8.7 VEGETATED ENVIRONMENT

The Vegetated Environment is defined as the physical area where vegetation is found, and includes all vascular plants and vegetation communities, and the soil, climatic, and hydrological conditions that support them in upland, wetland, and aquatic habitats. The Vegetated Environment was selected as a valued environmental component (VEC) because of the potential for the Project to affect the Vegetated Environment, and because of the intrinsic value of plants and vegetation communities for biodiversity. This VEC focuses on "rare" plants and vegetation communities as defined below, within the zone of influence of the Project as the most important indicators of biodiversity. Vegetation communities as they relate to terrestrial habitat for wildlife species were assessed as part of the Terrestrial Environment (Section 8.6).

A variety of information sources, including field surveys, were used to describe the existing conditions within the Project Development Area (PDA; Figure 1.2.1) and surrounding Local Assessment Area (LAA, defined later), focusing on vegetation communities (including wetlands), and vascular plant species at risk (SAR) and species of conservation concern (SOCC), defined below. Potential Project-VEC interactions are evaluated, including Construction-related activities such as site preparation for all mine-related infrastructure such as the tailings storage facility (TSF), ore processing facilities and open pit, the new 138 kV transmission line construction, and relocation of the existing 345 kV transmission line, and construction of the site access road, internal site roads, and relocation of the Fire Road, which were determined to be the Project-related activities that have the highest potential for causing adverse environmental effects to biodiversity and the Vegetated Environment. Mitigation measures are outlined. Potential cumulative environmental effects between the Project and other projects or activities that have been or will be carried out are also evaluated, particularly future forestry and agricultural land use, the activities determined to be most likely to potentially interact cumulatively with the Project on the Vegetated Environment.

Field surveys conducted in the LAA of the Project identified 446 vascular plant species. No vascular plant SAR were discovered during field surveys, and only one plant SOCC (Nodding ladies'-tresses, *Spiranthes cernua*) was found within the LAA, in the corridor for the planned relocation of the existing 345 kV transmission line. This SOCC was found immediately adjacent to an existing forest resource road, and as mitigation, clearing will be restricted in this area; with avoidance of clearing in this area and placement of transmission line poles to span this area, the identified SOCC will not be directly affected by the Project. The Project will result in the loss and/or change in some vegetation communities as Project facilities are constructed, but with mitigation, the resulting residual loss represents less than 1.6% of the vegetation communities in the Regional Assessment Area (RAA, defined later), and thus the resulting environmental effects are rated not significant. Cumulative environmental effects resulting from the Project and future forestry and agricultural use may result in a temporary change in the planned removal or change in vegetation communities within the RAA related to forest harvesting and the removal of timber (resulting from some stands within the PDA being removed earlier than planned and the subsequent need to adjust harvest plans for the area), as well as a temporary displacement of Old Forest Communities designated by the New Brunswick Department of Natural Resources (NBDNR). Crown land management in New Brunswick incorporates target levels of a variety of forest conditions for the support of various vertebrate species. Included in these targets are objectives for Old Forest Communities of various mature tree species compositions as defined in the Objectives and Standards document (NBDNR 2005). These communities can be replaced with

planning where appropriate stands are identified for management as Old Forest Communities. Any losses would be minor (*i.e.*, represent less than 0.8% of the affected Old Forest Communities in the RAA) and temporary in nature and are thus rated not significant. Monitoring of the SOCC population, particularly for Nodding ladies'-tresses, is proposed for years 1, 3, and 5 following the completion of Construction.

8.7.1 Scope of Assessment

This section defines the scope of the environmental assessment of the Vegetated Environment in consideration of the nature of the regulatory setting and issues identified during public and First Nations engagement activities.

8.7.1.1 Rationale for Selection of Valued Environmental Component, Regulatory Context, and Issues Raised During Engagement

The Vegetated Environment was selected as a VEC because of the potential for interaction between the Project and the Vegetated Environment, and because of the intrinsic value of plants and vegetation communities for biodiversity. This VEC focusses on "rare" vascular plants and vegetation communities within the zone of influence of the Project as they are indicators for biodiversity. There are no known occurrences of legislatively protected non-vascular plants in the RAA.

Rare plants include SAR and SOCC. SAR species include those listed as "Extirpated", "Endangered", "Threatened", or "Special Concern" by the federal *Species at Risk Act* (*SARA*) or the New Brunswick *Species at Risk Act* (NB *SARA*). The NB *SARA* has recently been proclaimed, and this report assumes that NB *SARA* and its regulations will be in effect by the time this environmental impact assessment (EIA) review is completed, and certainly prior to Construction of the Project. SOCC are defined as species ranked S1 ("Extremely Rare") or S2 ("Rare") in New Brunswick by the Atlantic Canada Conservation Data Centre (AC CDC), or species ranked "May Be At Risk" or "Sensitive" in New Brunswick by the Canadian Endangered Species Conservation Council (CESCC). Unlike SAR, SOCC are not afforded any direct protection by either federal or provincial legislation. SOCC are included in this VEC as a precautionary measure, reflecting observations and trends in their provincial population status, and are often important indicators of ecosystem health and regional biodiversity. Rare plants are often an indicator of the presence of unusual and/or sensitive habitat, and their protection as umbrella species can confer protection on their associated unusual habitats and co-existing species.

SARA and NB *SARA* include plants, the focus of this VEC, within the broader definition of "wildlife species". They both generally prohibit listed wildlife species or their residences from being destroyed, disturbed, or otherwise interfered with. Under *SARA* and NB *SARA*, a wildlife species is defined as *"a species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is (a) native to Canada* (New Brunswick)*, or (b) has extended its range into Canada* (New Brunswick) *without human intervention and has been present in Canada* (New Brunswick) *for at least 50 years"*. *SARA* is co-administered by Environment Canada, the Parks Canada Agency, and Fisheries and Oceans Canada (DFO). NB *SARA* is administered by the New Brunswick Department of Natural Resources (NBDNR).

No issues specifically related to vegetation communities were raised during public or stakeholder engagement activities. During Aboriginal engagement, First Nations expressed concerns about the potential effects of the Project may have on plants and vegetation of Aboriginal importance (*e.g.,* fiddleheads, berries, black ash, calamus root, and other species of vegetation used for subsistence or other traditional activities by First Nations). Additionally, the issue of the possible presence of medicinal plants in the PDA and their use by Aboriginal persons was raised. These issues are addressed herein in terms of the sustainability of vegetation communities; the use of those resources for traditional purposes will be addressed in the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons VEC (Section 8.13).

