned similar proportions in the Schefferville area. In the Fermont region, 10 % of polar and arctic-alpine species and 73 % of boreal taxa were found by Blondeau and Dignard (2001). In the Kuujjuaq region, 40 % of the plants are polar and arctic-alpine and 59 % are of boreal affinity. The geographic approach indicates that approximately 50 % of species are circumhemispheric, while 26 % of species have a North American distribution. Based on the field results and on the literature review, introduced plant account for 43 species in the Schefferville region. However, most of these introductions were not recent as many species were identified in Hustich (1971 and 1972). The presence of a railroad and an airport contribute largely to the dispersion and introduction of alien species in the region.

The results of the phytogeographical analysis indicate that the species found in the Study Area have vast distribution and tolerate a large spectrum of ecological conditions. These species are well-adapted to sudden changes in the environment (forest fires) and are generally acidophilic. These conditions are not favourable to rare species or to species of conservation concern. The only species that thrive are found on calcareous substrates, which are considered to be limiting within Labrador.

5 SUMMARY AND CLOSURE

To support the Joyce Lake Direct Shipping Iron Ore Project EA process, a Vegetation Baseline Study was undertaken in 2012 to describe the upland and wetland vegetation types, the overall floristic diversity and to determine the presence of rare plants, species of conservation concern and/or at risk within the Study Area.

A reconnaissance survey for rare plants, or uncommon plant communities was conducted on August 4, 2012, and the main field campaign was carried out from August 14 to August 24, 2012. A total of 55 sampling plots were surveyed to cover most of the vegetation types that occur in the Study Area. In addition, four plots were sampled in different vegetation types outside the Study Area. The various vegetation units (forested ecosystems, bogs, fens, etc.) were identified by helicopter which flew over the Study Area at low altitude. The vegetation communities and plant diversity description were conducted using sampling plots combined with random survey transects. Sampling plots were selected so as to cover part or all of the area of a given vegetation type found within the Study Area. The vegetation was described according to the simplified Braun-Blanquet's phytosociological method. Upland and wetland vegetation type were also photo-interpreted using high-resolution aerial photographs.

Uplands occupy 12,949 ha (85 %) of the total Study Area. Thirteen upland vegetation types were identified by photo-interpretation and information concerning the floristic associations and physical characteristics present in these upland vegetation types was collected from 31 survey plots. Uplands were divided into forested and non-forested sites.

Forested upland sites are the most frequent, occupying 57 % of the Study Area. They are found on moderately to well-drained terrain and are usually situated on gentle slopes. Open spruce-moss and spruce-lichen forests are the most abundant forest types. Closed spruce-moss forests are less common and colonize the richest and less weathered sites. Birch forests are uncommon in the Study Area and only one was found on a steep slope in its southern part.

Non-forested upland sites occupy 27 % of the Study Area and are dominated by the post-fire regeneration vegetation type, which occur in large patches in the mid portion of the Study Area. Shrubland follows and is generally located on slopes and is transitional between forested sites and more exposed summits. Lichen shrub-barrens colonize more xeric and poor sites. Slightly weathered rock barrens occupy large flatlands and are composed of large-sized fractured rock. Moderately and highly-weathered rock barrens are found on top of most of the highest mountains in the Study Area and are similar to alpine tundra environments. More marginal vegetation types such as human disturbances, clear cuts and exposed sand and gravel complete the upland plant communities found in the Study Area.

Wetlands occupy 2,298 ha (15 %) of the total Study Area. Ten types of wetlands were identified by photo-interpretation, and information concerning the floristic associations and physical characteristics present in these wetlands were collected from 24 survey plots.

Wetlands in the Study Area occupy flat poorly-drained depressions on impermeable substrates and are closely associated with watercourses. Wetlands occur either in large assemblages or small and isolated areas. Peatlands are by far the most abundant wetland type, and account for 1,977 ha (86 %) of all wetlands in the Study Area. Fens are the most abundant peatlands found in the Study Area. They are mostly influenced by the leeching of minerals dissolved from the underlying bedrock which is mostly of sedimentary origin. They occupy mineralized sites, enriched by surface runoff of seepage through the substrate. Swamps are the second most abundant wetland type and are usually found at the edge of lakes and rivers. Bogs occupy a lesser portion of the Study Area and are generally found in depressions fed by rainwater. Temporary ponds and ponds are small in size, isolated and scattered throughout the Study Area.

A wetland ecological function assessment was conducted in an area surrounding the revised project layout, which include wetlands most likely to be affected by the Project. Nine (9) key wetland functional categories are considered as the most important ecological services provided by wetlands that occur along the proposed Project. These functions are: the surface water detention, the sediment and other particulate retention, the streamflow maintenance, the carbon sequestration, the shoreline stabilization, the fish habitat, the stream shading, the waterfowl and waterbird habitat, and the species of conservation concern habitat. The main functions provided by wetlands in the vicinity of the Project Development Area are as potential habitat for species of conservation concern (100 % of the wetlands), the carbon sequestration (99.8 % of the wetlands), the shoreline stabilization (53.7 % of the wetlands) and the provision of waterfowl and waterbird habitats (55.5 % of the wetlands).

There is no known plant species listed under the federal *Species at Risk Act* or the provincial *Endangered Species Act* within the Study Area based on literature and on field work conducted during the summer of 2012. However, 40 rare or potentially rare vascular plant species were identified during the field work. Two of these occur in the region (bog willow and golden ragwort), while one is threatened (glacial sedge) as per the Quebec *Loi sur les espèces menacées ou vulnérables* (LEMV) and two are likely to be designated threatened or vulnerable in Québec (LEMV; Chamisso's arnica and large-leaved avens). Norwegian cudweed, a low priority candidate species as established by COSEWIC, has also been observed in the Study Area.

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Appendix A: Description of Vegetation Sampling Plots in the Study Area and Regionally

Appendix A.1: Description of Vegetation Sampling Plots in Forested Upland in the Study Area

Habitat Status	Forested Upland Habitats										
Ecosystem	Open Spruce-Moss Forest		Open Spruce-Lichen Forest						Closed Spruce-Moss Forest		Birch Forest
Sampling Plot	PN3	PN4	PN2	CL1	LA1	LA2	PC1	PC2	PB1	PN1	BE1
Date	2012-08-20	2012-08-21	2012-08-16	2012-08-16	2012-08-17	2012-08-20	2012-08-21	2012-08-22	2012-08-14	2012-08-18	2012-08-24
Latitude (dg:min:sec)	54°54'38,30"	54°50'23,80"	54°52'57,80"	54°53'08,70"	54°53'36,60"	54°54'17,90"	54°50'25,60"	54°39'40,40"	54°53'52,90"	54°52'56,60"	54°40'57,90"
Longitude (dg:min:sec)	66°32'28,90"	66°33'35,60"	66°36'21,20"	66°30'31,80"	66°31'24,90"	66°32'17,60"	66°33'32,40"	66°39'19,70"	66°31'14,00"	66°36'19,50"	66°41'00,50"
Altitude (m)	522	477	487	502	513	575	478	473	523	485	545
Exposition	North	East	North-West	East	East	North-east	Total	Total	West	West	West
Topographic Location	Foot of slope	Flat terrain	Mid-slope	Mid-slope	Foot of slope	Mid-slope	Flat terrain	Flat terrain	Mid-slope	Mid-slope	Mid-slope
Slope Incline	Small slope : incline of 4% to 8%	Small slope : incline of 4% to 8%	Smooth slope : incline of 4% to 15%	Small slope : incline of 4% to 8%	Smooth slope : incline of 4% to 15%	Small slope : incline of 4% to 8%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	Small slope : incline of 4% to 8%	Smooth slope : incline of 4% to 15%	Moderate slope : incline of 16% to 30%
Humus Type	Peat	Peat	Mor	Mor	Mor	Mor	Mor	Mor	Mor	Mor	Moder
Humus Thickness (cm)	30	30	15	2	5	5	10	5	5	15	3
Soil Type	Mesisol	Humo-Ferric Podzol	Humo-Ferric Podzol	Humo-Ferric Podzol	Humo-Ferric Podzol	Humo-Ferric Podzol	Humo-Ferric Podzol	Ferro-Humic Podzol	Humo-Ferric Podzol	Brunisol	Humo-Ferric Podzol
Von Post 20 cm	Mesic									Humic	
Von Post 60 cm										Humic	
Soil Texture	30 cm org. mat. on fine sandy loam	Fine sandy loam	Medium sandy loam	Medium sandy loam	Medium sandy loam	Fine sandy loam	Medium sandy loam	Very fine sandy loam	Medium sandy loam	Org. mat .on coarse sand	Medium sandy loam
Pierrosity (%)	10	20	15	25	20	5	50		25	10	20
Surface Deposit	Thin organic	Undifferentiated till	Undifferentiated till	Undifferentiated till	Undifferentiated till	Undifferentiated till	Weathered rocks	Alluviaux ancien	Undifferentiated till	Organic in undifferentiated till	Undifferentiated till
Deposit Thickness (cm)	60	50	80	15	40	70	20	130	40	60	50
Drainage	Poor with no modificator	Moderate with no modificator	Good with no modificator	Good with no modificator	Moderate with no modificator	Moderate with no modificator	Good with no modificator	Moderate with no modificator	Moderate with no modificator	Moderate with basic mineral lateral drainage	Good with no modificator
Water Table Depth (cm)	25										
Forest Cover	25% to 40%	25% to 40%	25% to 40%	6% to 24%	6% to 24%	6% to 24%	6% to 24%	6% to 24%	41% to 60%	41% to 60%	41% to 60%
Tree Hight	12 to 17 m	7 to 12 m	12 to 17 m	7 to 12 m	7 to 12 m	7 to 12 m	4 to 7 m	4 to 7 m	12 to 17 m	12 to 17 m	7 to 12 m
Stand Age	90	70	90	50	70	70	50	50	90	90	90
Arborescent Strata	50	35	35	15	15	20	15	20	50	50	45
Tall Shrub Strata	30	20	15	15	15	15	5	10	30	10	25
Low Shrub Strata	50	75	60	45	70	50	25	30	25	50	45
Herb Strata	50	30	15	10	10	3	3	5	15	30	40
Moss Strata	90	80	85	80	90	85	70	90	80	80	30
Water	0	0	0	0	0	0	0	0	0	0	0
Organic Matter	0	0	0	0	0	0	0	0	0	0	0
Bedrock, Rock and Gravel	0	0	0	0	0	0	20	0	0	0	0
Dead Wood	5	5	5	0	5	0	0	5	10	5	0
Litter	0	0	0	0	0	0	0	0	5	0	35
Bare Soil	0	0	0	5	0	0	0	0	o	0	0

Appendix A.1: Description of Vegetation Sampling Plots in Forested Upland in the Study Area

Habitat Status	Forested Upland Habitats										
Ecosystem	Open Spruce-Moss Forest		Open Spruce-Lichen Forest						Closed Spruce-Moss Forest		Birch Forest
Sampling Plot	PN3	PN4	PN2	CL1	LA1	LA2	PC1	PC2	PB1	PN1	BE1
Vascular Plants											
Dendrolycopodium dendroideum						a					
Diphasiastrum complanatum				a		a			a		1
Diphasiastrum sabinifolium				a							
Diphasiastrum sitchense			a				a	a			
Spinulum annotinum										1	2
Spinulum canadense	1		a	1	1	1	a	a	1		1
Equisetum sylvaticum	2	1	2					1			
Gymnocarpium dryopteris											1
Dryopteris carthusiana											a
Abies balsamea	1								1		
Larix laricina	a	1	1	a	a	1	1	1			
Picea glauca	1		1	2	2	2		1	3	a	2
Picea mariana	3	2	3	1	1	1	2	2		3	
Juniperus communis var. *depressa*						a					
Listera cordata var. *cordata*	a										
Luzula parviflora subsp. *melanocarpa*	a										
Carex brunnescens subsp. *brunnescens*						a					
Carex capillaris										a	
Carex deflexa var. *deflexa*						a					
Carex magellanica subsp. *irrigua*	a										
Carex vaginata		1	a							2	
Calamagrostis canadensis var. *canadensis*	a	a					a				
Deschampsia flexuosa	a		a	a	a	a	a	a	a		1
Coptis trifolia		a	a								
Ribes glandulosum						a					1
Mitella nuda		1								1	
Salix glauca var. *cordifolia*	r	a								1	
Salix humilis var. *humilis*						a			a		
Salix pellita			a								
Salix planifolia	1	1								a	
Salix vestita			a							2	
Amelanchier bartramiana				a							
Rubus chamaemorus	1	1									
Rubus idaeus subsp. *strigosus*											1
Sibbaldia tridentata						a					
Sorbus decora											a
Alnus viridis subsp. *crispa*	1			a		a			1		2
Betula cordifolia											3
Betula glandulosa	2	2	2	2	4	3	1	1	3		2
Betula minor											2
Chamerion angustifolium subsp. *angustifolium*	a		a	a	a	a	a	a	a		a
Geocaulon lividum			1			a	a		1	1	
Moehringia macrophylla										a	
Cornus canadensis	2	1	1	1	2	1	a		2	1	1
Trientalis borealis		a		a		a			a	a	1
Arctous alpina				1	1	1					
Chamaedaphne calyculata							a				
Empetrum nigrum subsp. *nigrum*	2	1	1	1	2	2	1	1	1	2	a
Gaultheria hispidula	1	1								1	

Appendix A.1: Description of Vegetation Sampling Plots in Forested Upland in the Study Area

Habitat Status	Forested Upland Habitats										
Ecosystem	Open Spruce-Moss Forest		Open Spruce-Lichen Forest						Closed Spruce-Moss Forest		Birch Forest
Sampling Plot	PN3	PN4	PN2	CL1	LA1	LA2	PC1	PC2	PB1	PN1	BE1
Kalmia polifolia	1	1					a	a			
Kalmia procumbens						1					
Moneses uniflora	a										
Orthilia secunda	a	a	a							a	
Rhododendron groenlandicum	2	3	3	2	3	2	2	1	2	3	2
Vaccinium angustifolium	1		1	1	2	2	1	1	1	1	2
Vaccinium boreale				1	1	1	1	2			
Vaccinium caespitosum	1	1	1						2	1	1
Vaccinium oxycoccos	1	1									
Vaccinium uliginosum		2	1	2	2	2	2	1	1	1	1
Vaccinium vitis-idaea	1	1	1	1	2	1	1	1	1	1	1
Petasites frigidus var. *palmatus*	1	1	1			a				1	
Solidago macrophylla	1	1	1	1	a					1	a
Viburnum edule											1
Lonicera villosa		1									
Linnaea borealis subsp. *longiflora*	a	1							a	2	1
Mosses, liverworts and lichens											
Cetraria islandica				a							
Cladina mitis	a	1		1		1		2		2	
Cladina rangiferina	a	1		1	1	1		1	1	4	
Cladina stellaris	1	1	2	4	2	2	4	3	1	1	
Dicranum sp.		a							1		1
Flavocetraria nivalis				1			a				
Hylocomium splendens		1	1							1	
Nephroma arcticum		a				a				a	
Peltigera aphthosa	a	a	a		a				a	a	
Peltigera elisabethae	a	a				a			a	a	
Pleurozium schreberi	3	3	3	1	4	3	1	1	3	2	
Polytrichum strictum							a				
Ptilidium ciliare				a		1	a	a			
Ptilium crista-castrensis	2	2	1						2	2	2
Racomitrium heterostichum							1				
Sphagnum angustifolium	1	1									
Sphagnum capillifolium		a				a	a			1	
Sphagnum rubellum	1	2									
Stereocaulon sp.				1		1	1	1			

Appendix A.2: Description of Vegetation Sampling Plots in Non-Forested Upland in the Study Area

Habitat Status	Non-Forested Upland Habitats							
Ecosystem	**Post-Fire Conifer Regeneration**	**Shrubland**			**Slightly Weathered Rock Barren**		**Human Disturbances**	**Exposed Gravel and Sand**
Sampling Plot	**BR1**	**PT1**	**AU1**	**LA3**	**DA1**	**DA2**	**IA**	**LC1B**
Date	2012-08-22	2012-08-14	2012-08-15	2012-08-20	2012-08-21	2012-08-21		2012-08-17
Latitude (dg:min:sec)	54°41'21,20"	54°53'51,70"	54°52'36,30"	54°54'11,10"	54°50'09,30"	54°50'05,70"		54°53'32,20"
Longitude (dg:min:sec)	66°38'40,90"	66°31'09,90"	66°30'55,70"	66°31'51,30"	66°33'32,80"	66°33'42,60"		66°31'06,00"
Altitude (m)	545	527	559	558	471	468		510
Exposition	Est	West	Est	South-West	Total	Total		East
Topographic Location	Slope Plateau	Foot of slope	Summit of slope	Summit of slope	Flat terrain	Flat terrain		Foot of slope
Slope Incline	Small slope : incline of 4% to 8%	Smooth slope : incline of 4% to 15%	Small slope : incline of 4% to 8%	Moderate slope : incline of 16% to 30%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%		Small slope : incline of 4% to 8%
Humus Type	Mor	Mor	Moder	Mor	Rocks	Rocks		Gravel and sand
Humus Thickness (cm)	5	5	15	10				
Soil Type	Humo-Ferric Podzol	Humo-Ferric Podzol	Humo-Ferric Podzol	Humo-Ferric Podzol				Humo-Ferric Podzol
Von Post 20 cm								
Von Post 60 cm								
Soil Texture	Fine sandy loam	Coarse sandy loam		Fine sandy loam				Medium sandy loam
Pierrosity (%)	20	60	25	15	80	100		10
Surface Deposit	Undifferentiated till	Old rock slides	Weathered rocks	Undifferentiated till	Weathered rocks	Weathered rocks		Beach
Deposit Thickness (cm)	35	15	20	50				50
Drainage	Moderate with no modificator	Good with lateral drainage	Moderate with no modificator	Good with no modificator	Complex	Fast with no modificator		Moderate with no modificator
Water Table Depth (cm)					15			
Forest Cover	1% to 5%			6% to 24%				
Tree Hight	2.0 m to 4 m		2.0 m to 4 m	12 to 17 m				
Stand Age	Regeneration			90				
Arborescent Strata	0	5	5	10	0	0		0
Tall Shrub Strata	10	90	100	80	3	0		25
Low Shrub Strata	60	25	25	25	20	15		15
Herb Strata	5	50	10	50	15	1		10
Moss Strata	70	20	15	80	30	15		5
Water	0	0	0	0	0	0		10
Organic Matter	0	0	0	0	0	0		0
Bedrock, Rock and Gravel	10	0	0	0	50	70		5
Dead Wood	5	0	5	0	0	0		3
Litter	0	20	75	10	0	0		10
Bare Soil	5	0	0	0	0	0		40

Appendix A.2: Description of Vegetation Sampling Plots in Non-Forested Upland in the Study Area

Habitat Status	Non-Forested Upland Habitats							
Ecosystem	**Post-Fire Conifer Regeneration**	**Shrubland**			**Slightly Weathered Rock Barren**		**Human Disturbances**	**Exposed Gravel and Sand**
Sampling Plot	**BR1**	**PT1**	**AU1**	**LA3**	**DA1**	**DA2**	**IA**	**LC1B**
Vascular Plants								
Dendrolycopodium dendroideum				a				
Diphasiastrum complanatum	a			a	a	a	a	
Diphasiastrum sabinifolium	a							
Diphasiastrum sitchense					a			a
Huperzia appressa					a			
Lycopodium lagopus								a
Spinulum annotinum			1	2				2
Spinulum canadense	a	2	1	a	a		1	1
Equisetum arvense							1	
Equisetum sylvaticum							1	1
Gymnocarpium dryopteris						r		
Dryopteris carthusiana			a					
Larix laricina	1		1		1	a	a	
Picea glauca	a	1	1	2	a	a	1	2
Picea mariana	1				1	a	1	
Juniperus communis var. *depressa*	r					r		a
Juncus bufonius							a	
Juncus castaneus							a	
Juncus filiformis							1	1
Luzula parviflora subsp. *melanocarpa*		a					1	a
Carex atratiformis							a	
Carex brunnescens subsp. *brunnescens*					1			a
Carex crawfordii							a	
Carex deflexa var. *deflexa*					a	a		
Carex lenticularis var. *lenticularis*							a	1
Carex trisperma								1
Carex vaginata					a			
Trichophorum cespitosum					a			
Agrostis scabra							1	1
Agrostis stolonifera							1	
Calamagrostis canadensis var. *canadensis*					1		2	2
Cinna latifolia					1		a	
Deschampsia flexuosa	a			a	a		1	1
Elymus repens							a	
Festuca rubra subsp. *rubra*							1	
Lolium perenne							a	
Poa annua							1	
Poa compressa							1	
Poa palustris						a	1	
Trisetum spicatum							a	
Ribes glandulosum		1	1	1	a		1	1
Mitella nuda							1	
Parnassia kotzebuei							a	
Viola labradorica								1
Populus balsamifera							a	
Salix argyrocarpa								2
Salix glauca var. *cordifolia*					r		1	a
Salix humilis var. *humilis*	a				a			
Salix pedicellaris					a			
Salix pellita							1	1
Salix planifolia					a	a	2	1

Appendix A.2: Description of Vegetation Sampling Plots in Non-Forested Upland in the Study Area

Habitat Status	Non-Forested Upland Habitats							
Ecosystem	**Post-Fire Conifer Regeneration**	**Shrubland**			**Slightly Weathered Rock Barren**		**Human Disturbances**	**Exposed Gravel and Sand**
Sampling Plot	**BR1**	**PT1**	**AU1**	**LA3**	**DA1**	**DA2**	**IA**	**LC1B**
Salix pyrifolia					a			
Trifolium hybridum							a	
Vicia cracca							1	
Potentilla norvegica							1	1
Rubus arcticus subsp. *acaulis*							1	
Rubus chamaemorus					a			
Rubus idaeus subsp. *strigosus*		a					1	1
Sorbus decora								r
Alnus viridis subsp. *crispa*		2	4	2			2	3
Betula glandulosa	2	4	2	4	1	1		2
Betula minor							a	
Chamerion angustifolium subsp. *angustifolium*	a				a		1	1
Epilobium hornemannii subsp. *hornemannii*							a	
Barbarea vulgaris							a	
Geocaulon lividum							a	
Rumex acetosella							a	
Rumex crispus							1	
Cerastium fontanum subsp. *vulgare*							a	
Minuartia groenlandica								r
Stellaria graminea							a	
Cornus canadensis	a	1	1	1			1	1
Trientalis borealis		a	1	1			a	1
Arctous alpina	1							
Chamaedaphne calyculata					a			
Empetrum nigrum subsp. *nigrum*	1				1	1	1	1
Kalmia polifolia					1			
Kalmia procumbens	a							
Moneses uniflora			a					
Orthilia secunda			a					
Rhododendron groenlandicum	1	3	1	3	1	1	2	1
Vaccinium angustifolium	2	2		2	1		1	1
Vaccinium boreale	a							
Vaccinium caespitosum		1						1
Vaccinium uliginosum	2	1		1	1	1	1	2
Vaccinium vitis-idaea	1	1	1	1	1	a		1
Galium trifidum subsp. *trifidum*								a
Plantago major							1	
Veronica serpyllifolia subsp. *serpyllifolia*							1	
Rhinanthus minor subsp. *groenlandicus*							1	
Achillea millefolium							1	
Crepis tectorum							a	
Hieracium caespitosum							a	
Leucanthemum vulgare							a	
Matricaria discoidea							1	
Omalotheca norvegica								r
Petasites frigidus var. *palmatus*							a	a
Solidago macrophylla	a	1	1	1	a	a	1	1
Symphyotrichum puniceum var. *puniceum*							a	a
Taraxacum lapponicum								r
Taraxacum officinale							1	
Viburnum edule		1						
Linnaea borealis subsp. *longiflora*				a			a	