8.7.1.2 Selection of Environmental Effect and Measurable Parameters

The environmental assessment of the Vegetated Environment is focused on the following environmental effect:

- Change in the Vegetated Environment.

The Project has the potential to affect the Vegetated Environment through changes in the abundance of vascular plant populations (including SAR and SOCC) and vascular plant communities. These potential changes could influence the sustained presence of vascular plant populations or communities within the greater Central Uplands and Valley Lowlands Ecoregions. There are two non-vascular plant species afford legislative protection in New Brunswick (*i.e.,* boreal felt lichen and voles ears lichen), but they are thought to be extirpated from the province. Given the value placed on the Vegetated Environment by regulatory agencies, the public, Aboriginal persons, and other stakeholders, the environmental assessment of the Vegetated Environment is focused on a Change in the Vegetated Environment, which encompasses the critical aspects of the VEC.

The measurable parameters used for the assessment of the environmental effect presented above and the rationale for their selection is provided in Table 8.7.1.

Table 8.7.1 Measurable Parameters for Vegetated Environment

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in the Vegetated Environment	Area of vegetation communities (ha)	• Vegetation communities will act as an umbrella or indicator for change in abundance and distribution of common species, including change in biodiversity. An assessment of vegetation communities will be used to consider whether or not vascular plant populations will be sustainable within the Central Uplands Ecoregion and Valley Lowlands Ecoregion.
	Loss of vascular plant SAR or SOCC (number of individuals or populations)	• SAR are protected by law (under *SARA* or NB *SARA*), and SOCC have special status or are of concern to NBDNR and/or COSEWIC.

The selection of these parameters was based on input from regulatory agencies, stakeholders, and the professional judgement of the Study Team, based on knowledge of the regulatory frameworks governing SAR and SOCC as well as the results of field surveys conducted for the Project as documented in the Baseline Vegetated and Wetland Environments Technical Report (Stantec 2012g).

These measurable parameters have a clear unit of measurement, and are central to the environmental assessment for the Vegetated Environment.

8.7.1.3 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on the Vegetated Environment include the three phases of Construction, Operation, and Decommissioning, Reclamation and Closure of the Project.

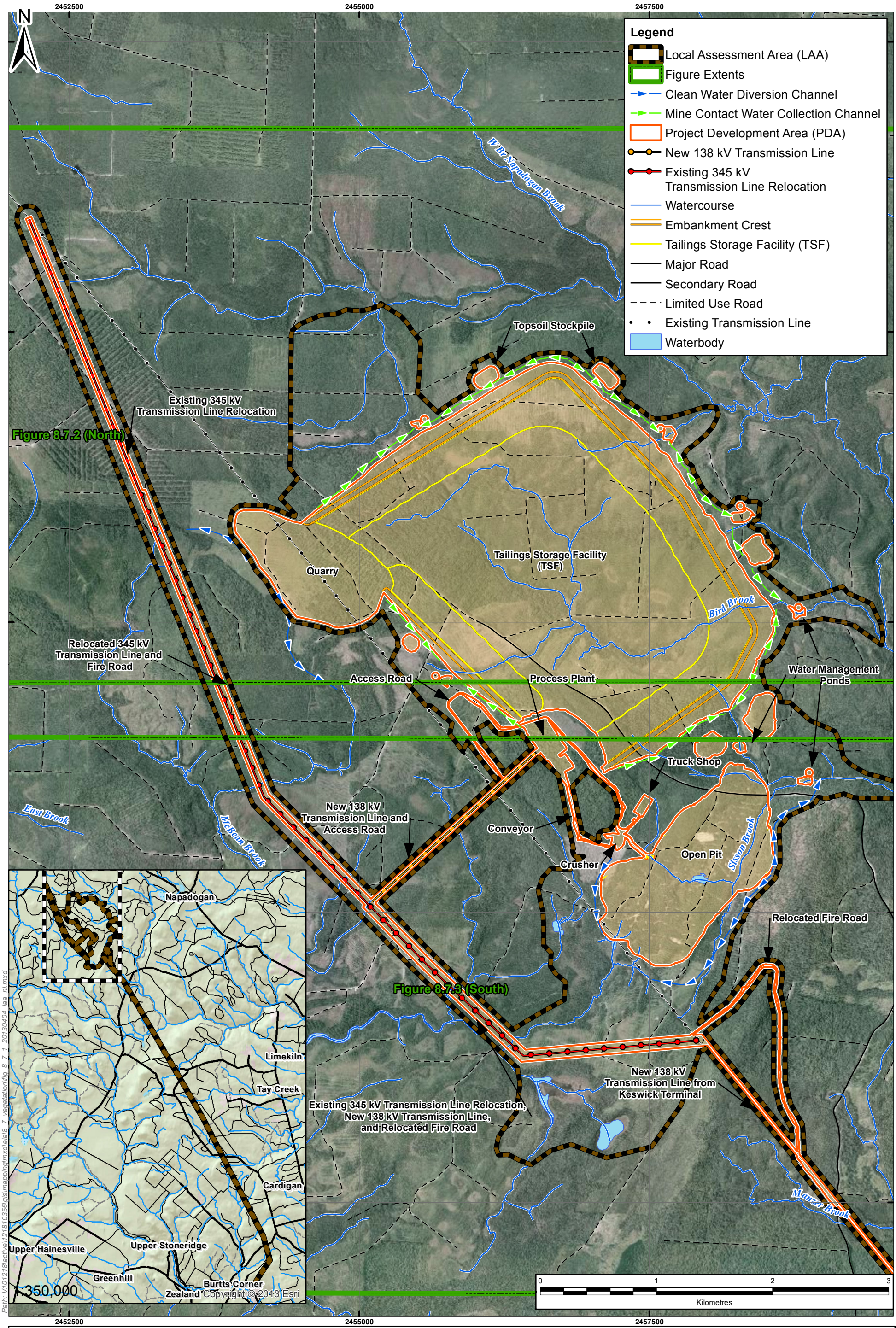
The Project's environmental effects on the Vegetated Environment will be greatest during Construction, when the majority of disturbance and ground work is being conducted. After this, disturbance of the vegetation communities is considerably less during Operation of the Project, primarily related to the growth of the TSF over the life of the Project. Decommissioning, Reclamation and Closure of the Project is expected to have the least potential to create adverse environmental effects on the Vegetated Environment, and may in fact result in positive environmental effects as vegetation is restored through re-vegetation and other reclamation efforts as well as through natural regrowth following the completion of Operation.