Appendix A.2: Description of Vegetation Sampling Plots in Non-Forested Upland in the Study Area

Habitat Status	Non-Forested Upland Habitats							
Ecosystem	Post-Fire Conifer Regeneration	Shrubland			Slightly Weathered Rock Barren		Human Disturbances	Exposed Gravel and Sand
Sampling Plot	BR1	PT1	AU1	LA3	DA1	DA2	IA	LC1B
Mosses, Liverworts and Lichens								
Bazzania trilobata			a					
Cetraria islandica	1							
Cladina mitis	3							
Cladina rangiferina	1			1	1	1		
Cladina stellaris	2			1	1	1		
Dicranum polysetum			a					
Dicranum sp.			1	1				
Flavocetraria nivalis	1				a			
Hylocomium splendens			1					
Pleurozium schreberi	1	3	2	4		a	2	2
Polytrichum commune			a		1			1
Polytrichum juniperinum	1							
Polytrichum piliferum					a			
Ptilidium ciliare	1							
Ptilium crista-castrensis		1	1	1				
Racomitrium heterostichum	a				1	1		
Stereocaulon sp.	2				1	1		

Appendix A.2: Description of Vegetation Sampling Plots in Non-Forested Upland in the Study Area

Habitat Status	Non-Forested Upland Habitats											
Ecosystem	Moderately Weathered Rock Barren						Highly Weathered Rock Barren					
Sampling Plot	EB1	TA1	AL3	AL7	AL8	PL1*	AL1	AL2	AL4	AL6	DE1	DE2
Date	2012-08-15	2012-08-15	2012-08-15	2012-08-20	2012-08-22	2012-08-24	2012-08-14	2012-08-15	2012-08-16	2012-08-20	2012-08-23	2012-08-23
Latitude (dg:min:sec)	54°52'36,00"	54°52'45,80"	54°52'58,50"	54°54'04,10"	54°51'26,10"	54°53'06,50"	54°53'46,00"	54°52'38,30"	54°53'06,30"	54°54'14,40"	54°41'14,70"	54°39'41,80"
Longitude (dg:min:sec)	66°30'48,90"	66°30'33,30"	66°30'59,00"	66°31'32,40"	66°33'24,70"	66°31'44,90"	66°30'56,50"	66°30'59,90"	66°30'36,60"	66°32'10,60"	66°38'59,20"	66°39'21,60"
Altitude (m)	538	510	536	530	614	543	549	559	531	589	475	474
Exposition	East	West	Total	Total	Total	North-east	Total	Total	Total	Total	South	North
Topographic Location	Mid-slope	Summit of slope	Round summit	Round summit	Round summit	Mid-slope	Round summit	Round summit	Round summit	Round summit	Mid-slope	Mid-slope
Slope Incline	Strong slope : incline of 31% to 40%	Strong slope : incline of 31% to 40%	Small slope : incline of 4% to 8%	Smooth slope : incline of 4% to 15%	Small slope : incline of 4% to 8%	Moderate slope : incline of 16% to 30%	No slope : incline of 0% to 3%	Small slope : incline of 4% to 8%	Small slope : incline of 4% to 8%	Small slope : incline of 4% to 8%	Small slope : incline of 4% to 8%	Smooth slope : incline of 4% to 15%
Humus Type	Rocks	Rocks	Rocks	Rocks	Rocks	Rocks	Rocks	Rocks	Rocks	Rocks	Rocks	Cryptogammic crust
Humus Thickness (cm)		2										2
Soil Type		Cryosol	Cryosol		Cryosol		Cryosol	Cryosol	Cryosol	Cryosol	Cryosol	Cryosol
Von Post 20 cm												
Von Post 60 cm												
Soil Texture		Medium sandy loam			Medium sandy loam		Fine sandy loam	Medium sandy loam	Coarse sandy loam	Fine sandy loam		Sandy clay loam
Pierrosity (%)	90	75	50	25	20	90	80	25	25	20	50	
Surface Deposit	Colluvial weathered rocks	Weathered rocks	Weathered rocks	Weathered rocks	Patterned ground	Bedrock	Patterned ground	Patterned ground	Weathered rocks	Patterned ground	Weathered soils	Weathered soils
Deposit Thickness (cm)		5		10	30		15	20	25	50	15	130
Drainage	Fast with no modificator	Fast with no modificator	Good with no modificator	Fast with no modificator	Good with no modificator	Fast with no modificator	Good with no modificator	Good with no modificator	Good with no modificator	Good with no modificator	Complex	Poor with seepage
Water Table Depth (cm)												
Forest Cover				1% to 5%								
Tree Hight				4 to 7 m								
Stand Age				30								
Arborescent Strata	0	0	0	10	0	0	0	0	0	0	0	0
Tall Shrub Strata	0	0	0	5	0	0	0	5	3	0	0	20
Low Shrub Strata	15	30	40	50	25	15	30	20	50	35	15	40
Herb Strata	0	10	0	5	1	1	0	1	0	0	15	15
Moss Strata	70	25	50	40	20	5	30	20	45	35	10	40
Water	0	0	0	0	0	0	0	0	0	0	0	0
Organic Matter	0	0	0	0	0	0	0	0	0	0	0	0
Bedrock, Rock and Gravel	85	40	30	40	40	80	35	60	10	30	20	0
Dead Wood	0	0	0	0	0	0	0	0	0	0	0	0
Litter	0	0	0	0	0	0	0	0	0	0	0	0
Bare Soil	0	15	0	0	15	0	5	5	20	20	60	30

Appendix A.2: Description of Vegetation Sampling Plots in Non-Forested Upland in the Study Area

Habitat Status	Non-Forested Upland Habitats											
Ecosystem	Moderately Weathered Rock Barren						Highly Weathered Rock Barren					
Sampling Plot	EB1	TA1	AL3	AL7	AL8	PL1*	AL1	AL2	AL4	AL6	DE1	DE2
Vascular Plants												
Diphasiastrum complanatum		a										
Diphasiastrum sabinifolium			r									
Diphasiastrum sitchense												a
Huperzia appressa		a	r		a							a
Lycopodium lagopus												a
Spinulum canadense	a	a		a			a					a
Equisetum arvense											1	1
Equisetum sylvaticum											1	1
Gymnocarpium dryopteris	r	a										
Woodsia ilvensis		a					r					
Dryopteris campyloptera		a										
Larix laricina		a		2			a	a	a	a	a	2
Picea glauca	a	1	1	2	a		1	1	1	1		a
Picea mariana	a	a						1			a	1
Juniperus communis var. *depressa*		a									a	
Tofieldia pusilla											a	a
Platanthera dilatata var. *dilatata*												a
Juncus castaneus												a
Juncus filiformis												a
Juncus triglumis var. *albescens*											1	1
Luzula parviflora subsp. *melanocarpa*												a
Carex bigelowii subsp. *bigelowii*					a		r			a		
Carex deflexa var. *deflexa*		a					r					
Carex glacialis					r		a		r	r		
Trichophorum alpinum											1	
Agrostis mertensii		a					r					
Agrostis scabra												1
Calamagrostis canadensis var. *langsdorfii*		a										
Deschampsia flexuosa		1										a
Vahlodea atropurpurea												a
Ribes glandulosum								r				
Viola renifolia		a										
Salix arctophila											a	
Salix argyrocarpa								r				1
Salix glauca var. *cordifolia*					r						r	
Salix humilis var. *humilis*	a		a									
Salix planifolia		a										a
Salix uva-ursi					a		a		a			
Salix vestita					a						a	
Amelanchier bartramiana		a										
Fragaria virginiana subsp. *glauca*												a
Rubus idaeus subsp. *strigosus*		a										
Myrica gale												1
Alnus viridis subsp. *crispa*	a			1	1		1	1				
Betula glandulosa	1	1	1	1	a		1	a	2	1	a	
Betula minor		a					r					
Betula pumila var. *glandulifera*											a	
Chamerion angustifolium subsp. *angustifolium*		a	a		a					a		1
Epilobium palustre												a
Geocaulon lividum		a										
Arenaria humifusa					r							
Minuartia groenlandica					a		r	a	a			
Moehringia macrophylla		r										
Cornus canadensis		a		a								

Appendix A.2: Description of Vegetation Sampling Plots in Non-Forested Upland in the Study Area

Habitat Status	**Non-Forested Upland Habitats**											
Ecosystem	**Moderately Weathered Rock Barren**						**Highly Weathered Rock Barren**					
Sampling Plot	**EB1**	**TA1**	**AL3**	**AL7**	**AL8**	**PL1***	**AL1**	**AL2**	**AL4**	**AL6**	**DE1**	**DE2**
Trientalis borealis		a										
Diapensia lapponica subsp. *lapponica*										a		
Arctous alpina	a	1	2	2	1		1	1	2	1	a	
Empetrum nigrum subsp. *nigrum*	1	1	2	2	2		1	1	2	1	a	
Gaultheria hispidula												a
Kalmia polifolia												a
Kalmia procumbens										a		
Moneses uniflora		a										
Orthilia secunda		a										
Pyrola minor		a										a
Rhododendron groenlandicum	1		a	a				a		a		1
Vaccinium angustifolium		a	a								a	a
Vaccinium boreale			a									1
Vaccinium oxycoccos												a
Vaccinium uliginosum	1	1	2	2	1		1	1	2	1	1	1
Vaccinium vitis-idaea	1	1	2	1	1		a	1	2	1		a
Pedicularis groenlandica												a
Antennaria neglecta												a
Petasites frigidus var. *palmatus*												a
Solidago macrophylla		a										a
Solidago multiradiata					a							a
Linnaea borealis subsp. *longiflora*												a
Mosses, Liverworts and Lichens												
Alectoria nigricans					a							
Alectoria ochroleuca	1		1	1	a		a	1	1	1		
Cetraria islandica	a	a	1	a	a		a	a	1	1		
Cetraria laevigata		a										
Cladina mitis			2	1			1	1	2	1	a	
Cladina rangiferina	1	a								a		
Cladina stellaris	2	1	2	1			1	1	2	1		a
Flavocetraria nivalis	a	a	1	1	1		a	1	1	1		
Nephroma arcticum												a
Pleurozium schreberi				1			a	a		a		1
Polytrichum commune												a
Polytrichum juniperinum	a			a						a		
Ptilidium ciliare	a		1	1			a	a		a		
Racomitrium heterostichum		a		a	a		a				a	
Racomitrium lanuginosum					a		a			a		
Stereocaulon sp.		1	1	1	1		a		2	1	a	a

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands					
Ecosystem	Forested Fen		Horizontal Fen	Northern-Ribbed Fen		
Sampling Plot	MU2	RU2	FE5	FE3	FE4	PL2*
Date	2012-08-18	2012-08-21	2012-08-23	2012-08-18	2012-08-21	2012-08-24
Latitude (dg:min:sec)	54°52'59,70"	54°50'38,60"	54°41'11,40"	54°53'05,60"	54°50'47,30"	54°53'03,50"
Longitude (dg:min:sec)	66°36'18,10"	66°33'47,00"	66°39'03,20"	66°36'23,10"	66°33'50,40"	66°32'42,40"
Altitude (m)	492	476	476	491	476	498
Exposition	Total	Total	Total	Total	Total	Total
Topographic Location	Open depression	Open depression	Open depression	Closed depression	Closed depression	Open depression
Slope Incline	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%
Humus Type	Anmoor	Anmoor	Peat	Peat	Peat	Peat
Humus Thickness (cm)						
Soil Type	Humisol	Humisol	Mesisol	Fibrisol	Mesisol	Fibrisol
Von Post 20 cm	Humic	Humic	Mesic	Fibric	Mesic	Fibric
Von Post 60 cm	Humic	Humic	Mesic	Mesic	Mesic	Fibric
Soil Texture	70 cm org. mat. on clay	Organique soils	Organique soils	Organique soils	Organique soils	Organique soils
Pierrosity (%)	15	10				
Surface Deposit	Deep organic	Deep organic	Deep organic	Deep organic	Deep organic	Deep organic
Deposit Thickness (cm)	90	60	130	130	130	130
Drainage	Very poor with seepage	Complex	Poor with no modificator	Very poor with no modificator	Very poor with no modificator	Very poor with no modificator
Water Table Depth (cm)	20	25		Surface	Surface	Surface
Forest Cover	6% to 24%	6% to 24%				
Tree Hight	12 to 17 m	7 to 12 m				
Stand Age	90	70				
Arborescent Strata	15	20	0	0	0	0
Tall Shrub Strata	15	35	5	5	0	0
Low Shrub Strata	65	55	0	20	25	35
Herb Strata	50	50	80	80	60	70
Moss Strata	80	70	100	40	45	65
Water	5	10	0	5	10	0
Organic Matter	0	0	0	10	10	5
Bedrock, Rock and Gravel	0	0	0	0	0	0
Dead Wood	0	10	0	5	0	0
Litter	0	5	0	0	0	0
Bare Soil	0	0	0	0	0	0

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands					
Ecosystem	Forested Fen		Horizontal Fen	Northern-Ribbed Fen		
Sampling Plot	MU2	RU2	FE5	FE3	FE4	PL2*
Vascular Plants						
Spinulum canadense					a	
Selaginella selaginoides	a	a	a	a	a	
Equisetum arvense	1	1		a		
Equisetum fluviatile	1		a	1		
Equisetum sylvaticum	2	2		a	1	
Equisetum variegatum subsp. *variegatum*	a					
Larix laricina	1	2	2	1	1	
Picea glauca	a			a		
Picea mariana	3	2	a	1	2	
Juniperus communis var. *depressa*		a			a	
Nuphar variegata				1		
Tofieldia pusilla				a		
Triantha glutinosa				1		
Triglochin maritima			a	1	a	
Platanthera aquilonis				a		
Platanthera dilatata var. *dilatata*	a			1	a	
Spiranthes romanzoffiana			a	a	a	
Maianthemum trifolium	1	1	1	1	1	
Juncus triglumis var. *albescens*				1	a	
Luzula parviflora subsp. *melanocarpa*	a		a			
Carex aquatilis var. *aquatilis*	1		3	1	1	
Carex canescens subsp. *canescens*		2				
Carex chordorrhiza				1		
Carex diandra			2			
Carex disperma	1	a				
Carex exilis				2	3	
Carex gynocrates	a	a	2	a		
Carex leptalea	1	a	1	1		
Carex limosa			1	2	1	
Carex livida				2	1	
Carex magellanica subsp. *irrigua*	1	1				
Carex pauciflora				a	1	
Carex rariflora var. *rariflora*	1		1			
Carex rostrata				1	1	
Carex tenuiflora	a					
Carex trisperma		1			1	
Carex utriculata					1	
Carex vaginata	2	2	1	1	2	
Carex vesicaria					1	
Eriophorum russeolum subsp. *russeolum*		1		a		
Eriophorum viridicarinatum	1		a	1	a	
Trichophorum alpinum	1		a	2	1	
Trichophorum cespitosum				2	2	
Agrostis mertensii				a		
Calamagrostis canadensis var. *canadensis*	2	1		1	1	
Deschampsia flexuosa					a	
Elymus trachycaulus subsp. *trachycaulus*	a			a		
Glyceria striata	a	a				
Poa palustris		a				
Vahlodea atropurpurea					a	
Ranunculus lapponicus	a	a				
Ribes triste	1					
Mitella nuda	1	1	a	a		

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands					
Ecosystem	Forested Fen		Horizontal Fen	Northern-Ribbed Fen		
Sampling Plot	MU2	RU2	FE5	FE3	FE4	PL2*
Viola labradorica		a				
Salix arctophila	1	1	1	1		
Salix argyrocarpa		1				
Salix ballii	1		1			
Salix glauca var. *cordifolia*	a					
Salix pedicellaris	1	1			2	
Salix pellita	1					
Salix planifolia	1	1				
Salix vestita	1	1	1			
Amelanchier bartramiana		a				
Dasiphora fruticosa	1		1	1		
Geum rivale	2					
Rubus arcticus subsp. *acaulis*	1	1	a	1	1	
Rubus chamaemorus	2	2		1	1	
Rubus pubescens	1	a				
Myrica gale			1	2	1	
Betula glandulosa	2	1				
Betula michauxii				1	1	
Betula pumila var. *glandulifera*	2	2	2	1	2	
Chamerion angustifolium subsp. *angustifolium*	1					
Epilobium hornemannii subsp. *hornemannii*	a					
Epilobium palustre	a	a	a			
Geocaulon lividum					a	
Drosera anglica				1		
Drosera intermedia				a		
Drosera rotundifolia				a	a	
Bistorta vivipara	1	a		a		
Cornus canadensis	1	a				
Andromeda polifolia var. *latifolia*	1		a		1	
Chamaedaphne calyculata				a	1	
Empetrum nigrum subsp. *nigrum*	1	1		1	1	
Gaultheria hispidula	1			a	a	
Kalmia polifolia			a	a	1	
Monotropa uniflora	a					
Orthilia secunda	a					
Pyrola asarifolia			a	a		
Pyrola minor	a					
Rhododendron groenlandicum	2	2	1	1	1	
Vaccinium caespitosum	1					
Vaccinium oxycoccos	1	1		1		
Vaccinium uliginosum		1	1	1	1	
Galium labradoricum			a			
Castilleja septentrionalis				a	a	
Pinguicula vulgaris				a		
Utricularia intermedia				1		
Utricularia minor				1		
Menyanthes trifoliata					1	
Eurybia radula	1	1		2	2	
Petasites frigidus var. *palmatus*	1	a				
Solidago macrophylla	a					
Solidago uliginosa	1		a	1	1	
Symphyotrichum puniceum var. *puniceum*	1					
Heracleum maximum	a					
Viburnum edule	a					

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands					
Ecosystem	Forested Fen		Horizontal Fen	Northern-Ribbed Fen		
Sampling Plot	MU2	RU2	FE5	FE3	FE4	PL2*
Lonicera villosa	1	1		1	1	
Linnaea borealis subsp. *longiflora*	1					
Mosses, Liverworts and Lichens						
Aulacomnium palustre		a			1	
Bazzania trilobata		a				
Cladina mitis				a	a	
Cladina rangiferina				a	1	
Cladina stellaris				a		
Drepanocladus sp.	a					
Hylocomium splendens	2	2				
Mylia anomala				a	a	
Paludella squarrosa	a		a	a		
Ptilidium ciliare		1				
Ptilium crista-castrensis		a				
Scorpidium scorpioides				1	1	
Sphagnum angustifolium	2					
Sphagnum fuscum				a	1	
Sphagnum pulchrum				1	1	
Sphagnum rubellum	2	3	2	1		
Sphagnum warnstorfii			2	2	2	
Tomentypnum nitens	1	1	2	2	2	

* No plant list in sampling plot

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands						
Ecosystem	Shrub Swamp		Forested Bog		Temporary Pond		
Sampling Plot	LC1A	MR1	MU1	TB1	TE1	TE2	LC2
Date	2012-08-17	2012-08-22	2012-08-16	2012-08-21	2012-08-14	2012-08-16	2012-08-20
Latitude (dg:min:sec)	54°53'48,20"	54°39'41,80"	54°53'06,30"	54°50'07,50"	54°53'52,50"	54°53'09,20"	54°54'02,40"
Longitude (dg:min:sec)	66°31'15,80"	66°39'14,70"	66°30'24,90"	66°33'27,60"	66°31'15,60"	66°30'45,00"	66°31'25,90"
Altitude (m)	508	467	480	476	517	509	518
Exposition	West	Total	Total	Total	No	No	Total
Topographic Location	Foot of slope	Flat terrain	Open depression	Flat terrain	Closed depression	Closed depression	Closed depression
Slope Incline	Small slope : incline of 4% to 8%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%
Humus Type	Moder	Leaves on sand	Peat	Peat	Mor	Sand	Mor
Humus Thickness (cm)	5				5		5
Soil Type	Humo-Ferric Podzol	Humo-Ferric Podzol	Mesisol	Mesisol	Humo-Ferric Podzol		
Von Post 20 cm			Mesic	Mesic			
Von Post 60 cm				Humic			
Soil Texture	Medium sandy loam	Very fine sandy loam	Organique soils	Organique soils	Coarse sandy loam	Coarse sandy loam	Fine sandy loam
Pierrosity (%)	15		20	10		25	15
Surface Deposit	Undifferentiated till	Ancient alluvial	Thin organic sur roche	Thin organic	Undifferentiated till	Undifferentiated till	Undifferentiated till
Deposit Thickness (cm)	80	130	40	60	20	15	30
Drainage	Moderate with no modificator	Poor with no modificator	Very poor with no modificator	Poor with no modificator	Complex	Complex	Complex
Water Table Depth (cm)			5	30	Surface		20
Forest Cover			6% to 24%	25% to 40%	1% to 5%		
Tree Hight			12 to 17 m	4 to 7 m	17 to 22 m		
Stand Age			70	50	90		
Arborescent Strata	0	0	20	25	5	0	0
Tall Shrub Strata	50	90	10	5	40	0	15
Low Shrub Strata	25	5	60	45	30	1	15
Herb Strata	30	60	50	20	20	20	50
Moss Strata	5	35	70	90	90	35	70
Water	10	10	10	0	40	70	15
Organic Matter	0	0	0	0	0	0	0
Bedrock, Rock and Gravel	0	0	0	0	0	20	0
Dead Wood	5	0	0	5	5	0	0
Litter	30	15	0	0	0	0	0
Bare Soil	20	0	0	0	0	0	0

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands						
Ecosystem	Shrub Swamp		Forested Bog		Temporary Pond		
Sampling Plot	LC1A	MR1	MU1	TB1	TE1	TE2	LC2
Vascular Plants							
Diphasiastrum sitchense	a					a	
Lycopodium lagopus	a						
Spinulum annotinum	2	a					
Spinulum canadense	1		1		1		
Equisetum sylvaticum	1	1	1				
Abies balsamea					a		
Larix laricina		1	1	1	1		
Picea glauca	2	1			2		
Picea mariana			2	3			
Juniperus communis var. *depressa*	a						
Listera cordata var. *cordata*			r				
Maianthemum trifolium			1	1			
Juncus filiformis	1		a			2	3
Luzula parviflora subsp. *melanocarpa*	a	a	a				a
Carex aquatilis var. *aquatilis*		2	a				
Carex arcta			a				a
Carex brunnescens subsp. *brunnescens*	a	1	1				a
Carex canescens subsp. *canescens*			1	a		a	a
Carex deflexa var. *deflexa*						a	
Carex disperma		1					
Carex lenticularis var. *lenticularis*	1						2
Carex limosa			1				
Carex magellanica subsp. *irrigua*		1	2	1			
Carex pauciflora				1			
Carex rariflora var. *rariflora*			2				
Carex trisperma	1		1	1			
Carex utriculata			a				
Carex vesicaria			a			2	a
Eriophorum russeolum subsp. *russeolum*			a				
Eriophorum vaginatum			a	a			
Trichophorum cespitosum				a			
Agrostis mertensii			a				
Agrostis scabra	1	1				1	2
Calamagrostis canadensis var. *canadensis*	2	2				a	2
Cinna latifolia		a					
Deschampsia flexuosa	1				2	a	
Elymus trachycaulus subsp. *trachycaulus*		a					
Glyceria striata		1					
Poa glauca subsp. *glauca*		a					
Vahlodea atropurpurea			a				
Coptis trifolia		a	a				
Ranunculus abortivus		a					
Ranunculus flammula var. *reptans*							a
Ranunculus lapponicus			a				
Ribes glandulosum	1	a					
Ribes triste		1					
Mitella nuda		1					
Viola labradorica	1	1				2	1
Viola macloskeyi		1	a				
Salix arctophila			a				
Salix argyrocarpa	2	3	1				2
Salix glauca var. *cordifolia*	a						1

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands						
Ecosystem	Shrub Swamp		Forested Bog		Temporary Pond		
Sampling Plot	LC1A	MR1	MU1	TB1	TE1	TE2	LC2
Salix humilis var. *humilis*							a
Salix pellita	1						1
Salix planifolia	1	3	a				1
Comarum palustre		1					
Fragaria virginiana subsp. *glauca*		2					
Geum rivale		1					
Potentilla norvegica	1						1
Rubus arcticus subsp. *acaulis*		1	a				
Rubus chamaemorus			1	2			
Rubus idaeus subsp. *strigosus*	1						
Rubus pubescens		1					
Sorbus decora	r						
Urtica dioica subsp. *gracilis*		a					
Myrica gale		1					
Alnus viridis subsp. *crispa*	3						1
Betula glandulosa	2	1	2	1	3	1	1
Betula pumila var. *glandulifera*		1					
Chamerion angustifolium subsp. *angustifolium*	1		a				
Epilobium palustre		a					
Geocaulon lividum				a	a		
Bistorta vivipara		a					
Minuartia groenlandica	r						
Stellaria borealis subsp. *borealis*		a					
Cornus canadensis	1		1		2	a	
Trientalis borealis	1	a	a		a		
Chamaedaphne calyculata			3	2			
Empetrum nigrum subsp. *nigrum*	1		2	1	2		
Gaultheria hispidula				1			
Kalmia polifolia			1	1			a
Pyrola minor		a					
Rhododendron groenlandicum	1		1	2	1		1
Vaccinium angustifolium	1	a	a	1	1		
Vaccinium caespitosum	1	1	1		2		
Vaccinium oxycoccos				1			
Vaccinium uliginosum	2	1	1	1	2	1	1
Vaccinium vitis-idaea	1		a	1	1		
Galium labradoricum		a					
Galium trifidum subsp. *trifidum*	a						a
Omalotheca norvegica	r						
Petasites frigidus var. *palmatus*	a		a				
Solidago macrophylla	1	a			a		
Symphyotrichum puniceum var. *puniceum*	a						
Taraxacum lapponicum	r	a					
Lonicera villosa		1					
Linnaea borealis subsp. *longiflora*		a					
Mosses, Liverworts and Lichens							
Aulacomnium palustre	a		a				1
Bazzania trilobata		a					
Cetraria islandica			a				
Cetraria laevigata					1		
Cladina mitis			a	a	2		
Cladina rangiferina			a	a			
Cladina stellaris			a	a	1		

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands						
Ecosystem	Shrub Swamp		Forested Bog		Temporary Pond		
Sampling Plot	LC1A	MR1	MU1	TB1	TE1	TE2	LC2
Dicranum sp.					1		
Mylia anomala				a			
Nephroma arcticum					a		
Peltigera aphthosa					a		
Pleurozium schreberi	2	1		2	2		
Polytrichum commune	1		a	1	2	3	3
Polytrichum juniperinum					1		
Ptilidium ciliare		1					
Sphagnum angustifolium		1	1	2	a		
Sphagnum capillifolium				1			
Sphagnum compactum					a	a	
Sphagnum cuspidatum			1				
Sphagnum fuscum			2	2			
Sphagnum rubellum		a	3	3			
Sphagnum tenellum			a				
Stereocaulon sp.					2		
Tomentypnum nitens		1					

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands					
Ecosystem	Riparian Fen					Forested Swamp
Sampling Plot	FE2	RU1	RV2	LC3	RU3	RU4
Date	2012-08-16	2012-08-18	2012-08-22	2012-08-23	2012-08-23	2012-08-23
Latitude (dg:min:sec)	54°52'54,00"	54°53'33,60"	54°39'39,00"	54°41'11,70"	54°41'18,80"	54°41'13,60"
Longitude (dg:min:sec)	66°30'05,40"	66°36'22,60"	66°39'13,60"	66°38'55,10"	66°39'04,40"	66°39'14,00"
Altitude (m)	495	478	468	473	478	477
Exposition	Total	Total	West	South	South	No
Topographic Location	Open depression	Open depression	Foot of slope Shoreline	Shoreline	Mid-slope	Open depression
Slope Incline	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	Smooth slope : incline of 4% to 15%	No slope : incline of 0% to 3%	Small slope : incline of 4% to 8%	Small slope : incline of 4% to 8%
Humus Type	Peat	Moder	Rocks	Anmoor	Peat	Anmoor
Humus Thickness (cm)		5				
Soil Type	Fibrisol	Humo-Ferric Podzol	Ferro-Humic Podzol	Humisol	Humisol	
Von Post 20 cm	Fibric			Humic	Humic	
Von Post 60 cm	Mesic			Humic		
Soil Texture	Organique soils	Fine sandy loam	Fine sandy loam	Organique soils		Coarse sandy loam
Pierrosity (%)		25			20	25
Surface Deposit	Deep organic	Recent alluvial	Recent alluvial	Deep organic	Thin organic	Recent alluvial
Deposit Thickness (cm)	130	60	130	130	40	30
Drainage	Very poor with seepage	Complex	Complex	Complex	Complex	Complex
Water Table Depth (cm)	5	20	10			
Forest Cover		6% to 24%		6% to 24%		25% to 40%
Tree Hight		7 to 12 m		7 to 12 m		22 m and more
Stand Age		50		70		120
Arborescent Strata	0	20	0	15	0	25
Tall Shrub Strata	0	5	30	25	20	50
Low Shrub Strata	5	65	25	30	60	30
Herb Strata	65	40	35	70	35	70
Moss Strata	100	70	20	20	70	35
Water	0	10	40	25	10	10
Organic Matter	0	0	0	0	10	0
Bedrock, Rock and Gravel	0	5	0	0	10	0
Dead Wood	0	0	0	0	5	5
Litter	0	0	0	0	0	5
Bare Soil	0	0	10	0	0	0

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands					
Ecosystem	Riparian Fen					Forested Swamp
Sampling Plot	FE2	RU1	RV2	LC3	RU3	RU4
Vascular Plants						
Selaginella selaginoides		a	a		a	
Equisetum arvense	a	2	1	a	1	a
Equisetum fluviatile		a		a		
Equisetum sylvaticum	a	a	1			
Equisetum variegatum subsp. *variegatum*					a	
Larix laricina	1	2	1	1	2	
Picea glauca			1	1	a	3
Picea mariana	1	2	1	a	a	
Juniperus communis var. *depressa*						a
Triglochin maritima		a			1	
Potamogeton pusillus subsp. *tenuissimus*				a		
Potamogeton richardsonii			a	a		
Streptopus amplexifolius						a
Platanthera dilatata var. *dilatata*		a			a	
Maianthemum canadense subsp. *canadense*				a		
Maianthemum trifolium	1			a		
Sparganium angustifolium			1	a		
Juncus balticus subsp. *littoralis*					a	
Juncus castaneus		a			a	
Juncus filiformis	1		1			
Juncus triglumis var. *albescens*		a			1	
Luzula parviflora subsp. *melanocarpa*		a		a	a	
Carex aquatilis var. *aquatilis*	4	1	2	2	1	
Carex atratiformis				a		1
Carex brunnescens subsp. *brunnescens*		1				
Carex canescens subsp. *canescens*	1	a				
Carex capillaris		a			a	
Carex disperma		a				
Carex echinata subsp. *echinata*			a			
Carex gynocrates		a		a	1	
Carex interior		a				
Carex lenticularis var. *lenticularis*		a				
Carex leptalea		a		a		
Carex limosa	a					
Carex magellanica subsp. *irrigua*	a	a				
Carex rariflora var. *rariflora*	1					
Carex scirpoidea subsp. *scirpoidea*					a	
Carex utriculata	1			a		
Carex vaginata		a			1	1
Eriophorum viridicarinatum		1			a	
Trichophorum alpinum		1			a	
Trichophorum cespitosum		1				
Agrostis scabra	a	a	a	1		
Bromus ciliatus				a		a
Calamagrostis canadensis var. *canadensis*	2	1	1	1		1
Elymus trachycaulus subsp. *trachycaulus*		a		a	a	1
Glyceria striata		a				
Poa pratensis subsp. *pratensis*				a		
Schizachne purpurascens		a				a
Vahlodea atropurpurea			a	a		
Actaea rubra subsp. *rubra*						a
Actaea rubra subsp. *rubra* f. *neglecta*						a

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands					
Ecosystem	Riparian Fen					Forested Swamp
Sampling Plot	FE2	RU1	RV2	LC3	RU3	RU4
Anemone parviflora					a	
Coptis trifolia					a	a
Ranunculus aquatilis var. *diffusus*			r			
Ranunculus hyperboreus	r					
Myriophyllum sibiricum			1	a		
Ribes triste				a		2
Mitella nuda				a	a	2
Parnassia kotzebuei		a				
Parnassia palustris				a	a	
Viola labradorica		a	a	1		1
Salix arctophila		1			1	
Salix argyrocarpa	2	1	2	2		
Salix ballii				2	a	1
Salix glauca var. *cordifolia*		1			1	
Salix pedicellaris	1					
Salix pellita	1	1	1			
Salix planifolia	2	1		1	1	1
Salix vestita		2		a	2	
Comarum palustre	1		1			
Dasiphora fruticosa		1		a	1	
Fragaria virginiana subsp. *glauca*			a	1	1	1
Geum rivale				1	1	1
Rubus arcticus subsp. *acaulis*	a	1	a	a		
Rubus chamaemorus	1					
Rubus idaeus subsp. *strigosus*		a				1
Rubus pubescens				1		2
Sanguisorba canadensis				a		1
Myrica gale		1	1	1		
Alnus viridis subsp. *crispa*		2		a		3
Betula glandulosa	1		1	a	2	1
Betula pumila var. *glandulifera*		1	a		a	1
Betula pumila var. *pumila*				2		
Chamerion angustifolium subsp. *angustifolium*				1	a	1
Epilobium palustre	a	a	a	a		
Cardamine nymanii			r			
Geocaulon lividum					4	
Bistorta vivipara		a	a	a	a	a
Stellaria borealis subsp. *borealis*				a		
Montia fontana		r				
Cornus canadensis		1		a		1
Trientalis borealis		a		a		a
Andromeda polifolia var. *latifolia*	1	1				
Chamaedaphne calyculata	1					
Empetrum nigrum subsp. *nigrum*	1				1	
Gaultheria hispidula	r				a	
Kalmia polifolia	1				a	
Moneses uniflora				a		
Orthilia secunda				a	a	
Pyrola asarifolia				a	a	
Pyrola minor			a			
Rhododendron groenlandicum	1	2		1	2	
Vaccinium angustifolium					1	
Vaccinium caespitosum			1			1

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	**Wetlands**					
Ecosystem	**Riparian Fen**					**Forested Swamp**
Sampling Plot	**FE2**	**RU1**	**RV2**	**LC3**	**RU3**	**RU4**
Vaccinium oxycoccos	1	1		a	a	
Vaccinium uliginosum	1	1	2	1	1	
Vaccinium vitis-idaea				a	a	a
Galium labradoricum	a			a		
Galium trifidum subsp. *trifidum*			a			
Galium triflorum						a
Callitriche hermaphroditica				a		
Hippuris vulgaris	1		a			
Castilleja septentrionalis		a	a	a	a	
Pedicularis groenlandica			a	a		
Rhinanthus minor subsp. *groenlandicus*				a		
Pinguicula vulgaris		a				
Menyanthes trifoliata	1					
Achillea millefolium				a		a
Eurybia radula		1				
Packera aurea						1
Petasites frigidus var. *palmatus*				a	a	
Solidago macrophylla		a			a	1
Solidago uliginosa		a			1	
Symphyotrichum puniceum var. *puniceum*					a	2
Taraxacum lapponicum						a
Heracleum maximum				a	a	2
Viburnum edule		1				1
Lonicera villosa		1	1			
Linnaea borealis subsp. *longiflora*				a	a	1
Mosses, Liverworts and Lichens						
Aulacomnium palustre	a					
Bazzania trilobata						1
Cladina mitis					a	
Cladopodiella fluitans	1					
Climacium dendroides				1		
Hylocomium splendens				2		2
Mylia anomala	1					
Paludella squarrosa		a		a		
Pleurozium schreberi					1	2
Polytrichum strictum	1					
Preissia quadrata		a				
Sphagnum angustifolium	4	1	2	1		
Sphagnum fuscum	1					
Sphagnum lindbergii	2					
Sphagnum pulchrum	1					
Sphagnum riparium	2					
Sphagnum rubellum	1			2		
Sphagnum tenellum	a					
Sphagnum warnstorfii		1		1	1	
Tomentypnum nitens	1	a		1	2	

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands				
Ecosystem	Flat Bog				
Sampling Plot	FE1	BO1	OM2	OM3	OM4
Date	2012-08-15	2012-08-16	2012-08-19	2012-08-21	2012-08-22
Latitude (dg:min:sec)	54°52'52,80''	54°53'00,30''	54°54'01,00''	54°50'06,30''	54°54'13,10''
Longitude (dg:min:sec)	66°30'34,50''	66°30'14,40''	66°32'05,20''	66°33'17,60''	66°31'33,50''
Altitude (m)	500	495	529	475	543
Exposition	Total	Total	Total	Total	Total
Topographic Location	Closed depression	Open depression	Closed depression	Closed depression	Closed depression
Slope Incline	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%	No slope : incline of 0% to 3%
Humus Type	Peat	Peat	Peat	Peat	Peat
Humus Thickness (cm)					
Soil Type	Fibrisol	Fibrisol	Fibrisol	Fibrisol	Fibrisol
Von Post 20 cm	Fibric	Fibric	Fibric	Fibric	Fibric
Von Post 60 cm	Fibric	Fibric	Fibric	Fibric	Fibric
Soil Texture	Organique soils	Organique soils	Organique soils	Organique soils	Organique soils
Pierrosity (%)					
Surface Deposit	Deep organic	Deep organic	Deep organic	Deep organic	Deep organic
Deposit Thickness (cm)	130	130	130	130	130
Drainage	Very poor with no modificator	Very poor with no modificator	Very poor with no modificator	Very poor with no modificator	Very poor with no modificator
Water Table Depth (cm)	Surface	Surface	Surface	Surface	5
Forest Cover					
Tree Hight					
Stand Age					
Arborescent Strata	0	0	0	0	0
Tall Shrub Strata	0	5	0	0	0
Low Shrub Strata	10	70	40	10	25
Herb Strata	45	50	35	40	23
Moss Strata	75	50	70	85	100
Water	20	25	5	5	0
Organic Matter	5	0	5	0	0
Bedrock, Rock and Gravel	0	0	0	0	0
Dead Wood	0	0	0	0	0
Litter	0	0	0	0	0
Bare Soil	0	0	0	0	0

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands				
Ecosystem	Flat Bog				
Sampling Plot	FE1	BO1	OM2	OM3	OM4
Vascular Plants					
Spinulum canadense					1
Equisetum arvense				a	
Abies balsamea					a
Larix laricina	1	1	a	a	1
Picea glauca					1
Picea mariana	1	1	2	2	
Scheuchzeria palustris	1			1	
Maianthemum trifolium	1	a	2	1	1
Juncus filiformis					2
Juncus triglumis var. *albescens*				a	
Carex aquatilis var. *aquatilis*		2			
Carex brunnescens subsp. *brunnescens*					1
Carex canescens subsp. *canescens*	a	a		a	1
Carex limosa	2	1	1	2	2
Carex livida				2	
Carex magellanica subsp. *irrigua*	1	a	1	2	1
Carex oligosperma			1	2	
Carex pauciflora	1		1	a	1
Carex rariflora var. *rariflora*		2	2	1	
Carex rostrata	2			2	2
Carex trisperma	1		1		
Carex utriculata				1	
Carex vesicaria					3
Eriophorum russeolum subsp. *russeolum*	a			a	1
Eriophorum viridicarinatum				a	
Trichophorum alpinum	a				
Trichophorum cespitosum	1	1	1	1	1
Calamagrostis canadensis var. *canadensis*		1	a		2
Deschampsia flexuosa					1
Coptis trifolia					a
Salix humilis var. *humilis*					1
Salix pedicellaris				a	
Amelanchier bartramiana					a
Rubus arcticus subsp. *acaulis*				a	
Rubus chamaemorus	1	a	2	1	1
Myrica gale			3	1	
Betula glandulosa	2	2	2	a	2
Betula michauxii				1	
Geocaulon lividum		a		a	
Drosera rotundifolia				a	
Cornus canadensis					2
Trientalis borealis					a
Andromeda polifolia var. *latifolia*			1	1	
Chamaedaphne calyculata	3	4	2	2	2
Empetrum nigrum subsp. *nigrum*	1	1	1	1	
Gaultheria hispidula			a	a	
Kalmia polifolia	1	1	1	1	1
Rhododendron groenlandicum	1		2	1	1
Vaccinium caespitosum					1
Vaccinium oxycoccos	1	1	1	1	1
Vaccinium uliginosum	1	1	1	1	2
Menyanthes trifoliata	1		1	1	1

Appendix A.3: Description of Vegetation Sampling Plots of the Wetlands in the Study Area

Habitat Status	Wetlands				
Ecosystem	Flat Bog				
Sampling Plot	FE1	BO1	OM2	OM3	OM4
Eurybia radula				a	
Viburnum edule					a
Mosses, Liverworts and Lichens					
Aulacomnium palustre				a	1
Cetraria laevigata				a	a
Cladina rangiferina				a	
Cladina stellaris				a	
Cladopodiella fluitans	1	1	1	1	a
Dicranum undulatum		a		a	
Drepanocladus sp.				1	2
Mylia anomala		a	a	a	
Pleurozium schreberi	1	a		1	
Polytrichum commune					2
Polytrichum strictum			1		
Ptilidium ciliare				1	
Scorpidium scorpioides	2				
Sphagnum angustifolium	1	1	1		
Sphagnum austinii					a
Sphagnum cuspidatum	1		1	1	2
Sphagnum fuscum	2	2	2	2	1
Sphagnum lindbergii		1	2	3	
Sphagnum magellanicum	2		1		a
Sphagnum majus					1
Sphagnum pulchrum	2	a			2
Sphagnum riparium	a				
Sphagnum rubellum	1	2	2	2	2
Sphagnum warnstorfii					1
Tomentypnum nitens		a		1	1

* No plant list in sampling plot

Appendix A.4: Description of Regional Vegetation Sampling Plots

Habitat Status	Outside the Study Area			
Ecosystem	**Swampy Bay River**	**Snow Patch**	**Alpine Summit**	**Northern-Ribbed Fen**
Sampling Plot	**RV1**	**CO1**	**AL5**	**T1**
Date	2012-08-19	2012-08-19	2012-08-19	2012-08-04
Latitude (dg:min:sec)	55°11'04,20"	55°03'05,50"	55°03'06,30"	55°02'24,00"
Longitude (dg:min:sec)	67°13'01,10"	67°13'46,90"	67°13'44,50"	67°55'27,00"
Altitude (m)	449	785	788	485
Exposition	South	West	Total	Total
Topographic Location	Shoreline	Foot of slope	Round summit	Flat terrain
Slope Incline	Small slope : incline of 4% to 8%	Small slope : incline of 4% to 8%	Small slope : incline of 4% to 8%	No slope : incline of 0% to 3%
Humus Type	Bedrock	Mor	Mor	Peat
Humus Thickness (cm)		2	5	
Soil Type		Cryosol	Cryosol	Humisol
Von Post 20 cm				Humic
Von Post 60 cm				Humic
Soil Texture		Fine sandy loam	Fine sandy loam	Organique soils
Pierrosity (%)	10	20	20	
Surface Deposit	Bedrock	Patterned soils	Patterned soils	Deep organic
Deposit Thickness (cm)		55	55	80
Drainage	Complex	Complex	Good with no modificator	Very poor with no modificator
Water Table Depth (cm)				Surface
Forest Cover				
Tree Hight				
Stand Age				
Arborescent Strata	0	0	0	0
Tall Shrub Strata	15	0	0	0
Low Shrub Strata	20	40	50	15
Herb Strata	20	15	15	60
Moss Strata	25	40	60	60
Water	10	10	0	10
Organic Matter	0	0	0	0
Bedrock, Rock and Gravel	45	20	20	0
Dead Wood	0	0	0	0
Litter	0	0	0	0
Bare Soil	0	0	0	0

Appendix A.4: Description of Regional Vegetation Sampling Plots

Habitat Status	Outside the Study Area			
Ecosystem	**Swampy Bay River**	**Snow Patch**	**Alpine Summit**	**Northern-Ribbed Fen**
Sampling Plot	**RV1**	**CO1**	**AL5**	**T1**
Vascular Plants				
Diphasiastrum alpinum		1		
Diphasiastrum complanatum		a		
Huperzia appressa	a	a	a	
Lycopodiella inundata	a			
Lycopodium lagopus		a		
Spinulum canadense		a		
Selaginella selaginoides	a	a		1
Equisetum arvense				1
Cystopteris fragilis	a			
Woodsia alpina	a			
Larix laricina	1		r	2
Picea glauca	1		r	
Picea mariana	1			2
Juniperus communis var. *depressa*	1			
Tofieldia pusilla	a			
Triglochin maritima				a
Potamogeton richardsonii	a			
Platanthera dilatata var. *dilatata*				a
Juncus trifidus		1	a	
Juncus triglumis var. *albescens*	1			1
Luzula confusa			a	
Luzula multiflora subsp. *frigida*		a		
Carex aquatilis var. *aquatilis*	a			2
Carex arctogena			a	
Carex atratiformis	a			
Carex bigelowii subsp. *bigelowii*		a	a	
Carex canescens subsp. *canescens*	a			
Carex capillaris			a	
Carex echinata subsp. *echinata*				1
Carex exilis				1
Carex glacialis			a	
Carex gynocrates	a			1
Carex lachenalii		r		
Carex limosa				3
Carex livida				1
Carex magellanica subsp. *irrigua*	1			1
Carex oligosperma	a			