8.7.1.4 Spatial Boundaries

The spatial boundaries for the environmental effects assessment of the Vegetated Environment are defined below.

Project Development Area (PDA): The PDA (Figure 8.7.1) is the most basic and immediate area of the Project, and consists of the area of physical disturbance associated with the Construction and Operation of the Project. Specifically, the PDA consists of an area of approximately 1,253 hectares that includes: the open pit; ore processing plant; storage areas; TSF; quarry; the relocated Fire Road and new Project site access road; and new and relocated power transmission lines. The PDA is the area represented by the physical Project footprint as detailed in Chapter 3.

Local Assessment Area (LAA): The LAA is the maximum area within which Project-related environmental effects can be predicted or measured with a reasonable degree of accuracy and confidence (encompassing the likely zone of influence for the Vegetated Environment) (Figure 8.7.1). The LAA includes the PDA and any adjacent areas where Project-related environmental effects may reasonably be expected to occur. For the Vegetated Environment, the LAA encompasses the entire PDA and also includes contiguous wetlands downstream of the PDA at the mine site to the point where they converge with a larger receiving watercourse/wetland system. The LAA also includes a minimum buffer area of 45 m (*i.e.*, 1.5 times the standard 30 m wetland buffer as prescribed in the provincial *Watercourse and Wetland Alteration Regulation*) from the perimeter of the PDA, as an added precaution to allow for the assessment of possible indirect environmental effects on wetlands and their vegetation, and to account for edge effects related to any changes. Additional areas around Trouser Lake and Christmas Lake to the south of the PDA were included as part of the LAA due to the potential for indirect environmental effects arising from possible surface water drainage changes and groundwater drawdown into the open pit. These areas were also considered to have a high potential for harbouring plant SOCC. The LAA for the transmission line portion of the PDA includes standard 30 m wetland buffers on either side of the new 138 kV transmission line. The LAA for the Vegetated Environment comprises an area of approximately 2,404 ha.



NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Project Development Area (PDA), and Local Assessment Area (LAA) for the Vegetated Environment Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B.	Scale: 1:30,000	Project No.: 121810356	Data Sources: NBDNR	Fig. No.: 8.7.1	Stantec
	Date: (dd/mm/yyyy) 23/11/2014	Dwn. By: JAB	Appd. By: DLM		
Client: Sisson Mines Ltd.					

Stantec Consulting Ltd. © 2013

Map: NAD83 CSRS NB Double Stereographic

Path: V:\01218\active\121810356\gis\mapping\mxd\eia\8_7_vegetation\fig_8_7_1_20130404_laa_nl.mxd

Regional Assessment Area (RAA): The RAA is the area within which the Project's environmental effects may overlap or accumulate with the environmental effects of other projects or activities that have been or will be carried out. The extent to which cumulative environmental effects for the Vegetated Environment may occur depend on physical and biological conditions and the type and location of other past, present, and reasonably foreseeable future projects or activities that have been or will be carried out, as defined within the RAA. For the Vegetated Environment, the RAA includes the Central Uplands Ecoregion (excluding the Caledonia Uplands) and the Valley Lowlands Ecoregion, within both of which the Project is located. These encompassing ecoregions were selected as the RAA because these areas represent environments similar to those in the LAA and PDA, and provide relevant comparisons with vegetation populations and communities in the greater landscape. Although a small portion of the PDA and LAA are within the Grand Lake Lowlands Ecoregion (*i.e.*, the extreme southern end of the proposed 138 kV transmission line at Keswick), this ecoregion is excluded from the RAA, for reasons discussed in sub-section 8.7.2.

8.7.1.5 Administrative and Technical Boundaries

Administrative and technical boundaries were considered in assessing the environmental effects of the Project on the Vegetated Environment.

The administrative boundaries for the Vegetated Environment were briefly summarized above in terms of the legislative, regulatory and policy instruments at the provincial and federal level. The protection of plant SAR is regulated by the federal *SARA* and the NB *SARA*, the primary administrative boundaries for the Vegetated Environment in this EIA.

The purposes of *SARA* are:

- to prevent wildlife species (specifically plants for this VEC) from becoming extirpated or becoming extinct;
- to provide for the recovery of wildlife species that are extirpated, endangered, or threatened as a result of human activity; and
- to manage species of special concern to prevent them from becoming endangered or threatened.

General prohibitions of *SARA* include primarily Section 32(1) and Section 33. Section 32(1) states that no person shall kill, harm, harass, capture, or take an individual of a wildlife species (specifically plants for this VEC) that is listed as an extirpated, endangered, or threatened species. Section 33 states that no person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered or threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada. In addition, critical habitat (defined as the habitat that is necessary for the survival or recovery of a listed wildlife species) may be defined and protected under Section 58. Only those species currently listed in Schedule 1 of *SARA* (*i.e.*, those listed as "Extirpated", "Endangered", or "Threatened") are protected by the prohibitions of Sections 32-36 and 58 of that Act, and then only on federal lands, except for aquatic species and migratory birds which are protected throughout Canada by other acts and regulations. *SARA*-listed species designated as "Special Concern" are not protected by the prohibitions of

Sections 32-36 or 58 of that Act; however, these species do require that provincial or regional management plans, including conservation measures, be developed to protect the species. In addition, Section 79 states that through the environmental assessment process, the competent minister or ministers must be notified in writing if a project is likely to affect a listed wildlife species or its critical habitat. In such cases, the adverse environmental effects of a project on the listed wildlife species and its critical habitat must be identified, and if the project is carried out, measures must be taken to avoid or lessen those effects in a way that is consistent with any applicable recovery strategy and/or action plans, and the effects must be monitored.

Similarly, the purposes of NB *SARA* are:

- to prevent wildlife species (specifically plants for this VEC) from being extirpated from the Province;
- to provide for the recovery of wildlife species that are extirpated, endangered, or threatened as a result of human activity; and
- to conserve species of special concern to prevent them from becoming endangered or threatened.

Prohibitions of NB *SARA* include Section 28(2), which states that no person shall kill, harm, harass, or take any individual that is listed as “Extirpated”, “Endangered”, or “Threatened”. However, under Section 25, each species must undergo a protection assessment which will determine whether or not prohibitions stated in Section 28 should apply. Protection assessments consider, among other aspects, the management implications for the Province, land ownership issues, and social and economic factors.