Appendix A.4: Description of Regional Vegetation Sampling Plots

Habitat Status	Outside the Study Area			
Ecosystem	**Swampy Bay River**	**Snow Patch**	**Alpine Summit**	**Northern-Ribbed Fen**
Sampling Plot	**RV1**	**CO1**	**AL5**	**T1**
Carex rariflora var. *rariflora*				1
Carex scirpoidea subsp. *scirpoidea*	a		a	
Carex vaginata				1
Eriophorum viridicarinatum				1
Trichophorum alpinum				1
Trichophorum cespitosum	1		a	2
Agrostis mertensii	a	a	a	
Agrostis scabra	a			a
Calamagrostis canadensis var. *canadensis*	1			1
Calamagrostis canadensis var. *langsdorfii*		a	a	
Danthonia intermedia subsp. *intermedia*	1			
Deschampsia cespitosa subsp. *cespitosa*		a		
Deschampsia flexuosa		a		a
Elymus trachycaulus subsp. *trachycaulus*	a	a		
Festuca prolifera var. *lasiolepis*	a			
Poa arctica subsp. *arctica*			a	
Poa glauca subsp. *glauca*	r			
Schizachne purpurascens				a
Trisetum spicatum	1	a	a	
Vahlodea atropurpurea	a	a		
Anemone parviflora	1			
Coptis trifolia	a			
Parnassia palustris	a			
Viola macloskeyi		1		
Viola labradorica	1			
Salix arctophila	1	1		1
Salix glauca var. *cordifolia*	a		r	
Salix herbacea	a	1	1	
Salix pedicellaris	a			1
Salix planifolia	a	a	a	1
Salix uva-ursi		1	2	
Salix vestita	1	a		
Dasiphora fruticosa	1			
Dryas integrifolia subsp. *integrifolia*			a	
Fragaria virginiana subsp. *glauca*	a			
Rubus arcticus subsp. *acaulis*	1			1
Sibbaldia procumbens		1		
Sibbaldia tridentata	1			

Appendix A.4: Description of Regional Vegetation Sampling Plots

Habitat Status	Outside the Study Area			
Ecosystem	**Swampy Bay River**	**Snow Patch**	**Alpine Summit**	**Northern-Ribbed Fen**
Sampling Plot	**RV1**	**CO1**	**AL5**	**T1**
Myrica gale	a			2
Alnus viridis subsp. *crispa*	1			
Betula glandulosa	1		1	1
Chamerion angustifolium subsp. *angustifolium*	a			
Cardamine bellidifolia var. *bellidifolia*			a	
Cardamine nymanii	a			
Draba norvegica var. *norvegica*	a			
Drosera rotundifolia				1
Bistorta vivipara	1	1	1	
Arenaria humifusa	a			
Cerastium alpinum subsp. l*anatum*			a	
Minuartia dawsonensis				
Minuartia rubella	a			
Moehringia macrophylla	a			
Silene acaulis	a			
Cornus canadensis	1			
Primula laurentiana	1			
Trientalis borealis	a			
Diapensia lapponica subsp. *lapponica*			1	
Andromeda polifolia var. *latifolia*				1
Arctous alpina	1		2	
Chamaedaphne calyculata				2
Empetrum nigrum subsp. *nigrum*	1	1	2	1
Harrimanella hypnoides		2		
Kalmia polifolia				1
Kalmia procumbens			a	
Moneses uniflora	a			
Orthilia secunda	1			
Phyllodoce caerulea	1	a		
Pyrola grandiflora			a	
Pyrola minor				
Rhododendron groenlandicum	1	a	a	1
Vaccinium oxycoccos				1
Vaccinium uliginosum	1	1	2	1
Vaccinium vitis-idaea	1	a	1	
Callitriche palustris	a			
Veronica wormskjoldii		a		
Bartsia alpina		1		

Appendix A.4: Description of Regional Vegetation Sampling Plots

Habitat Status	Outside the Study Area			
Ecosystem	**Swampy Bay River**	**Snow Patch**	**Alpine Summit**	**Northern-Ribbed Fen**
Sampling Plot	**RV1**	**CO1**	**AL5**	**T1**
Castilleja septentrionalis		a		
Euphrasia frigida		a		
Euphrasia hudsoniana	a			
Rhinanthus minor subsp. *groenlandicus*	a			
Pinguicula vulgaris	1			
Menyanthes trifoliata				1
Achillea millefolium	1			
Antennaria monocephala subsp. *angustata*	1	a		
Eurybia radula				1
Oclemena nemoralis				1
Omalotheca supina		a		
Packera pauciflora		a		
Solidago macrophylla	1	1		
Solidago multiradiata	1	a		
Solidago uliginosa				1
Taraxacum lapponicum	a	a		
Lonicera villosa				1
Linnaea borealis subsp. *longiflora*	1			1
Mosses, Liverworts and Lichens				
Alectoria ochroleuca			1	
Cetraria islandica			2	
Cladina mitis	1	2	2	
Cladina rangiferina			1	
Cladina stellaris	1		1	
Flavocetraria nivalis			1	
Hylocomium splendens	1			
Pleurozium schreberi	1			
Preissia quadrata	a			
Ptilidium ciliare			2	
Racomitrium heterostichum	2			
Racomitrium lanuginosum		1	2	
Scorpidium scorpioides				2
Sphagnum angustifolium	1			
Sphagnum compactum		a		
Stereocaulon sp.	1	1		

Appendix B: List of Plants Present in the Study Area, their Wetland Status, Phytogeography, Status Rank, and General Status

Appendix B.1: Vascular Plant Species Present in the Study Area, their Wetland Status, Phytogeography, Status Rank and General Status

Vascular Plants								
Scientific Name	**English Name**	**Family**	**Wetland Status**	**Phytogeography**	**GRANK**	**NRANK**	**SRANK**	**General Status**
Dendrolycopodium dendroideum	Round-branched tree-clubmoss	Lycopodiaceae		Boreal north America and east Asia	G5	N5	S3S4	Secure
Diphasiastrum complanatum	Northern running-pine	Lycopodiaceae		Circumboreal	G5	N5	S5	Secure
Diphasiastrum sabinifolium	Cedar like clubmoss	Lycopodiaceae		Boreal northeastern America	G4	NNR	SNA	---
Diphasiastrum sitchense	Sitka club-moss	Lycopodiaceae		Boreal north America and east Asia	G5	NNR	S3S4	Secure
Huperzia appressa	Mountan fir-moss	Lycopodiaceae		Arctic-alpine north America	G4G5	N4N5	SNR	Undetermined
Lycopodium lagopus	One-cone clubmoss	Lycopodiaceae		Circumboreal	G5	N5	S4S5	Secure
Spinulum annotinum	Stiff clubmoss	Lycopodiaceae		Circumboreal	G5	N5	S5	Secure
Spinulum canadense	Northern interrupted club-moss	Lycopodiaceae		Circumboreal	G5	N5	S5	Secure
Selaginella selaginoides	Northern spike-moss	Selaginellaceae	Facultative	Circumboreal	G5	NNR	S4S5	Secure
Equisetum arvense	Field horsetail	Equisetaceae		Cosmopolitan	G5	N5	S5	Secure
Equisetum fluviatile	River horsetail	Equisetaceae	Obligate	Circumboreal	G5	N5	S3S4	Secure
Equisetum sylvaticum	Woodland horsetail	Equisetaceae	Facultative	Circumboreal	G5	N5	S5	Secure
Equisetum variegatum subsp. *variegatum*	Variegated scouring rush	Equisetaceae	Facultative	Circumboreal	G5T5	N5	S3	Sensitive
Gymnocarpium dryopteris	Common oak fern	Cystopteridaceae		Circumboreal	G5	N5	S5	Secure
Woodsia ilvensis	Rusty cliff fern	Woodsiaceae		Circumboreal	G5	N5	S3S4	Secure
Dryopteris campyloptera	Mountain wood fern	Dryopteridaceae		Boreal northeastern America	G5	NNR	S4	Secure
Dryopteris carthusiana	Spinulose wood fern	Dryopteridaceae		Circumtemperate	G5	N5	S4	Secure
Abies balsamea	Balsam fir	Pinaceae		Boreal north America	G5	N5	S5	Secure
Larix laricina	Tamarack	Pinaceae	Facultative	Circumboreal disjunct in Asia	G5	N5	S5	Secure
Picea glauca	White spruce	Pinaceae		Boreal north America	G5	N5	S5	Secure
Picea mariana	Black spruce	Pinaceae	Facultative	Boreal north America	G5	N5	S5	Secure
Juniperus communis var. *depressa*	Common juniper	Cupressaceae		Boreal north America	G5T5	N5	S4S5	Secure
Nuphar variegata	Variegated pond-lily	Nymphaeaceae	Obligate	Boreal north America	G5T5	N5	---	---
Tofieldia pusilla	Scotch false asphodel	Tofieldiaceae		Arctic-alpine circumpolar discontinuous repartition	G5	N5	S4S5	Secure
Triantha glutinosa	Sticky false asphodel	Tofieldiaceae	Facultative	Boreal north America	G4G5	NNR	S1S3	Undetermined
Scheuchzeria palustris	Rannoch-rush	Scheuchzeriaceae	Obligate	Circumboreal	G5	NNR	S3S5	Secure
Triglochin maritima	Seaside arrow-grass	Juncaginaceae	Obligate	Circumboreal	G5	N5	S4S5	Secure
Potamogeton richardsonii	Richardson's pondweed	Potamogetonaceae	Obligate	Circumboreal	G5	N5	S1S3	Undetermined
Potamogeton pusillus subsp. *tenuissimus*	Narrow-leaved small pondweed	Potamogetonaceae	Obligate	Circumboreal	G5T5	NNR	S1S3	Undetermined
Streptopus amplexifolius	Claspingleaf twisted-stalk	Liliaceae		Circumboreal disjunct in Asia	G5	NNR	S5	Secure
Listera cordata var. *cordata*	Heart-leaved twayblade	Orchidaceae	Facultative	Circumboreal	G5T5	N5	S3S5	Secure
Platanthera aquilonis	Northern green orchid	Orchidaceae	Facultative	Boreal north America	G5	N5	S2S3	May be at risk
Platanthera dilatata var. *dilatata*	Scentbottle	Orchidaceae	Facultative	Boreal north America	G5T5	N5	S4S5	Secure
Spiranthes romanzoffiana	Hooded lady's-tresses	Orchidaceae	Facultative	Boreal amphi-atlantic	G5	N5	S3S4	Secure
Maianthemum canadense subsp. *canadense*	Canadian may-lily	Asparagaceae		Boreal north America	G5	N5	S5	Secure
Maianthemum trifolium	Three-leaved false Solomon's seal	Asparagaceae	Obligate	Boreal north America and east Asia	G5	N5	S5	Secure
Sparganium angustifolium	Narrow-leaved bur-reed	Typhaceae	Obligate	Circumboreal disjunct in Asia	G5	NNR	S3S5	Secure
Juncus balticus subsp. *littoralis*	Shoreline rush	Juncaceae	Facultative	Circumboreal	G5	N5	S3S4	Secure
Juncus bufonius	Toad rush	Juncaceae	Facultative	Cosmopolitan	G5	N5	S2S4	Undetermined
Juncus castaneus	Chestnut rush	Juncaceae		Arctic-alpine circumpolar	G5	NNR	S4	Secure
Juncus filiformis	Thread rush	Juncaceae	Facultative	Circumboreal	G5	NNR	S4S5	Secure
Juncus triglumis var. *albescens*	Northern white rush	Juncaceae		Arctic-alpine circumpolar	G5	NNR	S3S4	Secure
Luzula parviflora subsp. *melanocarpa*	Small-flowered wood rush	Juncaceae		Circumboreal	G5T5	N5	S4S5	---
Carex aquatilis var. *aquatilis*	Water sedge	Cyperaceae	Obligate	Circumboreal	G5T5	N5	S3S5	Secure
Carex arcta	Northern cluster sedge	Cyperaceae	Obligate	Circumboreal	G5	N5	SNR	Undetermined
Carex atratiformis	Scrabrous black sedge	Cyperaceae	Facultative	Boreal north America	G5	NNR	S3S5	Secure
Carex bigelowii subsp. *bigelowii*	Bigelow's sedge	Cyperaceae	Facultative	Arctic-alpine circumpolar	G5TNR	NNR	S3S5	Secure
Carex brunnescens subsp. *brunnescens*	Brownish sedge	Cyperaceae	Facultative	Circumboreal	G5T5	N5	S3S5	Secure
Carex canescens subsp. *canescens*	Silvery sedge	Cyperaceae	Obligate	Circumboreal	G5T5	N5	S3S5	Secure
Carex capillaris	Hairlike sedge	Cyperaceae	Facultative	Circumpolar	G5	N5	S3S5	Secure
Carex chordorrhiza	Creeping sedge	Cyperaceae	Obligate	Circumboreal	G5	N5	S3	Sensitive
Carex crawfordii	Crawford's sedge	Cyperaceae		Boreal north America	G5	N5	S3S4	Undetermined
Carex deflexa var. *deflexa*	Northern sedge	Cyperaceae		Boreal north America	G5	N5	S3S5	Secure
Carex diandra	Lesser panicled sedge	Cyperaceae	Obligate	Circumboreal	G5	N5	S2S4	Undetermined

Appendix B.1: Vascular Plant Species Present in the Study Area, their Wetland Status, Phytogeography, Status Rank and General Status

Vascular Plants								
Scientific Name	**English Name**	**Family**	**Wetland Status**	**Phytogeography**	**GRANK**	**NRANK**	**SRANK**	**General Status**
Carex disperma	Softleaf sedge	Cyperaceae	Obligate	Circumboreal	G5	N5	S3S5	Secure
Carex echinata subsp. *echinata*	Star sedge	Cyperaceae	Obligate	Circumboreal discontinuous repartition	G5T5	N5	S3S5	Secure
Carex exilis	Meagre sedge	Cyperaceae	Obligate	Boreal northeastern America	G5	N5	S3S5	Secure
Carex glacialis	Glacial sedge	Cyperaceae		Arctic-alpine circumpolar	G5	NNR	S2S3	Sensitive
Carex gynocrates	Northern bog sedge	Cyperaceae	Obligate	Circumboreal	G5	N5	S3S4	Secure
Carex interior	Inland sedge	Cyperaceae	Obligate	Boreal north America	G5	N5	S2S4	Undetermined
Carex lenticularis var. *lenticularis*	Lakeshore sedge	Cyperaceae	Obligate	Boreal north America	G5T5	N5	S4S5	Secure
Carex leptalea	Bristlystalked sedge	Cyperaceae	Obligate	Boreal north America	G5	N5	S3S5	Secure
Carex limosa	Mud sedge	Cyperaceae	Obligate	Circumboreal	G5	N5	S5	Secure
Carex livida	Livid sedge	Cyperaceae	Obligate	Circumboreal disjunct repartition	G5	N5	S3S5	Secure
Carex magellanica subsp. *irrigua*	Boreal bog sedge	Cyperaceae	Obligate	Circumboreal	G5T5	N5	S4S5	Secure
Carex oligosperma	Fewseed sedge	Cyperaceae	Obligate	Boreal northeastern America	G5	N5	S5	Secure
Carex pauciflora	Fewflower sedge	Cyperaceae	Obligate	Circumboreal	G5	N5	S4S5	Secure
Carex rariflora var. *rariflora*	Loose-flowered alpine sedge	Cyperaceae		Circumboreal	G5	N5	S4S5	Secure
Carex rostrata	Swollen beaked sedge	Cyperaceae	Obligate	Circumboreal	G5	NNR	S4S5	Secure
Carex scirpoidea subsp. *scirpoidea*	Northern singlespike sedge	Cyperaceae		Arctic-alpine north America and east Asia	G5	N5	S3S5	Secure
Carex tenuiflora	Sparseflower sedge	Cyperaceae	Obligate	Circumboreal	G5	N5	S3S5	Secure
Carex trisperma	Threeseeded sedge	Cyperaceae	Obligate	Boreal north America	G5	N5	S4S5	Secure
Carex utriculata	Northwest Territory sedge	Cyperaceae	Obligate	Circumboreal	G5	N5	SNR	Undetermined
Carex vaginata	Sheathed sedge	Cyperaceae	Obligate	Circumboreal	G5	N5	S3S5	Secure
Carex vesicaria	Blister sedge	Cyperaceae	Obligate	Circumboreal	G5	N5	S4S5	Secure
Eriophorum russeolum subsp. *russeolum*	Russet cotton-grass	Cyperaceae		Circumboreal	G5	NNR	SNR	---
Eriophorum vaginatum	Tussock cotton-grass	Cyperaceae	Obligate	Boreal north America	G5	N5	S5	Secure
Eriophorum viridicarinatum	Thinleaf cotton-sedge	Cyperaceae	Obligate	Boreal north America	G5	N5	S3S4	Secure
Trichophorum alpinum	Alpine clubrush	Cyperaceae	Obligate	Circumboreal	G5	N5	S3S5	Secure
Trichophorum cespitosum	Tufted clubrush	Cyperaceae		Circumboreal	G5	N5	S5	Secure
Agrostis mertensii	Northern bentgrass	Poaceae		Circumboreal discontinuous repartition	G5	NNR	S3S5	Secure
Agrostis scabra	Rough bentgrass	Poaceae		Boreal north America	G5	N5	S3S5	Secure
Agrostis stolonifera	Creeping bentgrass	Poaceae	Facultative	Introduced	G5	N5	S2S4	Undetermined
Bromus ciliatus	Fringed brome	Poaceae	Facultative	Boreal north America	G5T5	N5	S3S5	Secure
Calamagrostis canadensis var. *canadensis*	Bluejoint	Poaceae	Facultative	Boreal north America	G5T5	N5	SNR	Undetermined
Calamagrostis canadensis var. *langsdorfii*	Bluejoint	Poaceae		Circumboreal	G5T5	N5	SNR	Undetermined
Cinna latifolia	Drooping woodreed	Poaceae		Circumboreal	G5	N5	S3S5	Secure
Deschampsia flexuosa	Northern interrupted club-moss	Poaceae		Circumboreal disjunct repartition	G5	N5	S4S5	Secure
Elymus repens	Quackgrass	Poaceae		Introduced	GNR	NNA	SNA	Exotic/Alien
Elymus trachycaulus subsp. *trachycaulus*	Slender wheatgrass	Poaceae		Boreal north America	G5T5	N5	SNR	Undetermined
Festuca rubra subsp. *rubra*	Red fescue	Poaceae		Circumboreal	G5T5	N5	S4S5	Secure
Glyceria striata	Ridged glyceria	Poaceae	Obligate	Boreal north America	G5	N5	S3S5	Secure
Lolium perenne	Perennial ryegrass	Poaceae		Introduced	GNR	NNA	---	Exotic/Alien
Poa annua	Annual bluegrass	Poaceae		Introduced	GNR	NNA	SNA	Exotic/Alien
Poa compressa	Canada bluegrass	Poaceae		Introduced	GNR	NNR	SNA	Exotic/Alien
Poa glauca subsp. *glauca*	Glaucous bluegrass	Poaceae		Arctic-alpine circumpolar	G5T5	N5	S3S4	Secure
Poa palustris	Fowl bluegrass	Poaceae	Facultative	Circumboreal	G5	N5	SNA	Exotic/Alien
Poa pratensis subsp. *pratensis*	Kentucky bluegrass	Poaceae		Introduced	G5T5	N5	---	Exotic/Alien
Schizachne purpurascens	False melic	Poaceae		Circumboreal disjunct repartition	G5	N5	S2S4	Undetermined
Trisetum spicatum	Spike trisetum	Poaceae		Circumboreal	G5	NNR	S3S5	Secure
Vahlodea atropurpurea	Mountain hairgrass	Poaceae		Boreal amphi-atlantic	G5	NNR	S2S4	Undetermined
Actaea rubra subsp. *rubra*	Red baneberry	Ranunculaceae		Boreal north America	G5T5	NNR	S3S4	Secure
Actaea rubra subsp. *rubra f. neglecta*	White baneberry	Ranunculaceae		Boreal north America	G5T5	NNR	S3S4	Secure
Anemone parviflora	Small-flowered anemone	Ranunculaceae		Boreal north America	G5	NNR	S3S4	Secure
Coptis trifolia	Goldthread	Ranunculaceae		Boreal north America	G5	N5	S5	Secure
Ranunculus abortivus	Littleleaf buttercup	Ranunculaceae	Facultative	Boreal north America	G5	NNR	S3S4	Undetermined
Ranunculus aquatilis var. *diffusus*	White water crowfoot	Ranunculaceae	Obligate	Circumboreal	G5	NNR	S3S5	Secure
Ranunculus flammula var. *reptans*	Creeping spearwort	Ranunculaceae	Facultative	Circumboreal	G5T5	N5	S4S5	Secure

Appendix B.1: Vascular Plant Species Present in the Study Area, their Wetland Status, Phytogeography, Status Rank and General Status

Vascular Plants								
Scientific Name	**English Name**	**Family**	**Wetland Status**	**Phytogeography**	**GRANK**	**NRANK**	**SRANK**	**General Status**
Ranunculus hyperboreus	High northern buttercup	Ranunculaceae		Arctic-alpine circumpolar	G5	NNR	S3S5	Secure
Ranunculus lapponicus	Lapland buttercup	Ranunculaceae	Obligate	Circumboreal	G5	NNR	S2S3	Sensitive
Myriophyllum sibiricum	Siberian water-milfoil	Haloragaceae	Obligate	Circumboreal discontinuous repartition	G5	NNR	SNR	May be at risk
Ribes glandulosum	Skunk currant	Grossulariaceae	Facultative	Boreal north America	G5	N5	S5	Secure
Ribes triste	Red currant	Grossulariaceae	Obligate	Boreal north America and east Asia	G5	NNR	S3S4	Secure
Mitella nuda	Naked miterwort	Saxifragaceae	Facultative	Boreal north America and east Asia	G5	NNR	S3S4	Secure
Parnassia kotzebuei	Kotzebue's grass of Parnassus	Celastraceae	Facultative	Arctic-alpine north America and east Asia	G5	N5	S3S4	Sensitive
Parnassia palustris	Marsh-grass-of-Parnassus	Celastraceae	Obligate	Arctic-alpine circumpolar	G5	NNR	S3S5	Undetermined
Viola labradorica	Labrador violet	Violaceae		Boreal north America	G5	NNR	S4S5	Secure
Viola macloskeyi	Smooth white violet	Violaceae	Obligate	Boreal north America	G5	NNR	S5	Secure
Viola renifolia	Kidney-leaved violet	Violaceae		Boreal north America	G5	NNR	S1S3	Undetermined
Populus balsamifera	Balsam poplar	Salicaceae	Facultative	Boreal north America	G5	N5	S3	Sensitive
Salix arctophila	Northern willow	Salicaceae		Arctic-alpine north America	G5	NNR	S4S5	Secure
Salix argyrocarpa	Labrador willow	Salicaceae		Boreal northeastern America	G4	N4	S4S5	Secure
Salix ballii	Ball's willow	Salicaceae		Boreal northeastern America	G5?	NNR	S2S4	Undetermined
Salix glauca var. *cordifolia*	Beautiful willow	Salicaceae		Boreal northeastern America	G5T3T5	NNR	S5	Secure
Salix humilis var. *humilis*	Prairie willow	Salicaceae		Boreal northeastern America	G5T5	NNR	S3S5	Secure
Salix pedicellaris	Bog willow	Salicaceae	Obligate	Boreal north America	G5	NNR	S2S4	Sensitive
Salix pellita	Satiny willow	Salicaceae	Obligate	Boreal northeastern America	G5	NNR	S3S4	Secure
Salix planifolia	Tea-leaved willow	Salicaceae		Boreal north America	G5	NNR	S5	Secure
Salix pyrifolia	Balsam willow	Salicaceae	Facultative	Boreal north America	G5	NNR	S3S5	Secure
Salix uva-ursi	Bearberry willow	Salicaceae		Arctic-alpine northeastern America	G5	NNR	S4S5	Secure
Salix vestita	Hairy willow	Salicaceae		Boreal north America	G5	NNR	S3S4	Secure
Trifolium hybridum	Alsike clover	Fabaceae		Introduced	GNR	NNA	SNA	Exotic/Alien
Vicia cracca	Bird vetch	Fabaceae		Introduced	GNR	NNA	SNA	Exotic/Alien
Amelanchier bartramiana	Oblongfruit serviceberry	Rosaceae		Boreal northeastern America	G5	NNR	S3S5	Secure
Comarum palustre	Purple marshlocks	Rosaceae	Obligate	Circumboreal	G5	NNR	S3S5	Secure
Dasiphora fruticosa	Shrubby cinquefoil	Rosaceae	Facultative	Circumboreal	G5	NNR	S3S4	Secure
Fragaria virginiana subsp. *glauca*	Virginia strawberry	Rosaceae		Boreal north America	G5T5?	N5?	SNR	Undetermined
Geum rivale	Purple avens	Rosaceae	Obligate	Boreal amphi-atlantic	G5	NNR	S3S4	Undetermined
Potentilla norvegica	Rough cinquefoil	Rosaceae		Circumboreal	G5	NNR	S3S5	Secure
Rubus arcticus subsp. *acaulis*	Dwarf raspberry	Rosaceae		Boreal north America	G5T5	N5	S3S5	Secure
Rubus chamaemorus	Cloudberry	Rosaceae	Facultative	Circumboreal	G5	NNR	S5	Secure
Rubus idaeus subsp. *strigosus*	Grayleaf red raspberry	Rosaceae		Boreal north America and east Asia	G5T5	N5	S4S5	Secure
Rubus pubescens	Dwarf red blackberry	Rosaceae	Facultative	Boreal north America	G5	NNR	S4S5	Secure
Sanguisorba canadensis	Canadian burnet	Rosaceae	Facultative	Boreal northeastern America	G5	NNR	S3S5	Secure
Sibbaldia tridentata	Shrubby fivefingers	Rosaceae		Boreal north America	G5	NNR	S3S5	Secure
Sorbus decora	Northern mountain ash	Rosaceae		Boreal northeastern America	G4G5	NNR	S3S5	Secure
Urtica dioica subsp. *gracilis*	Slender stinging nettle	Urticaceae	Facultative	Boreal north America	G5T5	N5	S2S3	Sensitive
Myrica gale	Sweet gale	Myricaceae	Obligate	Circumboreal disjunct repartition in Asia	G5	NNR	S5	Secure
Alnus viridis subsp. *crispa*	American green alder	Betulaceae		Boreal north America and Asia	G5TNR	N5	S5	Secure
Betula cordifolia	Heartleaf birch	Betulaceae		Boreal northeastern America	G5T5	NNR	---	Secure
Betula glandulosa	Resin birch	Betulaceae	Facultative	Boreal north America	G5	N5	S5	Secure
Betula michauxii	Newfoundland dwarf birch	Betulaceae		Boreal northeastern America	G3G4	N2N4	S5	Secure
Betula minor	Dwarf white birch	Betulaceae		Boreal northeastern America	G4Q	N4	S4S5	Secure
Betula pumila var. *glandulifera*	Northern bog birch	Betulaceae	Obligate	Boreal north America	G5	N5	S5	Secure
Betula pumila var. *pumila*	Southern bog birch	Betulaceae	Obligate	Boreal north America	G5	N5	S5	Secure
Chamerion angustifolium subsp. *angustifolium*	Fireweed	Onagraceae		Circumboreal	G5T5	N5	---	Secure
Epilobium hornemannii subsp. *hornemannii*	Hornemann's willowherb	Onagraceae		Circumboreal	G5T5	NNR	S3S4	Secure
Epilobium palustre	Marsh willowherb	Onagraceae	Obligate	Circumboreal	G5	NNR	S5	Secure
Barbarea vulgaris	Garden yellowrocket	Brassicaceae		Introduced	GNR	NNA	SNA	Exotic/Alien
Cardamine nymanii	Nyman's Cuckooflower	Brassicaceae		Circumboreal	G5T5	N4N5	S3S4	Secure
Geocaulon lividum	False toadflax	Santalaceae		Boreal north America	G5	NNR	S5	Secure
Drosera anglica	English sundew	Droseraceae	Obligate	Circumboreal	G5	NNR	S5	Secure

Appendix B.1: Vascular Plant Species Present in the Study Area, their Wetland Status, Phytogeography, Status Rank and General Status

Vascular Plants								
Scientific Name	**English Name**	**Family**	**Wetland Status**	**Phytogeography**	**GRANK**	**NRANK**	**SRANK**	**General Status**
Drosera intermedia	Spoonleaf sundew	Droseraceae	Obligate	Circumtemperate	G5	NNR	S4S5	Secure
Drosera rotundifolia	Roundleaf sundew	Droseraceae	Obligate	Circumboreal	G5	N5	S5	Secure
Bistorta vivipara	Alpine bistort	Polygonaceae		Arctic-alpine circumpolar	G5	NNR	S5	Secure
Rumex acetosella	Sheep sorrel	Polygonaceae		Introduced	GNR	NNA	SNA	Exotic/Alien
Rumex crispus	Curly dock	Polygonaceae		Introduced	GNR	NNA	SNA	Exotic/Alien
Arenaria humifusa	Creeping sandwort	Caryophyllaceae		Arctic-alpine amphi-atlantic trans-american repartition	G4	NNR	S3	Sensitive
Cerastium fontanum subsp. *vulgare*	Big chickweed	Caryophyllaceae		Introduced	GNRTNR	NNA	SNA	Exotic/Alien
Minuartia groenlandica	Greenland stitchwort	Caryophyllaceae		Boreal northeastern America	G5	NNR	S3S4	Secure
Moehringia macrophylla	Largeleaf sandwort	Caryophyllaceae		Boreal north America	G5	NNR	SNR	Undetermined
Stellaria borealis subsp. *borealis*	Boreal starwort	Caryophyllaceae	Obligate	Circumboreal discontinuous repartition	G5T5	N5	S4S5	Secure
Stellaria graminea	Grasslike starwort	Caryophyllaceae		Introduced	GNR	NNA	SNA	Exotic/Alien
Montia fontana	Water blinks	Montiaceae	Facultative	Circumpolar disjunct repartition	G5	NNR	S3S4	Secure
Cornus canadensis	Bunchberry	Cornaceae		Boreal north America	G5	N5	S5	Secure
Trientalis borealis	Starflower	Primulaceae		Boreal north America	G5	NNR	S5	Secure
Diapensia lapponica subsp. *lapponica*	Pincushion plant	Diapensiaceae		Arctic-alpine amphi-atlantic	G5T3T5	NNR	S4S5	Secure
Andromeda polifolia var. *latifolia*	Glaucous-leaved bog rosemary	Ericaceae	Obligate	Boreal northeastern America	G5T5	NNR	---	Secure
Arctous alpina	Alpine bearberry	Ericaceae		Arctic-alpine circumpolar	G5	NNR	S5	Secure
Chamaedaphne calyculata	Leatherleaf	Ericaceae	Obligate	Circumboreal	G5	N5	S5	Secure
Empetrum nigrum subsp. *nigrum*	Black crowberry	Ericaceae		Circumboreal	G5T3T5	NNR	S4S5	Secure
Gaultheria hispidula	Creeping snowberry	Ericaceae		Boreal north America	G5	NNR	S5	Secure
Kalmia polifolia	Bog laurel	Ericaceae	Obligate	Boreal north America	G5	NNR	S5	Secure
Kalmia procumbens	Alpine azalea	Ericaceae		Arctic-alpine circumpolar	G5	NNR	S4S5	Secure
Moneses uniflora	Single delight	Ericaceae		Circumboreal	G5	NNR	S4S5	Secure
Monotropa uniflora	Indianpipe	Ericaceae		Temperate north America and Asia	G5	N5	SNR	Undetermined
Orthilia secunda	Sidebells wintergreen	Ericaceae		Circumboreal	G5	NNR	S5	Secure
Phyllodoce caerulea	Blue mountainheath	Ericaceae		Arctic-alpine circumpolar discontinuous repartition in Europe	G5	NNR	S4	Secure
Pyrola asarifolia	Liverleaf wintergreen	Ericaceae		Boreal north America	G5	NNR	S2S4	Undetermined
Pyrola minor	Snowline wintergreen	Ericaceae		Circumboreal	G5	NNR	S4	Secure
Rhododendron groenlandicum	Common Labrador tea	Ericaceae	Obligate	Boreal north America	G5	N5	S5	Secure
Vaccinium angustifolium	Early lowbush blueberry	Ericaceae		Boreal northeastern America	G5	N5	S5	Secure
Vaccinium boreale	Northern blueberry	Ericaceae		Boreal north America	G4	N4	S4S5	Secure
Vaccinium caespitosum	Dwarf bilberry	Ericaceae		Boreal north America	G5	NNR	S4S5	Secure
Vaccinium oxycoccos	Small cranberry	Ericaceae	Obligate	Circumboreal	G5	N5	S5	Secure
Vaccinium uliginosum	Alpine bilberry	Ericaceae		Circumboreal	G5	NNR	S5	Secure
Vaccinium vitis-idaea	Mountain cranberry	Ericaceae		Circumboreal	G5	NNR	S5	Secure
Galium labradoricum	Northern bog bedstraw	Rubiaceae	Obligate	Boreal north America	G5	NNR	S3S4	Secure
Galium trifidum subsp. *trifidum*	Threepetal bedstraw	Rubiaceae	Facultative	Circumboreal	G5T5	N5	S3S5	Secure
Galium triflorum	Fragrant bedstraw	Rubiaceae		Circumboreal	G5	NNR	S3S4	Secure
Callitriche hermaphroditica	Northern water-starwort	Plantaginaceae	Obligate	Circumboreal	G5	NNR	SNA	---
Hippuris vulgaris	Common mare's-tail	Plantaginaceae	Obligate	Circumboreal	G5	N5	S4S5	Secure
Plantago major	Common plantain	Plantaginaceae		Introduced	G5	NNA	SNA	Exotic/Alien
Veronica serpyllifolia subsp. *serpyllifolia*	Thymeleaf speedwell	Plantaginaceae		Introduced	G5TNR	NNA	SNA	---
Castilleja septentrionalis	Labrador Indian paintbrush	Orobanchaceae		Boreal northeastern America	G5	NNR	S4	Secure
Pedicularis groenlandica	Elephanthead lousewort	Orobanchaceae		Boreal north America	G4G5	NNR	S2S4	Undetermined
Rhinanthus minor subsp. *groenlandicus*	Arctic rattlebox	Orobanchaceae		Circumboreal	G5T5?	N5?	SNR	Undetermined
Pinguicula vulgaris	Common butterwort	Lentibulariaceae	Obligate	Circumboreal disjunct in Asia	G5	NNR	S4	Secure
Utricularia intermedia	Flatleaf bladderwort	Lentibulariaceae	Obligate	Circumboreal	G5	NNR	S4S5	Secure
Utricularia minor	Lesser bladderwort	Lentibulariaceae	Obligate	Circumboreal	G5	NNR	S3S4	Secure
Menyanthes trifoliata	Bog buckbean	Menyanthaceae	Obligate	Boreal northeastern America	G5	NNR	S5	Secure
Achillea millefolium	Common yarrow	Asteraceae		Boreal north America	G5	N5	S3S4	Secure
Antennaria neglecta	Field pussytoes	Asteraceae		Temperate north America	G5	N5	---	---
Crepis tectorum	Narrowleaf hawksbeard	Asteraceae		Introduced	GNR	NNA	SNA	Exotic/Alien
Eurybia radula	Low rough aster	Asteraceae	Obligate	Boreal northeastern America	G5	NNR	S4S5	Secure
Hieracium caespitosum	Meadow hawkweed	Asteraceae		Introduced	GNR	NNA	SNA	Exotic/Alien

Appendix B.1: Vascular Plant Species Present in the Study Area, their Wetland Status, Phytogeography, Status Rank and General Status

Vascular Plants								
Scientific Name	**English Name**	**Family**	**Wetland Status**	**Phytogeography**	**GRANK**	**NRANK**	**SRANK**	**General Status**
Leucanthemum vulgare	Ox-eye daisy	Asteraceae		Introduced	GNR	NNA	SNA	Exotic/Alien
Matricaria discoidea	Disc mayweed	Asteraceae		Introduced	G5	NNR	SNA	Exotic/Alien
Omalotheca norvegica	Norwegian Arctic-cudweed	Asteraceae		Arctic-alpine amphi-atlantic	G5	N2N3	S2S3	Sensitive
Packera aurea	Golden ragwort	Asteraceae	Facultative	Boreal northeastern America	G5	N5	S2S4	Undetermined
Petasites frigidus var. *palmatus*	Palmate coltsfoot	Asteraceae	Facultative	Boreal north America	G5T5	N5	S4S5	Secure
Solidago macrophylla	Large-leaved goldenrod	Asteraceae		Boreal northeastern America	G5	NNR	S5	Secure
Solidago multiradiata	Rocky Mountain goldenrod	Asteraceae		Boreal north America	G5	N5	S3S4	Secure
Solidago uliginosa	Bog goldenrod	Asteraceae	Obligate	Boreal north America	G4G5	N5	S5	Secure
Symphyotrichum puniceum var. *puniceum*	Purplestem aster	Asteraceae	Facultative	Boreal north America	G5T5	N5	S4	Secure
Taraxacum lapponicum	Lapland dandelion	Asteraceae		Arctic-alpine amphi-atlantic	GNR	NNR	S3	Sensitive
Taraxacum officinale	Common dandelion	Asteraceae		Introduced	G5	N5	SNA	Exotic/Alien
Heracleum maximum	Common cowparsnip	Apiaceae		Boreal north America and east Asia	G5	N5	S3S4	Secure
Viburnum edule	Squashberry	Adoxaceae	Facultative	Boreal north America	G5	NNR	S5	Secure
Lonicera villosa	Mountain fly honeysuckle	Caprifoliaceae		Boreal north America	G5	NNR	S5	Secure
Linnaea borealis subsp. *longiflora*	Longtube twinflower	Linnaeaceae		Boreal north America	G5	NNR	S5	Secure

Appendix B.2: Non-Vasculation Plant Species Present in the Study Area

Mosses, Liverworts and Lichens		
Scientific Name	**English Name**	**Family**
Alectoria nigricans	Black witch's hair lichen	Alectoriaceae
Alectoria ochroleuca	Green witch's hair lichen	Alectoriaceae
Aulacomnium palustre	Bog bead-moss	Aulacomniaceae
Bazzania trilobata	Greater whipwort	Lepidoziaceae
Cetraria islandica	Island cetraria lichen	Parmeliaceae
Cetraria laevigata	Cetraria lichen	Parmeliaceae
Cladina mitis	Green reindeer lichen	Cladoniaceae
Cladina rangiferina	Grey reindeer lichen	Cladoniaceae
Cladina stellaris	Star reindeer lichen	Cladoniaceae
Cladopodiella fluitans	Bog notchwort	Cephaloziaceae
Climacium dendroides	Tree-moss	Climaciaceae
Dicranum polysetum	Rugose fork-moss	Dicranaceae
Dicranum sp.	Fork-moss	Dicranaceae
Dicranum undulatum	Undulate fork-moss	Dicranaceae
Drepanocladus sp.	Hook-moss	Amblystegiaceae
Flavocetraria nivalis	Crinkled snow lichen	Parmeliaceae
Hylocomium splendens	Glittering wood-moss	Hylocomiaceae
Mylia anomala	Anomalous flapwort	Jungermanniaceae
Nephroma arcticum	Arctic kidney lichen	Nephromataceae
Paludella squarrosa	Tufted fen-moss	Meesiaceae
Peltigera aphthosa	Green dog lichen	Peltigeraceae
Peltigera elisabethae	Elizabeth's felt lichen	Peltigeraceae
Pleurozium schreberi	Red-stemmed feather-moss	Hylocomiaceae
Polytrichum commune	Common haircap	Polytrichaceae
Polytrichum juniperinum	Juniper haircap	Polytrichaceae
Polytrichum piliferum	Polytrichum moss	Polytrichaceae
Polytrichum strictum	Strict haircap	Polytrichaceae
Preissia quadrata	Narrow mushroom-headed liverwort	Marchantiaceae
Ptilidium ciliare	Ciliated fringwort	Ptilidiaceae
Ptilium crista-castrensis	Ostrich-plume feather-moss	Hypnaceae
Racomitrium heterostichum	Bristly fringe-moss	Grimmiaceae
Racomitrium lanuginosum	Woolly fringe-moss	Grimmiaceae
Scorpidium scorpioides	Hooked scorpion-moss	Amblystegiaceae
Sphagnum angustifolium	Fine bog-moss	Sphagnaceae
Sphagnum austinii	Austin's bog-moss	Sphagnaceae
Sphagnum capillifolium	Acute-leaved bog-moss	Sphagnaceae
Sphagnum compactum	Compact bog-moss	Sphagnaceae
Sphagnum cuspidatum	Feathery bog-moss	Sphagnaceae
Sphagnum fuscum	Rusty bog-moss	Sphagnaceae
Sphagnum lindbergii	Lindberg's bog-moss	Sphagnaceae
Sphagnum magellanicum	Magellanic bog-moss	Sphagnaceae
Sphagnum majus	Olive bog-moss	Sphagnaceae
Sphagnum pulchrum	Golden bog-moss	Sphagnaceae
Sphagnum riparium	Cleft bog-moss	Sphagnaceae
Sphagnum rubellum	Red bog-moss	Sphagnaceae
Sphagnum tenellum	Soft bog-moss	Sphagnaceae
Sphagnum warnstorfii	Warnstorf's bog-moss	Sphagnaceae
Stereocaulon sp.	Snow lichen	Stereocaulaceae
Tomentypnum nitens	Woolly feather-moss	Brachytheciaceae

Appendix C: Wetland Status, Phytogeography and List of Vascular Plants Present in the Region and Regional Sampling Plots

Appendix C: Wetland Status, Phytogeography and List of Vascular Plants Present in the Region and Regional Sampling Plots

Vascular Plants				
Scientific Name	**English Name**	**Family**	**Wetland Status**	**Phytogeography**
Diphasiastrum alpinum	Alpine club-moss	Lycopodiaceae		Arctic-alpine circumpolar
Lycopodiella inundata	Northern bog club-moss	Lycopodiaceae	Obligate	Circumtemperate disjunct repartition
Isoetes echinospora	Spiny-spored quillwort	Isoëtaceae	Obligate	Circumboreal
Isoetes lacustris	Lake quillwort	Isoëtaceae	Obligate	Boreal amphi-atlantique
Equisetum palustre	Marsh horsetail	Equisetaceae	Facultative	Circumboreal
Equisetum pratense	Meadow horsetail	Equisetaceae	Facultative	Circumboreal
Equisetum scirpoides	Dwarf scouring rush	Equisetaceae		Circumboreal
Botrychium lanceolatum subsp. *angustisegmentum*	Narrow triangle moonwort	Ophioglossaceae	Facultative	Boreal cordilleran disjunct in eastern Canada
Botrychium lunaria	Common moonwort	Ophioglossaceae		Circumboreal
Cystopteris fragilis	Brittle fern	Cystopteridaceae		Arctic-alpine circumpolar
Cystopteris montana	Mountain bladder fern	Cystopteridaceae		Circumboreal
Phegopteris connectilis	Northern beech fern	Thelypteridaceae		Circumboreal
Woodsia alpina	Alpine cliff fern	Woodsiaceae		Arctic-alpine circumpolar
Woodsia glabella	Smooth cliff fern	Woodsiaceae		Arctic-alpine circumpolar
Athyrium filix-femina var. *angustum*	Northern lady fern	Athyriaceae		Boreal northeastern America
Polystichum lonchitis	Holly fern	Dryopteridaceae		Arctic-alpine circumpolar
Triglochin palustris	Marsh arrow-grass	Juncaginaceae	Obligate	Circumboreal
Potamogeton alpinus	Alpine pondweed	Potamogetonaceae	Obligate	Circumboreal
Potamogeton gramineus	Variableleaf pondweed	Potamogetonaceae	Obligate	Circumboreal
Potamogeton perfoliatus	Claspingleaf pondweed	Potamogetonaceae	Obligate	Circumtemperate
Stuckenia filiformis subsp. *alpina*	Fineleaf pondweed	Potamogetonaceae	Obligate	Circumboreal
Clintonia borealis	Blue bead-lily	Liliaceae		Boreal northeastern America
Platanthera obtusata	Bluntleaved orchid	Orchidaceae	Facultative	Boreal north America
Sisyrinchium montanum var. *crebrum*	Strict blue-eyed grass	Iridaceae		Introduced
Sparganium hyperboreum	Northern bur-reed	Typhaceae	Obligate	Circumboreal
Juncus subtilis	Greater creeping rush	Juncaceae	Obligate	Boreal northeastern America
Juncus trifidus	Highland rush	Juncaceae		Arctic-alpine amphi-atlantic
Luzula arctica	Arctic wood rush	Juncaceae		Circumpolar
Luzula confusa	Northern wood rush	Juncaceae		Arctic-alpine circumpolar
Luzula multiflora subsp. *frigida*	Common wood rush	Juncaceae		Circumboreal
Luzula spicata	Spiked wood rush	Juncaceae		Arctic-alpine circumpolar disjunct in Asia
Carex arctogena	Alpine capitate sedge	Cyperaceae		Arctic amphi-atlantic
Carex buxbaumii	Buxbaum's sedge	Cyperaceae	Obligate	Circumboreal discontinuous repartition
Carex castanea	Chestnut sedge	Cyperaceae	Facultative	Boreal northeastern America
Carex concinna	Northern elegant sedge	Cyperaceae		Boreal north America
Carex conoidea	Openfield sedge	Cyperaceae		Boreal northeastern America
Carex foenea	Bronze sedge	Cyperaceae		Boreal north America
Carex garberi	Elk sedge	Cyperaceae	Facultative	Boreal north America
Carex heleonastes	Hudson Bay sedge	Cyperaceae	Obligate	Circumboreal discontinuous repartition
Carex lachenalii	Twotipped sedge	Cyperaceae		Arctic-alpine circumpolar
Carex leptonervia	Nerveless woodland sedge	Cyperaceae		Boreal northeastern America
Carex media	Closed-head sedge	Cyperaceae		Circumboreal
Carex microglochin subsp. *microglochin*	Fewseeded bog sedge	Cyperaceae	Obligate	Arctic-alpine circumpolar disjunct in Asia
Carex nardina	Spike sedge	Cyperaceae		Arctic-alpine amphi-atlantic trans-american repartition
Carex nigra	Smooth black sedge	Cyperaceae	Facultative	Boreal amphi-atlantique
Carex norvegica	Norway sedge	Cyperaceae		Arctic-alpine amphi-atlantic
Carex saxatilis	Rock sedge	Cyperaceae	Facultative	Circumpolar
Carex stylosa	Variegated sedge	Cyperaceae		Boreal cordilleran
Carex viridula subsp. *viridula*	Little green sedge	Cyperaceae	Obligate	Circumboreal