To meet the requirements of the Final Guidelines (NBENV 2009) and the Terms of Reference (Stantec 2012a), the assessment of the Vegetated Environment includes a description of the existing environment and the assessment of potential environmental effects of the Project during all phases. The description of the existing conditions will assist with developing mitigation strategies and the assessment of cumulative environmental effects of the Project alone and in combination with other past, present, and future projects or activities that have been or will be carried out.

Technical boundaries for the Vegetated Environment include spatial limitations in existing data sources used to characterize vegetation communities in the LAA and RAA, spatial limitations of field surveys conducted in the PDA (*i.e.,* vascular plants can only be identified where field surveys were conducted, but not beyond), and temporal variations associated with the presence of vascular plants from one growing season to another (*i.e.,* plant communities could be present at one location during one year but not the next). To characterize vegetation communities in the LAA and RAA, existing information used for the assessment includes NBDNR forest inventory data (2008), aerial imagery (2008), LiDAR (Light Detection and Ranging) data (2010), New Brunswick Department of Environment and Local Government (NBDELG) wetland data, AC CDC elemental occurrence and expert opinion range map data, and 2008 and 2011 field survey data. These data are sufficient and have been used to accurately describe existing conditions and assess potential Project-related environmental effects, but many of the data sources do not cover the entire RAA.

There are no comprehensive databases for non-vascular plants and other organisms for New Brunswick. Regulatory authorities and non-regulatory institutions and professionals have very limited expertise and knowledge in the identification of non-vascular plants and other organisms in New Brunswick. Consequently, there is a technical limitation in the EIA regarding their consideration. This limitation is affirmed in the Terms of Reference (Stantec 2012a) in that the EIA is limited to the consideration of vascular plants and communities. This is a standard technical limitation for EIA in New Brunswick and Canada, with the consideration of vegetation generally being limited to vascular plants and communities. There are no known occurrences of non-vascular plants with legislative protection in the RAA, and none known to be protected in New Brunswick.

8.7.1.6 Residual Environmental Effects Significance Criteria

For SAR and SOCC vascular plants, a significant adverse residual environmental effect on the Vegetated Environment is one that:

- alters the terrestrial habitat within the LAA physically, chemically, or biologically, in quality or extent, in such a way as to cause a change or decline in the distribution or abundance of a viable plant population that is dependent upon that habitat such that the likelihood of long-term survival within New Brunswick is substantially reduced as a result;
- results in the direct mortality of individual plants or vegetation communities such that the likelihood of the long-term survival within the Central Uplands Ecoregion (excluding the Caledonia Uplands) and the Valley Lowlands Ecoregion is substantially reduced as a result;
- results in a non-permitted contravention of any of the prohibitions stated in Sections 32-36 of *SARA*, or in contravention of any of the prohibitions stated in Section 28 of NB *SARA*; or
- results in any non-compliance with the objectives of management plans (developed as a result of Section 65 of *SARA* or Section 20 of NB *SARA*) that are in place at the time of relevant Project activities.

For all other (secure) terrestrial flora, a significant adverse residual environmental effect on the Vegetated Environment is one that affects vascular plant populations or communities in such a way as to cause a substantive decline in abundance or change in distribution of common and secure populations or communities such that populations or communities will not be sustainable within the Central Uplands Ecoregion (excluding the Caledonia Uplands) and the Valley Lowlands Ecoregion.

8.7.2 Existing Conditions

8.7.2.1 Overview

New Brunswick is divided into seven ecoregions (Figure 6.3.8) which differ in physical characteristics such as climate, geology and soils, forest cover and vegetation, and wetlands. The Central Uplands Ecoregion includes two geographically separate but ecologically similar areas: the Madawaska Uplands in northwestern New Brunswick, and the Caledonia Uplands in the southeast part of the province near the Bay of Fundy. The PDA and the LAA are located in the southern portion of the Madawaska Uplands. The mine site for the Project is entirely within the Beadle Ecodistrict in the southern portion of

the Central Uplands Ecoregion, but relatively close (approximately 3 km) to the Valley Lowlands Ecoregion.

The proposed 138 kV transmission line for the Project extends from the mine site in the Central Uplands Ecoregion through the Valley Lowlands Ecoregion and ending near Keswick. The southernmost final 1.5 km of the proposed transmission line is within the Grand Lake Lowlands Ecoregion (the smallest ecoregion in the province), which differs markedly from other ecoregions in its warm climate and abundance of floodplain wetlands. The combination of these characteristics results in a species assemblage in the Grand Lake Lowlands Ecoregion that includes many southern species not often seen in other areas of the province. The area surrounding the proposed transmission line within the Grand Lake Lowlands Ecoregion does not differ greatly from the Valley Lowlands or Central Uplands Ecoregions in terms of forest cover data (most notably, fewer spruce-dominated stands). Because such a small portion of the overall project is within the most northern section of the Grand Lake Lowlands Ecoregion, it is believed that this small portion is not representative of that ecoregion as a whole. In addition, increasing the area of the RAA to include the Grand Lake Lowlands Ecoregion would result in less conservative environmental effects predictions. Therefore, for the purpose of this EIA, the RAA for the Vegetated Environment includes the Central Uplands Ecoregion (Madawaska Uplands portion) and the Valley Lowlands Ecoregion, but does not include the Grand Lake Lowlands Ecoregion.

The Central Uplands Ecoregion (Madawaska Uplands) is characterized by plateaus and warmer, south-facing slopes that support tree species such as balsam fir (*Abies balsamea)*; red, white, and black spruce (*Picea rubens*, *P. glauca*, and *P. mariana*); and tolerant hardwoods such as sugar maple (*Acer saccarum*), yellow birch (*Betula alleghaniensis*), and beech (*Fagus grandifolia*) (NBDNR 2007). Common understory shrub species include mountain maple (*Acer spicatum*), striped maple (*A. pensylvanicum*), and hobblebush (*Viburnum lantanoides*). Watercourses in the northern part of the Madawaska Uplands generally flow into the St. John River, whereas those in the southern part of the region primarily flow east and eventually into the Miramichi River. Rivers in the extreme south of the Madawaska Uplands are an exception; these flow into the Nashwaak River, which empties into the St. John River. The Central Uplands Ecoregion contains many different wetland types, particularly in southern areas where the landscape is less constrained by steep slopes. Bedrock within the Beadle Ecodistrict (where the mine is located) is primarily granitic, with relatively few fractures and low porosity causing poor drainage (Colpitts *et al.* 1995). This poor drainage has often resulted in lakes, ponds, and wetlands. Common wetland types include shrub riparian wetlands dominated by alder (*Alnus* spp.), open water wetlands, and peatlands (NBDNR 2007).

The Valley Lowlands Ecoregion, which the majority of the transmission line passes through, is the largest ecoregion in the province. It is associated with several large river systems, including the St. John and Kennebecasis rivers (NBDNR 2007). Because this ecoregion is associated with large river systems that are removed from the mediating influence of the ocean, winters are colder and summers are warmer compared to most of the province.

As discussed previously, the focus of the VEC is on vascular plants. There are two non-vascular plant SAR that either could occur in the LAA or were once found in the RAA: boreal felt lichen and voles ear lichen. Boreal felt lichen occurs in coastal coniferous forests and is currently thought to be extirpated from New Brunswick, although there are records from the coast of Cape Chignecto, which is outside of

the RAA. As such, there is a small potential that it persists in the southeast coastal areas of the province. However, known occurrences are limited to coastal areas of the Maritimes, and while the Central Uplands Ecoregion has a coastal component (Caledonia Uplands), it is unlikely that any possible remaining occurrences of boreal felt lichen would be found within the inland Madawaska Uplands component. Voles ears lichen was once found in the Central Uplands Ecoregion. However, it is thought to be extirpated from the province and predictive modeling for its habitat only includes the Caledonia Uplands Portion of the Central Uplands Ecoregion (COSEWIC 2009).

8.7.2.2 Methods Used to Establish Existing Conditions

8.7.2.2.1 Information Sources

Information was obtained from a variety of sources to characterize the LAA and identify data to be collected during field surveys. These information sources include: the NBDNR forest stand data (2008), aerial imagery (2008), soils data, watercourses, and waterbodies; LiDAR data (2010) collected for the Project; wetlands information documented by NBDELG; and information from AC CDC.

NBDNR forest cover data for the areas covered by the Project are based on aerial photos taken in 2008. LiDAR data was collected for the Project in December 2010, and was used to:

- update changes in the forest layer that have occurred since 2008;
- interpret watercourse locations and extents;
- develop a “hydrograph” for wetland interpretation;
- develop a wetland model;
- guide and assist the planning of field surveys; and
- assist in the interpretation of wetland boundaries.

NBDELG wetland data were used to determine the locations of “regulated” wetlands (as described in the Wetland Environment VEC, Section 8.8). NBDNR soils data were used in conjunction with forest data to assist in identifying richer sites that may support unusual communities or SAR and SOCC. AC CDC data indicated the known presence of SAR and/or SOCC within a 5 km radius of the Project.

8.7.2.2.2 Remote Sensing, Modelling, and Field Surveys

Existing conditions for the Vegetated Environment were determined using a combination of remote sensing, modelling, and field surveys. Prior to conducting field surveys, remote sensing and modelling were used to predict the locations and extents of wetlands and other areas of high potential for rare plants.

Specific vegetation communities or features with elevated potential for SOCC (sub-communities within the major vegetation communities described within the LAA) were identified from the NBDNR forest inventory, soils, watercourses and waterbodies information, NBDELG wetland information, and aerial imagery.

These vegetation communities include uncommon communities and other habitats required by SAR and SOCC identified by AC CDC to have potential to occur in the area, and include:

- wetlands;
- eastern white cedar-dominated forest stands;
- watercourses;
- lake margins;
- wet, 40+ year old black spruce- or red maple-dominated forest stands; and
- mature tolerant hardwood stands.

These elevated potential vegetation communities are described in the Baseline Vegetated and Wetland Environments Technical Report (Stantec 2012g). A summary description of these vegetation communities is as follows.

- Wetlands, although generally common within the LAA, include many individual sub-types that represent unique and uncommon habitats, and are well known for providing important habitat to a number of rare and uncommon species (Flather *et al.* 1998; NBDNRE 2002).
- Eastern white cedar-dominated forest stands are not common in the LAA as a result of a lack of calcareous soil units particularly in wet areas, and are known habitat for a number of species in the orchid family, many of which are SAR, SOCC, or uncommon (Hinds 2000).
- Watercourses provide important habitat for SAR and SOCC, including several species that have been identified by AC CDC as having potential for occurring in and around the LAA (AC CDC 2012a).
- Lake margins, also known as lacustrine shallow water wetlands (National Wetlands Working Group 1997), provide uncommon habitat for SAR and SOCC aquatic and semi-aquatic plants, including prototype quillwort, which AC CDC has identified as having potential for occurring in and around the LAA (AC CDC 2012a).
- Wet, 40+ year old black spruce- or red maple-dominated forest stands are known for providing habitat within the province for southern twayblade (*Listera australis*), a SAR designated as "Endangered" under NB *SARA*.
- Mature tolerant hardwood stands (*i.e.,* characterized by a dominance of tree species that grow well in shade) are relatively uncommon in New Brunswick, and are a known habitat for several SAR and SOCC, such as butternut (*Juglans cinerea*), a species that has been identified by AC CDC as having potential for occurring in and around the LAA (AC CDC 2012a).

Major vegetation communities (described in sub-section 8.7.2.3) were initially generated from NBDNR forestry and NBDELG wetland data, and then updated with wetland modelling, field survey observations, and interpretation of LiDAR data and aerial imagery. Further details on the methodology

of identification and delineation of vegetation communities, including wetland modelling, is available in the Baseline Vegetated and Wetland Environments Technical Report (Stantec 2012g).

Vegetation surveys were conducted from early June to mid-September 2011 and in 2012 to identify vascular plant species present, and to describe major vegetation communities in the LAA. Floristic habitat sampling (Newmaster *et al.* 2005) was completed by random meandering throughout the major vegetation communities. Hinds (2000) and Gleason and Cronquist (1991) were consulted for identification of species not identified in the field, and nomenclature followed AC CDC (2012c).

Surveys for plant SAR and SOCC used floristic habitat sampling focused on elevated potential vegetation communities. The geographical coordinates were recorded for the first encounter with all vascular plant species, dominant vascular plant species in each habitat type, and all SAR or SOCC vascular plant species.