Appendix C: Wetland Status, Phytogeography and List of Vascular Plants Present in the Region and Regional Sampling Plots

Vascular Plants				
Scientific Name	**English Name**	**Family**	**Wetland Status**	**Phytogeography**
Carex williamsii	Williams' sedge	Cyperaceae		Arctic north America and east Asia
Eleocharis acicularis	Needle spike-rush	Cyperaceae	Obligate	Cosmopolitan
Eleocharis nitida	Neat spike-rush	Cyperaceae		Boreal north America discontinuous repartition
Eriophorum angustifolium subsp. *angustifolium*	Tall cotton-grass	Cyperaceae	Obligate	Circumboreal
Eriophorum brachyantherum	Closed-sheath cotton-grass	Cyperaceae		Circumboreal
Alopecurus aequalis var. *aequalis*	Shortawn foxtail	Poaceae	Obligate	Circumboreal
Anthoxanthum monticola subsp. *alpinum*	Alpine sweetgrass	Poaceae		Arctic-alpine circumpolar
Bromus inermis	Smooth brome	Poaceae		Introduced
Calamagrostis lapponica	Lapland reedgrass	Poaceae		Circumpolar
Calamagrostis stricta subsp. *inexpansa*	Northern reedgrass	Poaceae	Facultative	Boreal north America
Danthonia intermedia subsp. *intermedia*	Timber oatgrass	Poaceae		Boreal north America and east Asia
Danthonia spicata	poverty oatgrass	Poaceae		Boreal north America
Deschampsia cespitosa subsp. *cespitosa*	Tufted hairgrass	Poaceae	Facultative	Circumboreal
Festuca brachyphylla subsp. *brachyphylla*	Alpine fescue	Poaceae		Arctic-alpine circumpolar
Festuca prolifera var. *lasiolepis*	Proliferous fescue	Poaceae		Circumboreal disjunct repartition
Festuca saximontana var. *saximontana*	Rocky Mountain fescue	Poaceae		Boreal north America
Glyceria canadensis subsp. *canadensis*	Rattlesnake mannagrass	Poaceae	Obligate	Temperate northeastern America
Hordeum jubatum subsp. *jubatum*	Foxtail barley	Poaceae		Introduced
Phleum alpinum subsp. *alpinum*	Alpine timothy	Poaceae		Arctic-alpine circumpolar
Phleum pratense subsp. *pratense*	Timothy	Poaceae		Introduced
Piptatheropsis canadensis	Canada ricegrass	Poaceae		Boreal north America
Piptatheropsis pungens	Slender ricegrass	Poaceae		Boreal north America
Poa alpina subsp. *alpina*	Alpine bluegrass	Poaceae		Arctic-alpine circumpolar discontinuous repartition
Poa arctica subsp. *arctica*	Arctic bluegrass	Poaceae		Circumpolar
Poa nemoralis	Woodland bluegrass	Poaceae		Circumboreal
Poa pratensis subsp. *alpigena*	Alpigene bluegrass	Poaceae		Circumpolar
Capnoides sempervirens	Pale corydalis	Papaveraceae		Temperate north America
Ranunculus acris	Tall buttercup	Ranunculaceae		Introduced
Ranunculus allenii	Allen's buttercup	Ranunculaceae		Arctic-alpine northeastern America
Ranunculus pedatifidus var. *affinis*	Northern buttercup	Ranunculaceae		Arctic-alpine circumpolar
Thalictrum pubescens	King-of-the-meadow	Ranunculaceae	Facultative	Boreal northeastern America
Myriophyllum alterniflorum	Alternateflower watermilfoil	Haloragaceae	Obligate	Boreal amphi-atlantique
Saxifraga paniculata subsp. *neogaea*	White Mountain saxifrage	Saxifragaceae		Arctice-alpine amphi-atlantic
Viola palustris	Marsh violet	Violaceae	Facultative	Boreal amphi-atlantique
Populus tremuloides	Quaking aspen	Salicaceae		Boreal north America
Salix bebbiana	Bebb willow	Salicaceae	Facultative	Boreal north America
Salix discolor	Pussy willow	Salicaceae	Facultative	Temperate north America
Salix herbacea	Snowbed willow	Salicaceae		Arctic-alpine amphi-atlantic
Salix lucida subsp. *lucida*	Shining willow	Salicaceae	Facultative	Boreal north America and cordilleran
Astragalus alpinus var. *alpinus*	Alpine milkvetch	Fabaceae		Arctic-alpine circumpolar
Hedysarum alpinum	Alpine sweetvetch	Fabaceae		Arctic-alpine circumpolar
Lotus corniculatus	Bird's-foot trefoil	Fabaceae		Introduced
Trifolium pratense	Red clover	Fabaceae		Introduced
Trifolium repens	White clover	Fabaceae		Introduced
Alchemilla filicaulis subsp. *filicaulis*	Thinstem lady's mantle	Rosaceae		Boreal amphi-atlantique
Dryas integrifolia subsp. *integrifolia*	Entireleaf mountain-avens	Rosaceae		Arctic-alpine north America
Geum macrophyllum var. *perincisum*	Incised large-leaved avens	Rosaceae	Facultative	Boreal north America
Potentilla argentea var. *argentea*	Silver cinquefoil	Rosaceae		Introduced
Potentilla nivea	Snow cinquefoil	Rosaceae		Arctic-alpine circumpolar

Appendix C: Wetland Status, Phytogeography and List of Vascular Plants Present in the Region and Regional Sampling Plots

Vascular Plants				
Scientific Name	**English Name**	**Family**	**Wetland Status**	**Phytogeography**
Prunus pensylvanica	Pin cherry	Rosaceae		Boreal north America
Rubus ×paracaulis	Short-shoot dwarf rasberry	Rosaceae		Boreal north America
Sibbaldia procumbens	Creeping sibbaldia	Rosaceae		Arctic-alpine circumpolar
Chamerion latifolium	Dwarf fireweed	Onagraceae		Arctic-alpine circumpolar
Circaea alpina subsp. *alpina*	Small enchanter's nightshade	Onagraceae	Facultative	Circumboreal
Epilobium anagallidifolium	Pimpernel willowherb	Onagraceae		Arctic-alpine circumpolar
Epilobium davuricum	Dahurian willowherb	Onagraceae		Circumboreal
Epilobium lactiflorum	Milkflower willowherb	Onagraceae		Boreal cordilleran disjunct in eastern America and Europe
Arabis alpina	Alpine rockcress	Brassicaceae		Arctic-alpine amphi-atlantic
Arabis arenicola var. *arenicola*	Sand rockcress	Brassicaceae		Arctic northeastern America
Barbarea orthoceras	American yellowrocket	Brassicaceae	Facultative	Circumboreal
Cardamine bellidifolia var. *bellidifolia*	Alpine bittercress	Brassicaceae		Arctic-alpine circumpolar
Draba arabisans	Rock draba	Brassicaceae		Boreal northeastern America
Draba glabella var. *glabella*	Smooth draba	Brassicaceae		Arctic-alpine circumpolar
Draba nivalis	Yellow arctic draba	Brassicaceae		Arctic-alpine circumpolar
Draba norvegica var. *norvegica*	Norwegian draba	Brassicaceae		Arctice-alpine amphi-atlantic
Erysimum cheiranthoides subsp. *cheiranthoides*	Wormseed wallflower	Brassicaceae		Introduced
Lepidium densiflorum var. *densiflorum*	Common pepperweed	Brassicaceae		Introduced
Raphanus raphanistrum	Wild radish	Brassicaceae		Introduced
Sinapis arvensis	Charlock mustard	Brassicaceae		Introduced
Subularia aquatica subsp. *americana*	American waterawlwort	Brassicaceae	Obligate	Boreal north America
Thlaspi arvense	Field pennycress	Brassicaceae		Introduced
Fallopia convolvulus	Black bindweed	Polygonaceae		Introduced
Oxyria digyna	Alpine mountain-sorrel	Polygonaceae		Arctic-alpine circumpolar
Cerastium alpinum subsp. *lanatum*	Alpine mouse-ear chickweed	Caryophyllaceae		Arctic-alpine amphi-atlantic
Cerastium arvense subsp. *strictum*	Field chickweed	Caryophyllaceae		Circumboreal
Minuartia biflora	Mountain stitchwort	Caryophyllaceae		Arctic-alpine circumpolar
Minuartia dawsonensis	Rock stitchwort	Caryophyllaceae		Boreal north America
Minuartia rubella	Beautiful sandwort	Caryophyllaceae		Arctic-alpine circumpolar
Minuartia stricta	Bog stitchwort	Caryophyllaceae		Arctic-alpine circumpolar
Silene acaulis	Moss campion	Caryophyllaceae		Arctic-alpine circumpolar disjunct in Asia
Silene vulgaris	Bladder campion	Caryophyllaceae		Introduced
Stellaria longipes subsp. *longipes*	Goldie's starwort	Caryophyllaceae		Boreal north America and east Asia
Cornus sericea	Redosier dogwood	Cornaceae		Boreal north America
Primula egaliksensis	Greenland primrose	Primulaceae		Arctic north America
Primula laurentiana	Birdeye primrose	Primulaceae		Boreal northeastern America
Cassiope tetragona var. *tetragona*	White arctic mountain heather	Ericaceae		Circumpolar
Harrimanella hypnoides	Mossplant	Ericaceae		Arctic-alpine amphi-atlantic
Pyrola grandiflora	Largeflowered wintergreen	Ericaceae		Arctic-alpine circumpolar
Rhododendron lapponicum var. *lapponicum*	Lapland rosebay	Ericaceae		Arctic-alpine circumpolar discontinuous repartition in Eurasia
Vaccinium myrtilloides	Velvetleaf huckleberry	Ericaceae		Boreal north America
Gentianella amarella subsp. *acuta*	Autumn dwarf gentian	Gentianaceae		Circumboreal
Callitriche heterophylla subsp. *heterophylla*	Twoheaded water-starwort	Plantaginaceae	Obligate	Boreal north America
Callitriche palustris	Vernal water-starwort	Plantaginaceae	Obligate	Circumboreal
Linaria vulgaris	Butter and eggs	Plantaginaceae		Introduced
Veronica scutellata	Skullcap speedwell	Plantaginaceae	Obligate	Circumboreal discontinuous repartition in Asia
Veronica wormskjoldii	American alpine speedwell	Plantaginaceae		Boreal north America
Bartsia alpina	Alpine bartsia	Orobanchaceae		Arctic-alpine amphi-atlantic
Euphrasia frigida	Arctic eyebright	Orobanchaceae		Arctic-alpine amphi-atlantic

Appendix C: Wetland Status, Phytogeography and List of Vascular Plants Present in the Region and Regional Sampling Plots

Vascular Plants				
Scientific Name	**English Name**	**Family**	**Wetland Status**	**Phytogeography**
Euphrasia hudsoniana	Hudson Bay eyebright	Orobanchaceae		Boreal north America
Euphrasia wettsteinii	Wettstein's eyebright	Orobanchaceae		Arctic-alpine amphi-atlantic
Pedicularis flammea	Redtipped lousewort	Orobanchaceae		Arctic-alpine amphi-atlantic
Pedicularis labradorica	Labrador lousewort	Orobanchaceae		Boreal north America and east Asia
Utricularia vulgaris subsp. *macrorhiza*	Common bladderwort	Lentibulariaceae	Obligate	Boreal north America
Ambrosia artemisiifolia	Annual ragweed	Asteraceae		Introduced
Antennaria alpina	Alpine pussytoes	Asteraceae		Arctic-alpine circumpolar
Antennaria monocephala subsp. *angustata*	Pygmy pussytoes	Asteraceae		Arctic-alpine north America
Arnica angustifolia subsp. *angustifolia*	Narrowleaf arnica	Asteraceae		Arctic north America and western Europe (Iceland)
Arnica chamissonis	Chamisso arnica	Asteraceae		Arctic-alpine north America disjunct repartition
Cirsium arvense	Field thistle	Asteraceae		Introduced
Euthamia graminifolia	Common goldentop	Asteraceae		Boreal north America
Hieracium umbellatum	Narrowleaf hawkweed	Asteraceae		Boreal north America
Hieracium ×floribundum	Yellow devil hawkweed	Asteraceae		Introduced
Hieracium vulgatum	Common hawkweed	Asteraceae		Circumboreal discontinuous repartition
Oclemena nemoralis	Bog aster	Asteraceae	Obligate	Boreal northeastern America
Omalotheca supina	Alpine arctic cudweed	Asteraceae		Arctice-alpine amphi-atlantic
Packera indecora	Elegant groundsel	Asteraceae	Facultative	Boreal north America
Packera pauciflora	Alpine groundsel	Asteraceae		Boreal north America disjunct repartition
Packera paupercula	Balsam groundsel	Asteraceae		Boreal north America
Petasites frigidus var. *×vitifolius*	Grapeleaf sweet coltsfoot	Asteraceae	Facultative	Boreal north America
Petasites frigidus var. *sagittatus*	Arrowleaf sweet coltsfoot	Asteraceae	Facultative	Boreal north America
Symphyotrichum novi-belgii var. *novi-belgii*	New York aster	Asteraceae	Facultative	Temperate northeastern America

Appendix D: List of Vascular Plant Specimen Collected in the Study Area and in the Regional Sampling Plots

Appendix D: List of Vascular Plant Specimen Collected in the Study Area and in the Regional Sampling Plots

Scientific Name	Sampling Plot	Specimen Number
Carex deflexa var. *deflexa*	AL1	DL12-377
Agrostis mertensii	AL1	DL12-376
Betula glandulosa	AL1	DL12-378
Betula minor	AL1	DL12-379
Huperzia appressa	AL5	DL12-482
Juncus trifidus	AL5	DL12-485
Luzula confusa	AL5	DL12-486
Carex arctogena	AL5	DL12-494
Carex bigelowii subsp. *bigelowii*	AL5	DL12-487
Carex capillaris	AL5	DL12-484
Carex scirpoidea subsp. *scirpoidea*	AL5	DL12-489
Agrostis mertensii	AL5	DL12-492
Calamagrostis canadensis var. *langsdorfii*	AL5	DL12-493
Poa arctica subsp. *arctica*	AL5	DL12-495
Trisetum spicatum	AL5	DL12-488
Salix glauca var. *cordifolia*	AL5	DL12-480
Salix planifolia	AL5	DL12-478
Salix uva-ursi	AL5	DL12-483
Cardamine bellidifolia var. *bellidifolia*	AL5	DL12-491
Cerastium alpinum subsp. *lanatum*	AL5	DL12-490
Kalmia procumbens	AL5	DL12-479
Pyrola grandiflora	AL5	DL12-481
Luzula multiflora subsp. *frigida*	CO1	DL12-497
Carex lachenalii	CO1	DL12-506
Deschampsia cespitosa subsp. *cespitosa*	CO1	DL12-499
Vahlodea atropurpurea	CO1	DL12-509
Viola macloskeyi	CO1	DL12-502
Salix herbacea	CO1	DL12-496
Salix planifolia	CO1	DL12-498
Sibbaldia procumbens	CO1	DL12-508
Harrimanella hypnoides	CO1	DL12-503
Veronica wormskjoldii	CO1	DL12-500
Bartsia alpina	CO1	DL12-501
Antennaria monocephala subsp. *angustata*	CO1	DL12-504
Omalotheca supina	CO1	DL12-507
Packera pauciflora	CO1	DL12-505
Diphasiastrum sitchense	DA1	DL12-524
Carex deflexa var. *deflexa*	DA1	DL12-525
Cinna latifolia	DA1	DL12-526
Calamagrostis canadensis var. *canadensis*	DA1	DL12-528
Salix pyrifolia	DA1	DL12-527
Lycopodium lagopus	DE2	DL12-577
Agrostis scabra	DE2	DL12-576
Phyllodoce caerulea	DE2	DL12-575
Antennaria neglecta	DE2	DL12-574
Solidago multiradiata	DE2	DL12-578
Equisetum arvense	FE2	DL12-402
Equisetum sylvaticum	FE2	DL12-394
Carex aquatilis var. *aquatilis*	FE2	DL12-397 and DL12-405
Carex limosa	FE2	DL12-399
Carex rariflora var. *rariflora*	FE2	DL12-395

Appendix D: List of Vascular Plant Specimen Collected in the Study Area and in the Regional Sampling Plots

Scientific Name	Sampling Plot	Specimen Number
Carex utriculata	FE2	DL12-404
Ranunculus hyperboreus	FE2	DL12-400
Salix pellita	FE2	DL12-401
Salix pedicellaris	FE2	DL12-398
Salix planifolia	FE2	DL12-403
Chamaedaphne calyculata	FE2	DL12-396
Equisetum fluviatile	FE3	DL12-456
Tofieldia pusilla	FE3	DL12-447
Triglochin maritima	FE3	DL12-451
Platanthera aquilonis	FE3	DL12-446
Spiranthes romanzoffiana	FE3	DL12-448
Carex chordorrhiza	FE3	DL12-459
Carex exilis	FE3	DL12-452
Carex livida	FE3	DL12-460
Carex rostrata	FE3	DL12-457
Agrostis mertensii	FE3	DL12-454
Elymus trachycaulus subsp. *trachycaulus*	FE3	DL12-453
Betula michauxii	FE3	DL12-455
Pyrola asarifolia	FE3	DL12-449
Vaccinium oxycoccos	FE3	DL12-458
Eurybia radula	FE3	DL12-445
Lonicera villosa	FE3	DL12-450
Carex diandra	FE5	DL12-549
Galium labradoricum	FE5	DL12-550
Salix glauca var. *cordifolia*	LC1	DL12-418
Minuartia groenlandica	LC1	DL12-420
Galium trifidum subsp. *trifidum*	LC1	DL12-417
Taraxacum sp.	LC1	DL12-419
Carex arcta	LC2	DL12-510
Carex lenticularis var. *lenticularis*	LC2	DL12-511
Carex vesicaria	LC2	DL12-512
Agrostis scabra	LC2	DL12-513
Ranunculus flammula var. *reptans*	LC2	DL12-515
Salix pellita	LC2	DL12-516
Salix humilis var. *humilis*	LC2	DL12-518
Salix glauca var. *cordifolia*	LC2	DL12-517
Salix planifolia	LC2	DL12-519
Galium trifidum subsp. *trifidum*	LC2	DL12-514
Potamogeton pusillus subsp. *tenuissimus*	LC3	DL12-565
Potamogeton richardsonii	LC3	DL12-564
Bromus ciliatus	LC3	DL12-560
Poa pratensis subsp. *pratensis*	LC3	DL12-559
Myriophyllum sibiricum	LC3	DL12-563
Parnassia palustris	LC3	DL12-558
Salix ballii	LC3	DL12-551, DL12-552 and DL12-553
Sanguisorba canadensis	LC3	DL12-561
Betula pumila var. *pumila*	LC3	DL12-554 and DL12-555
Stellaria borealis subsp. *borealis*	LC3	DL12-557
Pyrola asarifolia	LC3	DL12-556
Callitriche hermaphroditica	LC3	DL12-562
Agrostis scabra	MR1	DL12-543

Appendix D: List of Vascular Plant Specimen Collected in the Study Area and in the Regional Sampling Plots

Scientific Name	Sampling Plot	Specimen Number
Cinna latifolia	MR1	DL12-548
Elymus trachycaulus subsp. *trachycaulus*	MR1	DL12-541
Poa glauca subsp. *glauca*	MR1	DL12-542
Ranunculus abortivus	MR1	DL12-545
Fragaria virginiana subsp. *glauca*	MR1	DL12-544
Urtica dioica subsp. *gracilis*	MR1	DL12-546
Stellaria borealis subsp. *borealis*	MR1	DL12-540
Taraxacum lapponicum	MR1	DL12-547
Juncus filiformis	MU1	DL12-415
Luzula parviflora subsp. *melanocarpa*	MU1	DL12-411
Carex brunnescens subsp. *brunnescens*	MU1	DL12-413
Carex canescens subsp. *canescens*	MU1	DL12-408
Carex trisperma	MU1	DL12-409
Carex vesicaria	MU1	DL12-416a
Carex arcta	MU1	DL12-416b
Agrostis mertensii	MU1	DL12-412
Vahlodea atropurpurea	MU1	DL12-410
Ranunculus lapponicus	MU1	DL12-406
Viola macloskeyi	MU1	DL12-414
Salix arctophila	MU1	DL12-407
Equisetum variegatum subsp. *variegatum*	MU2	DL12-475
Carex disperma	MU2	DL12-461
Carex tenuiflora	MU2	DL12-472
Carex vaginata	MU2	DL12-465
Glyceria striata	MU2	DL12-473
Ribes triste	MU2	DL12-464
Mitella nuda	MU2	DL12-467
Salix ballii	MU2	Dl12-470
Salix glauca var. *cordifolia*	MU2	DL12-471
Salix planifolia	MU2	DL12-474
Geum rivale	MU2	DL12-462
Rubus pubescens	MU2	DL12-466
Epilobium hornemannii subsp. *hornemannii*	MU2	DL12-469
Epilobium palustre	MU2	DL12-468
Symphyotrichum puniceum var. *puniceum*	MU2	DL12-463
Carex oligosperma	OM2	DL12-476
Carex pauciflora	OM2	DL12-477
Scheuchzeria palustris	OM3	DL12-523
Carex rostrata	OM3	DL12-520
Carex utriculata	OM3	DL12-522
Eriophorum russeolum subsp. *russeolum*	OM3	DL12-521
Carex vesicaria	OM4	DL12-529
Eriophorum russeolum subsp. *russeolum*	OM4	DL12-530
Selaginella selaginoides	RU1	DL12-430
Platanthera dilatata var. *dilatata*	RU1	DL12-421
Juncus castaneus	RU1	DL12-424
Juncus triglumis var. *albescens*	RU1	DL12-441
Carex capillaris	RU1	DL12-432
Carex gynocrates	RU1	DL12-437 and DL12-440
Carex interior	RU1	DL12-442
Carex lenticularis var. *lenticularis*	RU1	DL12-427