8.7.2.3 Vegetation Communities

A summary of distribution of vegetation communities found in the LAA, including total area of each habitat type in the LAA and their associated percentage, is provided in Table 8.7.2. The distribution of these vegetation communities within the PDA and LAA (excluding the transmission line portion) is illustrated in Figures 8.7.2 and 8.7.3.

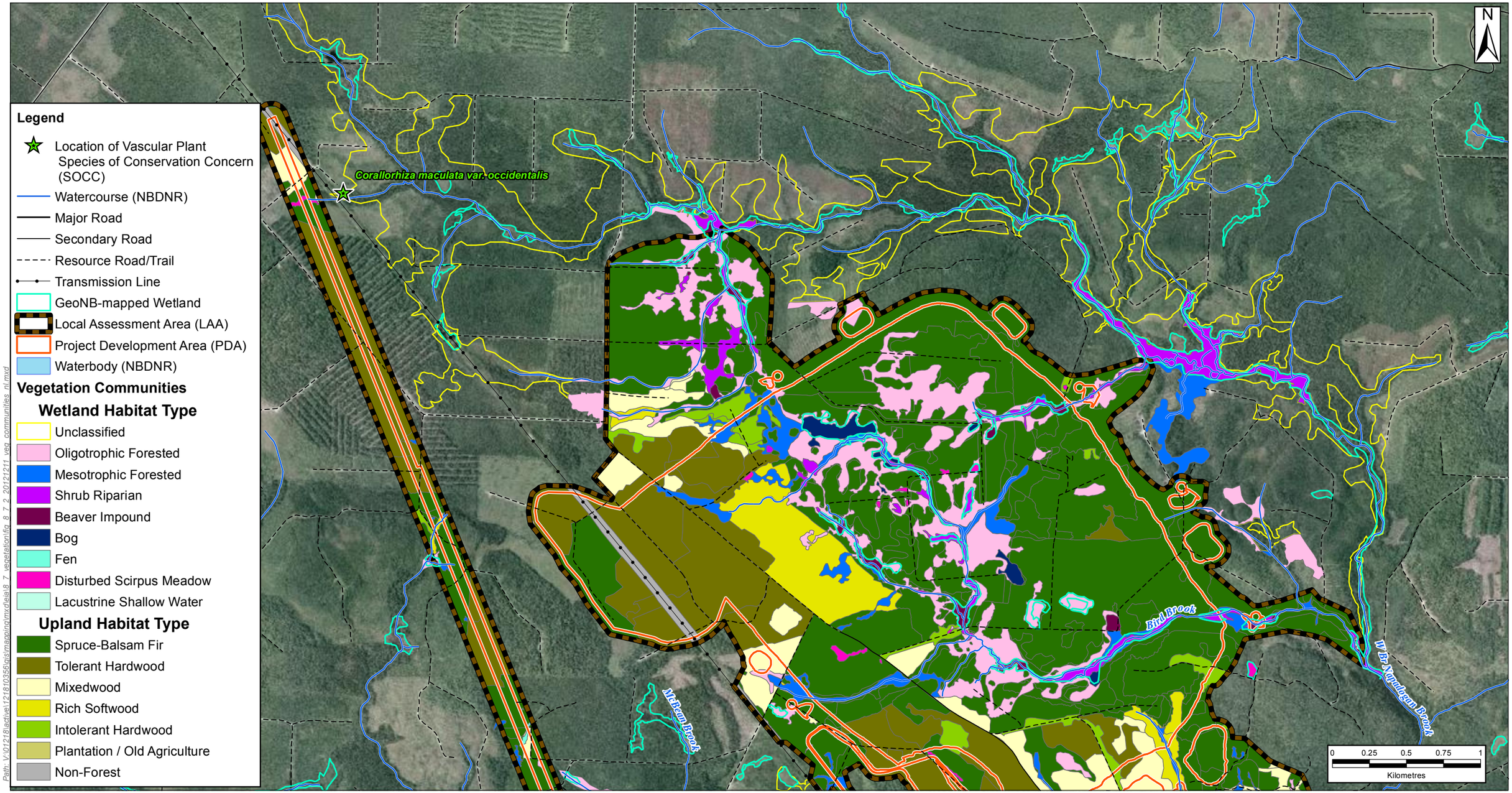
Table 8.7.2 Distribution of Vegetation Communities Within the LAA

Vegetation Community	Area of Vegetation Community within the LAA (ha)	Percentage of Total Area of the LAA (%)
Upland Habitat Types		
Spruce-Balsam Fir	1,101.9	45.8
Tolerant Hardwood	409.7	17.0
Mixedwood	143.9	6.0
Rich Softwood	108.4	4.5
Intolerant Hardwood	75.8	3.2
Plantation/Old Agriculture	20.0	0.8
Wetland Habitat Types		
Oligotrophic Forested Wetland	238.3	9.9
Mesotrophic Forested Wetland	111.7	4.7
Shrub Riparian Wetland	40.0	1.7
Beaver Impoundment Wetland	30.6	1.3
Bog	12.0	0.5
Fen	10.2	0.4
Disturbed Scirpus Meadow	5.4	0.2
Lacustrine Shallow Water Wetland	0.9	0.04
Other		
Non-forested (transmission line, waterbodies, industrial/mining areas)	95.5	4.0
Total	**2,404**	**100**

Spruce-Balsam Fir is the most common habitat type in LAA, comprising 45.8% of the LAA. This habitat type is composed of stands ranging in age from recently harvested to mature, with the majority of stands approximately 20 to 35 years old, and pre-commercially thinned (PCT) from recently to 15 years ago. The overstory in these stands is dominated by balsam fir and red or black spruce, with some red maple (*Acer rubrum*), and white birch (*Betula papyrifera*). The woody understory, depending on the age and openness of a stand (*i.e.,* how recently PCT occurred), is typically dominated by regenerating balsam fir, red spruce, red maple, and some mountain paper birch, with pin cherry (*Prunus pensylvanica*), and red raspberry (*Rubus idaeus*). The herbaceous ground layer is dominated by bryophytes (such as Schreber's feathermoss (*Pleurozium schreberi*), a moss (commonly known as broom moss, *Dicranum scoparium*), waxyleaf moss (*Dicranum polysetum*), and stairstep moss (*Hylocomium splendens*)), bunchberry (*Cornus canadensis*), wood ferns (primarily evergreen woodfern (*Dryopteris intermedia*)), velvet-leaved blueberry (*Vaccinium myrtilloides*), and wild lily-of-the-valley (*Maianthemum canadense*).

Tolerant Hardwood stands in the LAA are generally restricted to higher slopes where soils are richer and drainage is good. Near the mine site, much of this habitat has been partially harvested within the last 20 years, leaving approximately one-third of the residual overstory canopy, often in a linear strip pattern. Tolerant hardwood stands in the LAA are dominated in the overstory layer by sugar maple, yellow birch, and beech (*Fagus grandifolia*), with scattered amounts of white birch, red spruce, and balsam fir. On more southerly exposures, recently harvested, regenerating stands are often dominated by dense regrowth of red raspberry, and sapling-sized pin cherry, beech, and/or white birch, with shade tolerant species scattered throughout. The woody understory is primarily dominated by immature or stunted beech (beech canker is quite advanced in the LAA), hobblebush, striped maple, or other immature overstory species. The herbaceous ground cover community is dominated by wood ferns (primarily evergreen woodfern (*Dryopteris intermedia*)), shining firmoss (*Huperzia lucidula*), common wood sorrel (*Oxalis montana*), and uncommon members of the lily family (Liliaceae), such as painted trillium (*Trillium undulatum*), yellow trout lily (*Erythronium americanum*), Indian cucumber root (*Medeola virginiana*), and rose twisted-stalk (*Streptopus lanceolatus*). The tolerant hardwood stands in the LAA are representative of moderately rich sites, with few rich site indicator species such as ironwood (*Ostrya virginiana*), white ash, beaked hazel (*Corylus cornuta*), and baneberry (*Actaea* spp.), which are common in tolerant hardwood stands with more calcareous soils in the province.

Mixedwood habitat is scattered throughout the LAA. These stands are typically transitional between hardwood stands on upper slopes, and softwood stands at lower elevations. Some mixedwood stands have been recently harvested, while others are in a young or regenerating state; there are only a few mature-overmature mixedwood stands in the LAA. The tree canopy stratum, when present, is typically dominated by red spruce, yellow birch, balsam fir, red maple, and/or white birch. The woody understory includes species such as regenerating balsam fir, red maple, yellow birch, and/or red spruce, hobblebush, and striped maple. The herbaceous understory is usually dominated by wood sorrel, evergreen woodfern, goldthread (*Coptis trifolia*), wild sarsaparilla (*Aralia nudicaulis*), and hay-scented fern (*Dennstaedtia punctilobula*).



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NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Vegetation Communities within the PDA and LAA, and Species of Conservation Concern (North)

Sisson Project:
Environmental Impact Assessment (EIA) Report, Napadogan, N.B.

Client: Sisson Mines Ltd.

Scale:	Project No.:	Data Sources:	Fig. No.:
1:25,000	121810356	NBDNR	8.7.2

Date: (dd/mm/yyyy):	Fig. By:	Appd. By:
24/11/2014	JAB	DLM

Stantec

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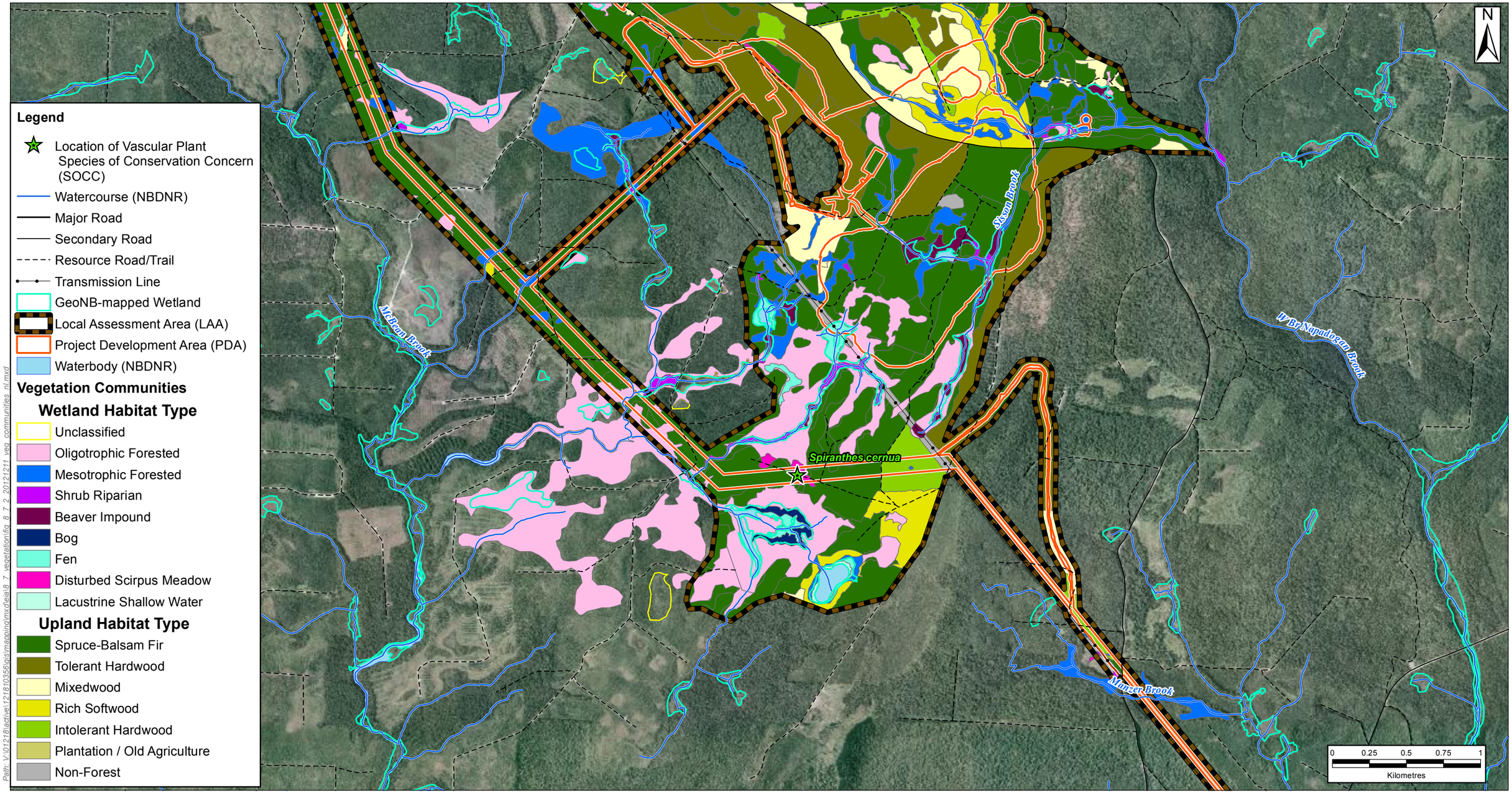
Coordinate System: NAD 1983 CSRS New Brunswick Stereographic



NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Vegetation Communities within the PDA and LAA, and Species of Conservation Concern (South)

Sisson Project:
Environmental Impact Assessment (EIA) Report, Napadogan, N.B.