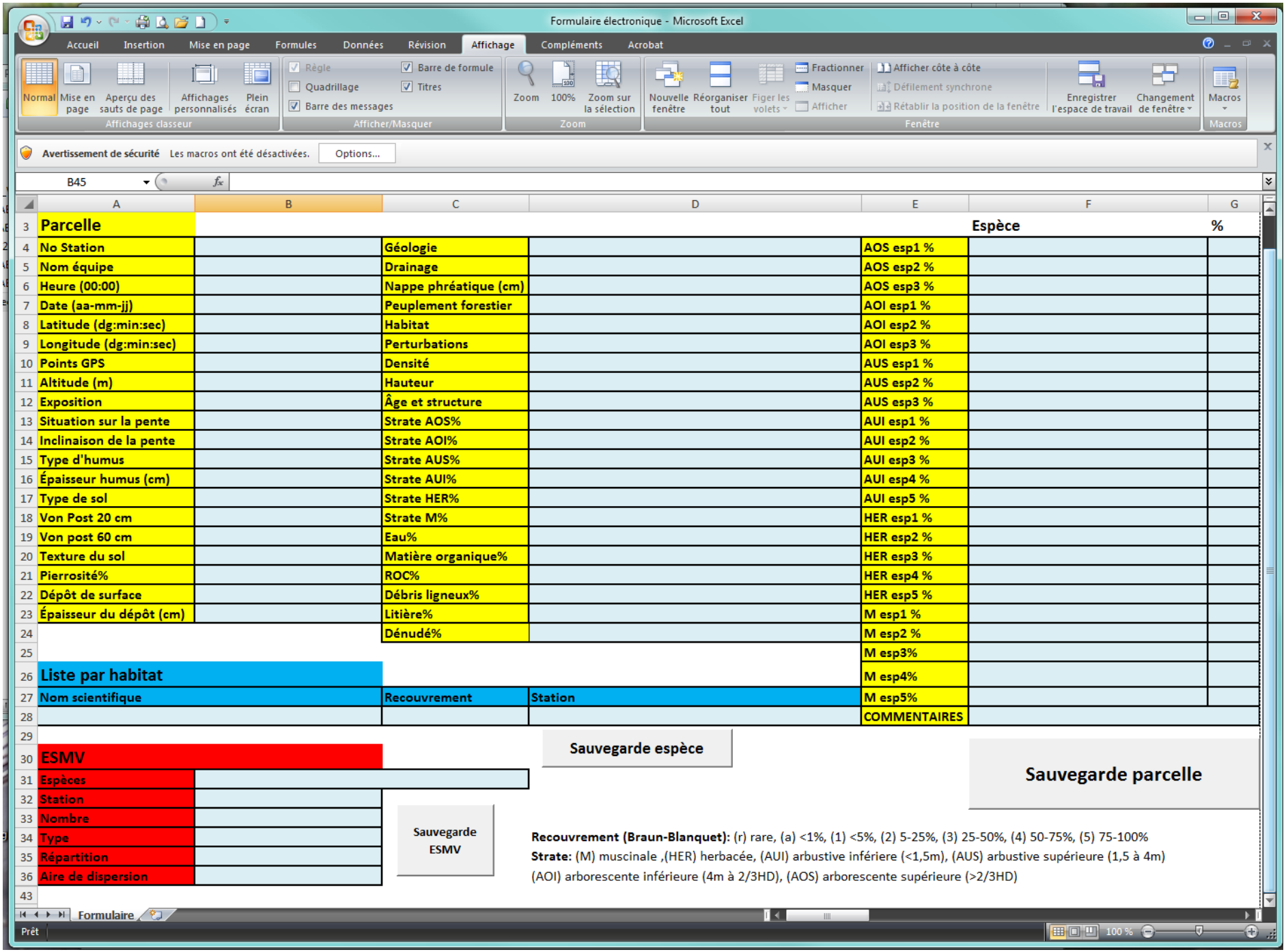
Appendix D: List of Vascular Plant Specimen Collected in the Study Area and in the Regional Sampling Plots

Scientific Name	Sampling Plot	Specimen Number
Carex leptalea	RU1	DL12-425
Eriophorum viridicarinatum	RU1	DL12-439
Glyceria striata	RU1	DL12-426
Parnassia kotzebuei	RU1	DL12-429
Salix arctophila	RU1	DL12-434
Salix vestita	RU1	DL12-423
Dasiphora fruticosa	RU1	DL12-435
Myrica gale	RU1	DL12-438
Betula pumila var. *glandulifera*	RU1	DL12-436
Bistorta vivipara	RU1	DL12-431
Andromeda polifolia var. *latifolia*	RU1	DL12-433
Castilleja septentrionalis	RU1	DL12-443
Pinguicula vulgaris	RU1	DL12-428
Solidago uliginosa	RU1	DL12-444
Lonicera villosa	RU1	DL12-422
Juncus balticus subsp. *littoralis*	RU3	DL12-566
Carex atratiformis	RU4	DL12-570
Actaea rubra subsp. *rubra*	RU4	DL12-567
Actaea rubra subsp. *rubra* f. *neglecta*	RU4	DL12-568
Viola labradorica	RU4	DL12-569
Salix ballii	RU4	DL12-573
Galium triflorum	RU4	DL12-572
Packera aurea	RU4	DL12-571
Lycopodiella inundata	RV1	120804-12
Cystopteris fragilis	RV1	DL12-261 and 120804-18
Woodsia alpina	RV1	DL12-262
Tofieldia pusilla	RV1	120804-22
Juncus triglumis var. *albescens*	RV1	DL12-242
Carex aquatilis var. *aquatilis*	RV1	120804-08
Carex atratiformis	RV1	DL12-250 and 120804-20
Carex canescens subsp. *canescens*	RV1	DL12-258
Carex gynocrates	RV1	120804-05
Carex oligosperma	RV1	120804-06
Carex scirpoidea subsp. *scirpoidea*	RV1	DL12-259 and 120804-27
Agrostis mertensii	RV1	DL12-254
Agrostis scabra	RV1	DL12-244
Elymus trachycaulus subsp. *trachycaulus*	RV1	DL12-251
Festuca prolifera var. *lasiolepis*	RV1	120804-19
Poa glauca subsp. *glauca*	RV1	DL12-263, DL12-264 and 120804-13
Vahlodea atropurpurea	RV1	DL12-247
Parnassia palustris	RV1	DL12-253
Salix glauca var. *cordifolia*	RV1	DL12-255 and 120804-21
Salix pedicellaris	RV1	120804-07
Fragaria virginiana subsp. *glauca*	RV1	120804-16
Cardamine nymanii	RV1	DL12-260
Bistorta vivipara	RV1	DL12-246
Arenaria humifusa	RV1	DL12-241
Minuartia dawsonensis	RV1	DL12-245
Minuartia rubella	RV1	120804-14
Silene acaulis	RV1	120804-18
Primula laurentiana	RV1	DL12-252 and 120804-15

Appendix D: List of Vascular Plant Specimen Collected in the Study Area and in the Regional Sampling Plots

Scientific Name	Sampling Plot	Specimen Number
Moneses uniflora	RV1	120804-10
Orthilia secunda	RV1	120804-09
Euphrasia hudsoniana	RV1	DL12-257
Rhinanthus minor subsp. *groenlandicus*	RV1	120804-23
Pinguicula vulgaris	RV1	120804-24
Achillea millefolium	RV1	DL12-256
Antennaria monocephala subsp. *angustata*	RV1	DL12-248
Solidago macrophylla	RV1	120804-25
Solidago multiradiata	RV1	DL12-243
Taraxacum lapponicum	RV1	DL12-249
Potamogeton richardsonii	RV2	DL12-536
Sparganium angustifolium	RV2	DL12-534
Ranunculus aquatilis var. *diffusus*	RV2	DL12-531
Myriophyllum sibiricum	RV2	DL12-533
Pyrola minor	RV2	DL12-538
Galium trifidum subsp. *trifidum*	RV2	DL12-537
Callitriche palustris	RV2	DL12-535
Hippuris vulgaris	RV2	DL12-532
Pedicularis groenlandica	RV2	DL12-539
Huperzia appressa	TA1	DL12-384
Diphasiastrum complanatum	TA1	DL12-382
Gymnocarpium dryopteris	TA1	DL12-380
Woodsia ilvensis	TA1	DL12-391
Dryopteris campyloptera	TA1	DL12-390
Juniperus communis var. *depressa*	TA1	DL12-389
Agrostis mertensii	TA1	DL12-387
Calamagrostis canadensis var. *langsdorfii*	TA1	DL12-388
Deschampsia flexuosa	TA1	DL12-383
Viola renifolia	TA1	DL12-386
Salix planifolia	TA1	DL12-392
Betula minor	TA1	DL12-393
Moehringia macrophylla	TA1	DL12-381
Orthilia secunda	TA1	DL12-385

Appendix E:
Copy of the Electronic Field Form


Formulaire électronique - Microsoft Excel
Accueil
Insertion
Mise en page
Formules
Données
Révision
Affichage
Compléments
Acrobat
Normal
Mise en page
Aperçu des sauts de page
Affichages personnalisés
Plein écran
Affichages classeur
Règle
Quadrillage
Barre des messages
Barre de formule
Titres
Afficher/Masquer
Zoom
100%
Zoom sur la sélection
Zoom
Nouvelle fenêtre
Réorganiser tout
Figer les volets
Fractionner
Masquer
Afficher
Afficher côte à côte
Défilement synchrone
Rétablir la position de la fenêtre
Enregistrer l'espace de travail
Changement de fenêtre
Fenêtre
Macros
Macros
Avertissement de sécurité
Les macros ont été désactivées.
Options...
B45
Parcelle
No Station
Nom équipe
Heure (00:00)
Date (aa-mm-jj)
Latitude (dg:min:sec)
Longitude (dg:min:sec)
Points GPS
Altitude (m)
Exposition
Situation sur la pente
Inclinaison de la pente
Type d'humus
Épaisseur humus (cm)
Type de sol
Von Post 20 cm
Von post 60 cm
Texture du sol
Pierrosité%
Dépôt de surface
Épaisseur du dépôt (cm)
Géologie
Drainage
Nappe phréatique (cm)
Peuplement forestier
Habitat
Perturbations
Densité
Hauteur
Âge et structure
Strate AOS%
Strate AOI%
Strate AUS%
Strate AUI%
Strate HER%
Strate M%
Eau%
Matière organique%
ROC%
Débris ligneux%
Litière%
Dénudé%
Espèce
%
AOS esp1 %
AOS esp2 %
AOS esp3 %
AOI esp1 %
AOI esp2 %
AOI esp3 %
AUS esp1 %
AUS esp2 %
AUS esp3 %
AUI esp1 %
AUI esp2 %
AUI esp3 %
AUI esp4 %
AUI esp5 %
HER esp1 %
HER esp2 %
HER esp3 %
HER esp4 %
HER esp5 %
M esp1 %
M esp2 %
M esp3%
M esp4%
M esp5%
COMMENTAIRES
Liste par habitat
Nom scientifique
Recouvrement
Station
ESMV
Espèces
Station
Nombre
Type
Répartition
Aire de dispersion
Sauvegarde espèce
Sauvegarde parcelle
Sauvegarde ESMV
Recouvrement (Braun-Blanquet): (r) rare, (a) <1%, (1) <5%, (2) 5-25%, (3) 25-50%, (4) 50-75%, (5) 75-100%
Strate: (M) muscinale ,(HER) herbacée, (AUI) arbustive inférieure (<1,5m), (AUS) arbustive supérieure (1,5 à 4m) (AOI) arborescente inférieure (4m à 2/3HD), (AOS) arborescente supérieure (>2/3HD)
Formulaire
Prêt
100 %

Appendix F: Photographs

Photo 1. Open spruce-moss forest (PN4)

Photo 2. Open spruce-lichen forest (CL1)

Photo 3. Closed spruce-moss forest (PB1)

Photo 4. Birch forest (BE1)

Photo 5. Post-fire conifer regeneration (BR1)

Photo 6. Shrubland (AU1)

Photo 7. Shrubland (LA3)

Photo 8. Lichen-shrub barren

Photo 9. Slightly weathered rock barren

Photo 10. Slightly weathered rock barren (DA2)

Photo 11. Moderatly weathered rock barren (AL1)

Photo 12. Moderatly weathered rock barren (AL8)

Photo 13. Clear cut

Photo 14. Highly weathered rock barren (AL1)

Photo 15. Highly weathered rock barren (DE1)

Photo 16. Highly weathered rock barren (DE2)

Photo 17. Human disturbances (IA)

Photo 18. Exposed sand and gravel (LC1B)

Photo 19. Forested fen (MU2)

Photo 20. Horinzontal fen (FE5)

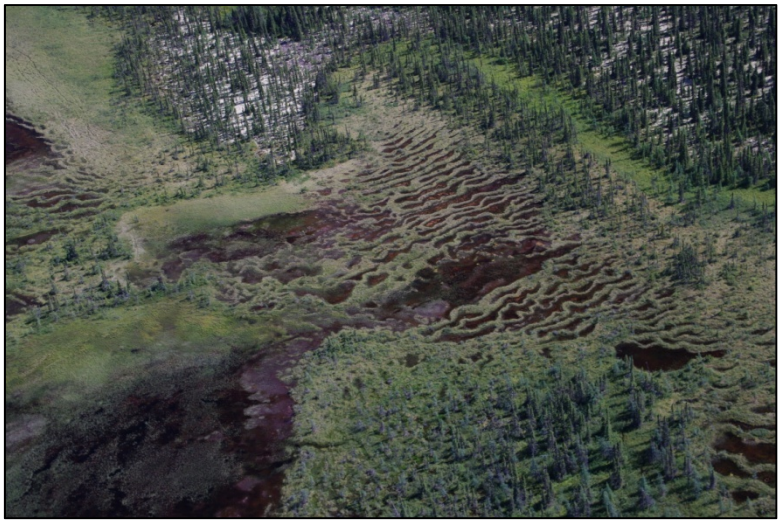


Photo 21. Northern ribbed fen

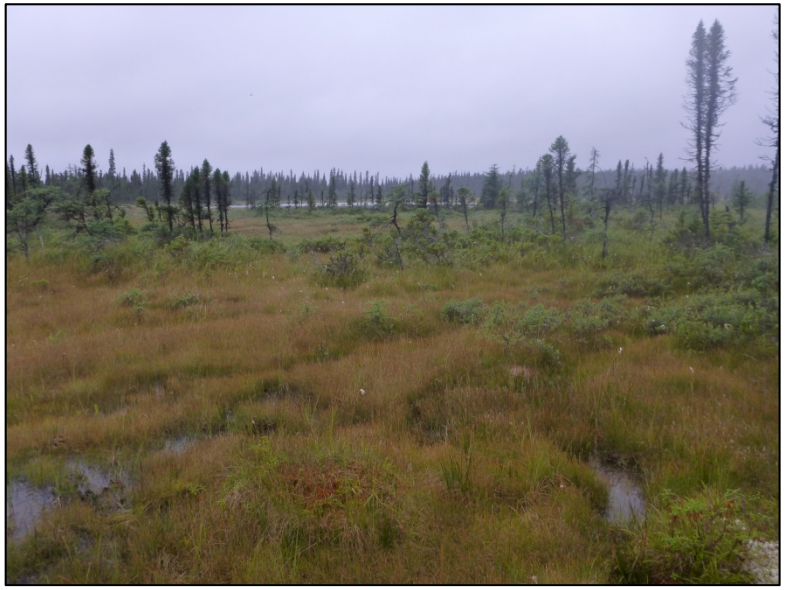


Photo 22. Northern ribbed fen (FE3)

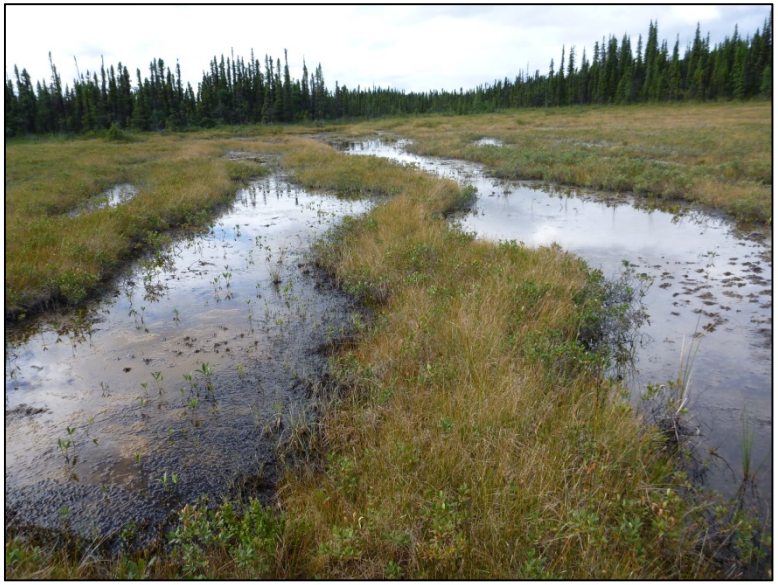


Photo 23. Northern ribbed fen (FE4)

Photo 24. Shrub swamp (MR1)

Photo 25. Forested bog (TB1)

Photo 26. Riparian fen (RU3)

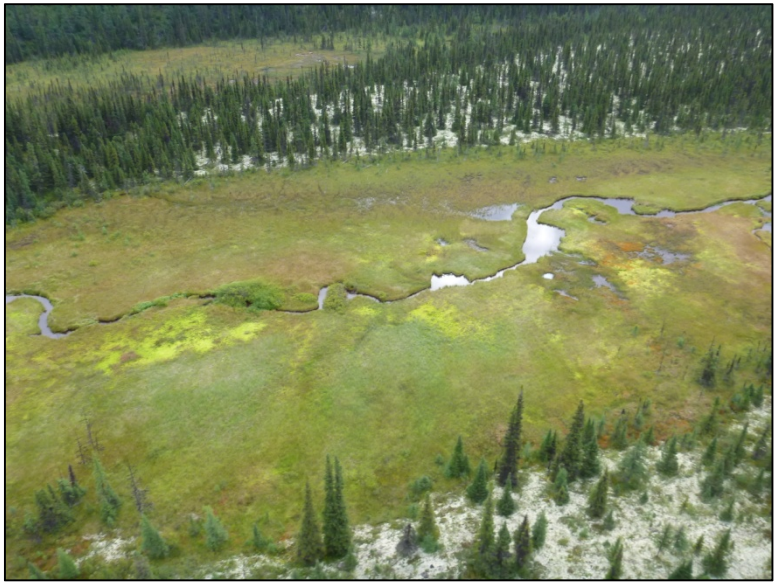


Photo 27. Riparian fen

Photo 28. Forested swamp (RU4)

Photo 29. Flat bog (FE1)

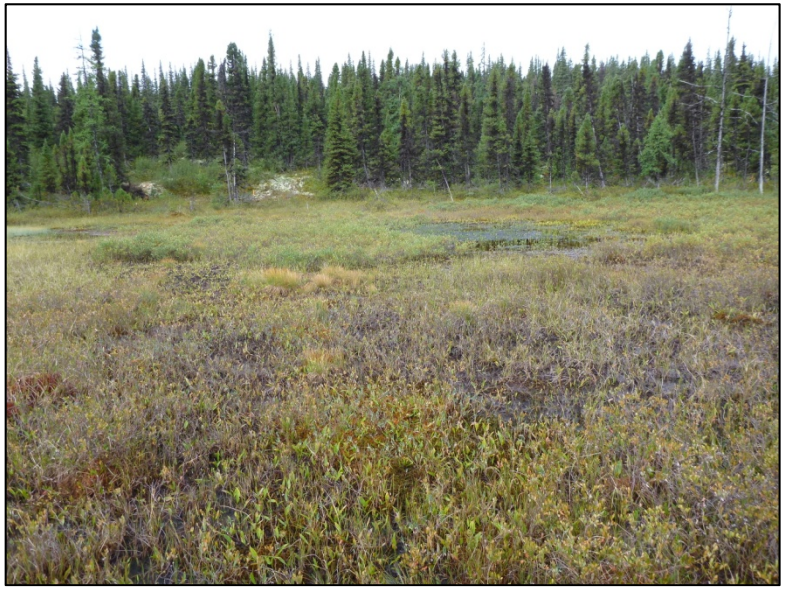


Photo 30. Flat bog (OM2)

Photo 31. Temporary pond (TE2)

Photo 32. Pond (in Joyce Lake Peninsula)

Photo 33. Norwegian cudweed found on exposed gravel substrate (OMNO)

Photo 34. Norwegian cudweed inflorescenses, Monts Groulx, Québec, 2009 (Source: Derek Lynch)

Photo 35. Swampy Bay River (RV1)

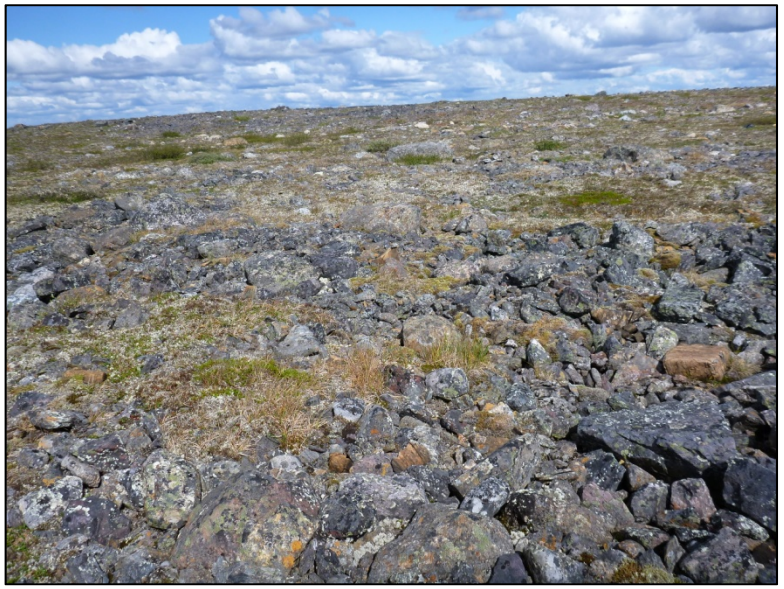


Photo 36. Alpine tundra (AL5)

Photo 37. Melted snow pack (CO1)

Photo 38. Dolomitic bedrock (AL8)

Photo 39. Gilling River (MR1 and DE2)

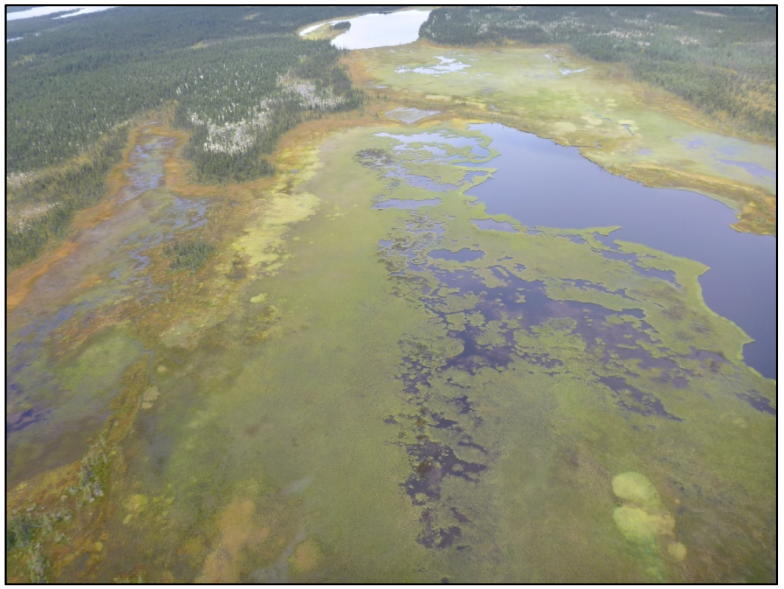


Photo 40. Peat land mosaic

Appendix G:
Wetland Ecological Function Assessment

Appendix G: Wetland Ecological Function Assessment

Wetland ID	Wetland Type	Complex ID	Landscape Position	Landform	Water Flow Path	Stream Order	Borders Lake	Surface Water Detention	Sediment Retention	Streamflow Maintenance	Carbon Sequestration	Shoreline Stabilisation	Fish Habitat	Stream Shading	Waterfowl and Waterbird Habitat	Species of Conservation Concern Habitat	Area (ha)
1	HORIZONTAL FEN	1	Lentic	Fringe	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	No	No	Yes	Yes	1.24
2	SHRUB SWAMP	1	Lentic/Lotic	Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.80
3	HORIZONTAL FEN	1	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.00
4	HORIZONTAL FEN	1	Terrene	Slope	Outflow undefined	0	Yes	No	No	No	Yes	No	No	No	No	Yes	11.69
5	NORTHERN RIBBED FEN	1	Terrene pond	Flat/Slope	Outflow	0	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	2.56
6	NORTHERN RIBBED FEN	1	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.93
7	SHRUB SWAMP		Lentic	Fringe	Outflow undefined	0	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	0.50
8	FLAT BOG		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.52
9	FLAT BOG		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.35
10	TEMPORARY POND		Terrene pond	Basin	Isolate	0	No	Yes	No	No	No	No	No	No	Yes	Yes	1.03
11	SHRUB SWAMP		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.36
12	TEMPORARY POND		Terrene	Basin	Isolate	0	No	Yes	No	No	No	No	No	No	Yes	Yes	0.10
13	SHRUB SWAMP		Lentic	Slope	Outflow undefined	0	Yes	No	Yes	No	No	Yes	No	No	No	Yes	0.79
14	FLAT BOG		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.68
15	FLAT BOG		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.22
16	FORESTED BOG		Terrene	Flat	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	0.99
17	FORESTED BOG		Terrene	Flat	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	0.55
18	HORIZONTAL FEN		Terrene pond	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	Yes	Yes	0.57
19	NORTHERN RIBBED FEN		Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	1.07
21	FORESTED FEN	2	Terrene	Slope	Outflow undefined	0	Yes	No	No	No	Yes	Yes	No	No	No	Yes	128.01
22	HORIZONTAL FEN	2	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	No	No	Yes	Yes	0.56
23	SHRUB SWAMP	2	Lotic	Flat/Slope	Throughflow	1	No	No	No	Yes	Yes	No	No	Yes	Yes	Yes	1.35
24	HORIZONTAL FEN	2	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	6.80
33	SHRUB SWAMP		Lentic	Fringe	Outflow undefined	0	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	1.93
34	SHRUB SWAMP		Lentic	Fringe	Outflow undefined	0	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	0.50
35	SHRUB SWAMP		Lentic	Fringe	Outflow undefined	0	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	0.36
36	FORESTED BOG		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.71
46	FORESTED FEN		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.55
47	FORESTED FEN		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.73
48	SHRUB SWAMP		Lentic	Slope	Outflow undefined	0	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.79
49	FORESTED FEN	3	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	3.25
50	SHRUB SWAMP	3	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.71
51	NORTHERN RIBBED FEN		Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	2.03
56	SHRUB SWAMP		Lotic	Slope	Throughflow	1	No	No	Yes	Yes	Yes	No	No	Yes	No	Yes	0.77
57	FORESTED FEN	4	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.07
58	HORIZONTAL FEN	4	Terrene	Flat/Slope	Outflow	0	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	13.28
59	NORTHERN RIBBED FEN	4	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.34

Appendix G: Wetland Ecological Function Assessment

Wetland ID	Wetland Type	Complex ID	Landscape Position	Landform	Water Flow Path	Stream Order	Borders Lake	Surface Water Detention	Sediment Retention	Streamflow Maintenance	Carbon Sequestration	Shoreline Stabilisation	Fish Habitat	Stream Shading	Waterfowl and Waterbird Habitat	Species of Conservation Concern Habitat	Area (ha)
60	FORESTED FEN	4	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.61
61	NORTHERN RIBBED FEN	4	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	8.62
62	FORESTED FEN	4	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.01
63	FORESTED BOG	5	Terrene	Flat	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	2.11
64	NORTHERN RIBBED FEN	5	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	1.91
65	NORTHERN RIBBED FEN		Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	1.16
66	FORESTED FEN	6	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	9.73
67	NORTHERN RIBBED FEN	6	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	1.69
68	HORIZONTAL FEN	7	Terrene	Flat	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	0.61
69	SHRUB SWAMP	7	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.70
70	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.34
71	TEMPORARY POND		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	1.03
72	RIPARIAN FEN		Terrene pond	Flat	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	1.77
73	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.78
74	FORESTED FEN	8	Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	18.63
75	NORTHERN RIBBED FEN	8	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.89
76	RIPARIAN FEN		Lentic/Lotic	Flat/Slope	Throughflow	0	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.27
77	RIPARIAN FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.15
78	RIPARIAN FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.99
79	RIPARIAN FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.72
80	FORESTED FEN	9	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8.56
81	RIPARIAN FEN	9	Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.18
82	NORTHERN RIBBED FEN	9	Lentic	Flat/Slope	Outflow undefined	0	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	5.46
328	FORESTED BOG	9	Terrene	Flat	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	23.98
329	FORESTED FEN	9	Lentic	Flat/Slope	Throughflow	0	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	19.36
83	FORESTED FEN	10	Lentic	Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7.35
84	FORESTED FEN	10	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	4.20

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Wetland ID	Wetland Type	Complex ID	Landscape Position	Landform	Water Flow Path	Stream Order	Borders Lake	Surface Water Detention	Sediment Retention	Streamflow Maintenance	Carbon Sequestration	Shoreline Stabilisation	Fish Habitat	Stream Shading	Waterfowl and Waterbird Habitat	Species of Conservation Concern Habitat	Area (ha)
85	RIPARIAN FEN	10	Lentic	Flat/Slope	Outflow undefined	0	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	6.34
86	NORTHERN RIBBED FEN	10	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	3.48
87	HORIZONTAL FEN	10	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	15.27
88	FORESTED FEN	10	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	5.94
89	HORIZONTAL FEN	10	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.58
90	FORESTED FEN	10	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	3.32
91	NORTHERN RIBBED FEN	10	Terrene pond	Flat/Slope	Outflow undefined	0	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	99.45
92	NORTHERN RIBBED FEN	10	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	2.81
93	FORESTED FEN	10	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	16.58
94	NORTHERN RIBBED FEN	10	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.87
95	HORIZONTAL FEN	10	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	5.16
96	HORIZONTAL FEN	10	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	5.01
97	FORESTED BOG	10	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	7.98
98	HORIZONTAL FEN	10	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.95
99	HORIZONTAL FEN	10	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.72
100	FORESTED BOG	10	Lentic	Flat	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10.16
101	FORESTED FEN	10	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.67
102	RIPARIAN FEN	10	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	2.20
103	RIPARIAN FEN	10	Lentic/Lotic	Flat/Slope	Outflow undefined	0	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.44
104	FORESTED FEN	10	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	12.11
105	FORESTED FEN		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	4.01
106	FORESTED FEN		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.28
107	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.96
108	FORESTED FEN		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	5.21
109	FORESTED FEN	11	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	9.59
110	HORIZONTAL FEN	11	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.27
111	FORESTED FEN	11	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.36
112	HORIZONTAL FEN	11	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.10
113	HORIZONTAL FEN	12	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.88
114	FORESTED FEN	12	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.03
115	NORTHERN RIBBED FEN	12	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	1.08

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Wetland ID	Wetland Type	Complex ID	Landscape Position	Landform	Water Flow Path	Stream Order	Borders Lake	Surface Water Detention	Sediment Retention	Streamflow Maintenance	Carbon Sequestration	Shoreline Stabilisation	Fish Habitat	Stream Shading	Waterfowl and Waterbird Habitat	Species of Conservation Concern Habitat	Area (ha)
116	HORIZONTAL FEN	12	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	3.05
117	FORESTED FEN	12	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	5.82
118	HORIZONTAL FEN	12	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.12
119	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	7.21
120	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.51
121	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.21
122	FLAT BOG		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.64
123	RIPARIAN FEN	13	Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5.45
124	RIPARIAN FEN	13	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7.31
125	NORTHERN RIBBED FEN	13	Lentic	Flat/Slope	Outflow undefined	0	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.26
126	SHRUB SWAMP	13	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2.52
127	HORIZONTAL FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	6.16
128	SHRUB SWAMP		Terrene	Flat/Slope	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	0.97
129	FORESTED FEN		Lentic/Lotic	Flat/Slope	Outflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.03
130	HORIZONTAL FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	3.65
131	SHRUB SWAMP		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.93
132	SHRUB SWAMP		Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	3.26
133	SHRUB SWAMP		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.48
134	SHRUB SWAMP		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	3.12
135	HORIZONTAL FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4.08
136	HORIZONTAL FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2.22
137	SHRUB SWAMP		Terrene	Basin	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	0.48
138	RIPARIAN FEN	14	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	3.13

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Wetland ID	Wetland Type	Complex ID	Landscape Position	Landform	Water Flow Path	Stream Order	Borders Lake	Surface Water Detention	Sediment Retention	Streamflow Maintenance	Carbon Sequestration	Shoreline Stabilisation	Fish Habitat	Stream Shading	Waterfowl and Waterbird Habitat	Species of Conservation Concern Habitat	Area (ha)
139	SHRUB SWAMP	14	Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	6.96
140	RIPARIAN FEN	14	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7.48
141	FORESTED FEN	14	Lentic	Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8.14
142	RIPARIAN FEN	14	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.29
143	HORIZONTAL FEN	14	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	4.14
144	RIPARIAN FEN	14	Lentic/Lotic	Flat/Slope	Outflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	3.58
145	SHRUB SWAMP		Lentic	Flat/Slope	Outflow	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4.17
146	FORESTED FEN	15	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.84
147	TEMPORARY POND	15	Terrene pond	Flat	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.28
148	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.13
149	RIPARIAN FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.91
150	RIPARIAN FEN		Lentic	Island	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.65
151	RIPARIAN FEN		Lentic	Island	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.18
152	NORTHERN RIBBED FEN	16	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	20.97
153	FORESTED FEN	16	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	7.78
154	SHRUB SWAMP	16	Terrene pond	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	Yes	Yes	0.61
155	FORESTED BOG		Terrene	Basin	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	0.44
156	RIPARIAN FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.32
157	RIPARIAN FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.33
158	RIPARIAN FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.43
159	FORESTED BOG	17	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.40
160	SHRUB SWAMP	17	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.35
161	RIPARIAN FEN	17	Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10.70

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Wetland ID	Wetland Type	Complex ID	Landscape Position	Landform	Water Flow Path	Stream Order	Borders Lake	Surface Water Detention	Sediment Retention	Streamflow Maintenance	Carbon Sequestration	Shoreline Stabilisation	Fish Habitat	Stream Shading	Waterfowl and Waterbird Habitat	Species of Conservation Concern Habitat	Area (ha)
162	FORESTED BOG		Terrene	Basin	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	0.29
163	FORESTED BOG		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.37
164	FORESTED FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.56
165	FORESTED BOG		Terrene	Basin	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	1.80
166	FORESTED BOG		Terrene	Basin	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	0.85
167	FORESTED BOG		Terrene	Basin	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	0.61
168	FORESTED BOG	18	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.39
169	TEMPORARY POND	18	Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.56
170	HORIZONTAL FEN	19	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.38
171	FORESTED FEN	19	Lentic	Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11.91
172	RIPARIAN FEN	20	Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.78
173	FORESTED SWAMP	20	Lentic	Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2.68
174	SHRUB SWAMP	20	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.58
175	SHRUB SWAMP		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.29
176	POND		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.12
177	HORIZONTAL FEN	21	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	4.31
178	TEMPORARY POND	21	Terrene pond	Basin	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.43
179	RIPARIAN FEN	21	Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.28
180	HORIZONTAL FEN	22	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.67
181	FORESTED BOG	22	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.46
182	FLAT BOG	22	Lentic	Flat	Outflow undefined	0	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.64
183	FORESTED SWAMP	23	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.84
184	POND	23	Terrene pond	Basin	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.25
185	RIPARIAN FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.84
186	FORESTED FEN		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	24.66
187	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.26

Appendix G: Wetland Ecological Function Assessment

Wetland ID	Wetland Type	Complex ID	Landscape Position	Landform	Water Flow Path	Stream Order	Borders Lake	Surface Water Detention	Sediment Retention	Streamflow Maintenance	Carbon Sequestration	Shoreline Stabilisation	Fish Habitat	Stream Shading	Waterfowl and Waterbird Habitat	Species of Conservation Concern Habitat	Area (ha)
188	RIPARIAN FEN		Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.69
189	RIPARIAN FEN		Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.74
190	FORESTED FEN	24	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	3.21
191	FORESTED BOG	24	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	11.79
192	HORIZONTAL FEN	24	Terrene pond	Flat	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	2.60
193	NORTHERN RIBBED FEN	24	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	11.09
194	FORESTED FEN	24	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.32
195	HORIZONTAL FEN	24	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	4.94
196	FORESTED FEN	24	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	10.64
197	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.36
198	TEMPORARY POND		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.25
199	RIPARIAN FEN		Terrene	Flat	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.75
200	FORESTED FEN	25	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	3.35
201	SHRUB SWAMP	25	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	3.37
202	HORIZONTAL FEN	25	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	9.93
203	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	5.45
204	FORESTED BOG		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	9.90
205	RIPARIAN FEN	26	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	No	Yes	Yes	No	No	No	Yes	1.41
206	TEMPORARY POND	26	Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	1.33
207	TEMPORARY POND		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.43
208	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.80
209	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.69
210	FORESTED FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.20
211	FORESTED BOG		Terrene	Flat	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	0.57
212	FORESTED FEN	27	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	4.35
213	SHRUB SWAMP	27	Lotic	Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5.55
214	FORESTED FEN	27	Lotic	Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	20.88
215	RIPARIAN FEN	27	Lentic/Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11.31
216	FORESTED FEN	27	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	8.98
217	SHRUB SWAMP		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.72
218	SHRUB SWAMP		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.98

Appendix G: Wetland Ecological Function Assessment

Wetland ID	Wetland Type	Complex ID	Landscape Position	Landform	Water Flow Path	Stream Order	Borders Lake	Surface Water Detention	Sediment Retention	Streamflow Maintenance	Carbon Sequestration	Shoreline Stabilisation	Fish Habitat	Stream Shading	Waterfowl and Waterbird Habitat	Species of Conservation Concern Habitat	Area (ha)
219	SHRUB SWAMP		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	3.02
220	HORIZONTAL FEN	28	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.08
221	TEMPORARY POND	28	Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.38
222	SHRUB SWAMP		Lotic	Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2.76
223	SHRUB SWAMP	29	Lotic	Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5.32
224	NORTHERN RIBBED FEN	29	Terrene pond	Flat/Slope	Outflow undefined	0	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	53.51
225	FORESTED FEN	29	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	4.51
226	FORESTED FEN	29	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.81
227	NORTHERN RIBBED FEN		Terrene	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	4.99
228	FLAT BOG		Terrene	Basin	Isolate	0	No	No	No	No	Yes	No	No	No	No	Yes	0.52
229	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.01
230	FORESTED FEN		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	17.33
231	HORIZONTAL FEN		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.95
232	FORESTED FEN	30	Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9.35
233	NORTHERN RIBBED FEN	30	Terrene	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	4.04
234	FORESTED FEN	30	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.23
235	FORESTED FEN	30	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	3.16
236	FORESTED FEN		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.24
237	NORTHERN RIBBED FEN	31	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.50
238	HORIZONTAL FEN	31	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.74
239	NORTHERN RIBBED FEN		Terrene	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.37
240	FORESTED FEN		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	5.67
241	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.58
242	FORESTED FEN		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.61
243	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.41
244	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.15
245	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.18
246	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.45
247	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.25
248	RIPARIAN FEN	32	Terrene	Flat	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.26
249	NORTHERN RIBBED FEN	32	Terrene	Flat	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.26
250	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.83
251	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.56

Appendix G: Wetland Ecological Function Assessment

Wetland ID	Wetland Type	Complex ID	Landscape Position	Landform	Water Flow Path	Stream Order	Borders Lake	Surface Water Detention	Sediment Retention	Streamflow Maintenance	Carbon Sequestration	Shoreline Stabilisation	Fish Habitat	Stream Shading	Waterfowl and Waterbird Habitat	Species of Conservation Concern Habitat	Area (ha)
252	SHRUB SWAMP	33	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.82
253	HORIZONTAL FEN	33	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.09
254	NORTHERN RIBBED FEN	33	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	1.09
255	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.87
256	HORIZONTAL FEN	34	Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	3.13
257	NORTHERN RIBBED FEN	34	Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	1.14
258	RIPARIAN FEN	35	Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.50
259	SHRUB SWAMP	35	Terrene	Flat/Slope	Outflow	0	No	No	No	No	Yes	No	No	No	No	Yes	1.56
260	POND		Terrene pond	Basin	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.20
261	FORESTED FEN		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	3.52
262	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.80
263	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.48
264	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.58
265	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.28
266	RIPARIAN FEN		Lentic	Flat	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.43
267	FORESTED FEN		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	3.17
268	FORESTED FEN		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.10
269	FORESTED FEN		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.78
270	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.33
271	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.34
272	FORESTED FEN		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.41
273	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.23
274	RIPARIAN FEN		Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2.43
275	POND		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.09
276	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.38
277	RIPARIAN FEN	36	Lotic	Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2.00
278	FORESTED FEN	36	Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	3.66
279	POND		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.33
280	SHRUB SWAMP		Lotic	Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2.88
281	HORIZONTAL FEN	37	Lentic	Flat	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4.87

Appendix G: Wetland Ecological Function Assessment

Wetland ID	Wetland Type	Complex ID	Landscape Position	Landform	Water Flow Path	Stream Order	Borders Lake	Surface Water Detention	Sediment Retention	Streamflow Maintenance	Carbon Sequestration	Shoreline Stabilisation	Fish Habitat	Stream Shading	Waterfowl and Waterbird Habitat	Species of Conservation Concern Habitat	Area (ha)
282	SHRUB SWAMP	37	Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	0.59
283	FORESTED BOG	37	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.19
284	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.95
285	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	1	No	No	No	No	Yes	No	No	No	No	Yes	2.17
286	HORIZONTAL FEN		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.54
287	HORIZONTAL FEN		Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	3.06
288	SHRUB SWAMP		Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.68
289	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.34
290	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.23
291	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.10
292	SHRUB SWAMP	38	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.44
293	POND	38	Terrene pond	Basin	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.48
294	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.75
295	HORIZONTAL FEN		Terrene pond	Flat/Slope	Outflow undefined	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	3.55
296	SHRUB SWAMP		Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8.16
297	HORIZONTAL FEN		Lotic	Flat/Slope	Outflow undefined	0	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2.36
298	SHRUB SWAMP		Lotic	Flat/Slope	Outflow undefined	0	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2.46
299	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.41
300	SHRUB SWAMP		Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.43
301	SHRUB SWAMP		Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.27
302	FORESTED BOG	39	Lotic	Flat/Slope	Outflow undefined	0	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.84
303	HORIZONTAL FEN	39	Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.49
304	SHRUB SWAMP	40	Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.38
305	FORESTED BOG	40	Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.28
306	SHRUB SWAMP		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	1.05

Appendix G: Wetland Ecological Function Assessment

Wetland ID	Wetland Type	Complex ID	Landscape Position	Landform	Water Flow Path	Stream Order	Borders Lake	Surface Water Detention	Sediment Retention	Streamflow Maintenance	Carbon Sequestration	Shoreline Stabilisation	Fish Habitat	Stream Shading	Waterfowl and Waterbird Habitat	Species of Conservation Concern Habitat	Area (ha)
307	SHRUB SWAMP		Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.42
308	SHRUB SWAMP	41	Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.46
309	SHRUB SWAMP	41	Lentic/Lotic	Flat/Slope	Throughflow	0	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11.11
310	FORESTED BOG	41	Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.17
311	TEMPORARY POND		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.34
312	HORIZONTAL FEN		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.20
313	SHRUB SWAMP		Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.92
314	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.93
315	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.78
316	FORESTED FEN		Terrene	Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	2.89
317	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.16
318	POND		Terrene pond	Basin	Isolate	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	0.17
319	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.61
320	FORESTED FEN	42	Lentic	Flat/Slope	Outflow undefined	0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4.22
321	SHRUB SWAMP	42	Lentic/Lotic	Flat/Slope	Throughflow	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1.39
322	SHRUB SWAMP		Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	3.55
323	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.18
324	SHRUB SWAMP		Terrene	Flat	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	0.18
325	SHRUB SWAMP		Lotic	Flat/Slope	Throughflow	1	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5.79
326	FORESTED BOG		Terrene	Flat/Slope	Outflow undefined	0	No	No	No	No	Yes	No	No	No	No	Yes	11.13
327	NORTHERN RIBBED FEN		Terrene	Flat/Slope	Throughflow	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	13.43
330	RIPARIAN FEN	43	Lentic	Flat/Slope	Throughflow	0	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	19.18
331	FORESTED BOG	43	Lentic	Flat/Slope	Isolate	0	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	30.16
332	NORTHERN RIBBED FEN	44	Terrene	Flat/Slope	Throughflow	0	No	Yes	No	No	Yes	No	No	No	Yes	Yes	24.3
333	FORESTED FEN	45	Lentic	Flat/Slope	Throughflow	0	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	36.77
334	HORIZONTAL FEN	45	Terrene	Flat/Slope	Throughflow	0	No	No	No	No	Yes	No	No	No	No	Yes	20.61

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