Client: Sisson Mines Ltd.

Scale:	Project No.:	Data Sources:	Fig. No.:
1:25,000	121810356	NBDNR	8.7.3

Date: (dd/mm/yyyy):	Fig. By:	Appd. By:
23/11/2014	JAB	DLM

Stantec

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Coordinate System: NAD 1983 CSRS New Brunswick Stereographic

Rich Softwood habitat is characterized by the presence of more nutrient-demanding species than those that are present in the more widespread oligotrophic black spruce stands within the LAA. Rich softwood habitat is somewhat uncommon within the LAA; stands are generally on slopes that lead to mapped watercourses or waterbodies with narrow fringing wetland. The majority of the rich softwood stands are mature or overmature, and many of the stands have been subject to some form of forest management, primarily partial cuts and two-pass cuts. These rich softwood habitats are dominated in the tree canopy layer by red spruce, with smaller amounts of yellow birch, red maple, and/or balsam fir. The woody understory layer is dominated by regenerating red spruce, balsam fir, and/or yellow birch. The herbaceous ground cover is typically sparse, but contains scattered amounts of species such as mountain wood fern (*Dryopteris camploptera*), flat-branched tree-clubmoss (*Lycopodium obscurum*) and round-branched tree-clubmoss (*Lycopodium dendroidium*), goldthread, creeping snowberry (*Gautheria hispidula*), and wild lily-of-the-valley, with some bryophyte species (such as Schreber's feathermoss, broom moss, waxyleaf moss and stairstep moss).

Intolerant Hardwood (characterized by a dominance of tree species that do not grow well in shade) is an uncommon upland habitat type within the LAA. Most of the intolerant hardwood habitat in the LAA is relatively young (regenerating, sapling, or young growth stage). There are two main intolerant hardwood stand types within the LAA. One of these types has an overstory canopy layer that is strongly dominated by red maple, with smaller amounts of yellow birch, balsam fir, red spruce, and white birch. The other type of intolerant hardwood stand within the LAA has an overstory layer dominated by trembling aspen. Both of these intolerant hardwood stands have a woody understory layer dominated by a combination of red maple, striped maple, mountain maple, yellow birch, and/or sugar maple. The herbaceous understory is dominated by common forest species such as bunchberry, wood sorrel, and wood ferns.

Plantation/Old Agriculture vegetation community is characterized by mature or near-mature softwood-dominated forest with a closed or nearly closed forest canopy and very little, or patchy undergrowth. These conditions were usually found in the LAA in older softwood plantations of tamarack (*Larix laricina*), jack pine (*Pinus banksiana*), and spruce. However, some old pasturelands have grown up with mature white spruce forest cover and have developed similar habitat conditions in terms of structure and diversity. These forest communities typically have low diversity in both the overstory (being dominated largely by one species), and understory, which have low densities of tree regeneration and sparse and patchy shrub and herbaceous layers. The forest floor is typically devoid of vegetation with the exception of scattered bunchberry, sheep laurel (*Kalmia angustifolia*), and patches of hair-cap moss (*Polytrichum* spp.). Occasional openings have greater structural and species diversity, but these are small and isolated except where wet areas dissect these stands. These understory conditions are a product of low light availability, with contributing factors that may include acidic and/or compacted soil conditions.

Wetland habitat types are described in the Wetland Environment VEC (Section 8.8).

8.7.2.4 Vascular Plant Populations (including SAR and SOCC)

Table 8.7.3 provides a listing of the vascular plant species that were identified during the vegetation surveys of the LAA conducted in 2011 and 2012. In total, 446 vascular plant species were identified in the LAA and surrounding areas.

Table 8.7.3 Vascular Plant Species Observed in the LAA and Surrounding Areas

Common name	AC CDC binomial	AC CDC S-Rank	NBDNR/CESCC Status Rank
Balsam Fir	*Abies balsamea*	S5	Secure
Striped Maple	*Acer pensylvanicum*	S5	Secure
Red Maple	*Acer rubrum*	S5	Secure
Sugar Maple	*Acer saccharum*	S5	Secure
Mountain Maple	*Acer spicatum*	S5	Secure
Common Yarrow	*Achillea millefolium*	S5	Secure
White Baneberry	*Actaea pachypoda*	S4	Secure
Red Baneberry	*Actaea rubra*	S5	Secure
Colonial Bent Grass	*Agrostis capillaris*	SNA	Exotic
Redtop	*Agrostis gigantea*	SNA	Exotic
Upland Bent Grass	*Agrostis perennans*	S5	Secure
Rough Bent Grass	*Agrostis scabra*	S5	Secure
Creeping Bent Grass	*Agrostis stolonifera*	S5	Secure
Speckled Alder	*Alnus incana*	S5	Secure
Bartram's Serviceberry	*Amelanchier bartramiana*	S5	Secure
Pearly Everlasting	*Anaphalis margaritacea*	S5	Secure
Bog Rosemary	*Andromeda polifolia*	S5	Secure
Woodland Angelica	*Angelica sylvestris*	SNA	Exotic
Howell's Pussytoes	*Antennaria howellii ssp. neodioica*	S5	Secure
Large Sweet Vernal Grass	*Anthoxanthum odoratum*	SNA	Exotic
Spreading Dogbane	*Apocynum androsaemifolium*	S5	Secure
Bristly Sarsaparilla	*Aralia hispida*	S5	Secure
Wild Sarsaparilla	*Aralia nudicaulis*	S5	Secure
Arethusa	*Arethusa bulbosa*	S4	Secure
Jack-in-the-pulpit	*Arisaema triphyllum*	S5	Secure
Common Lady Fern	*Athyrium filix-femina*	S5	Secure
Yellow Birch	*Betula alleghaniensis*	S5	Secure
Paper Birch	*Betula papyrifera*	S5	Secure
Gray Birch	*Betula populifolia*	S5	Secure
a hybrid Birch [papyrifera X populifolia]	*Betula x caerulea*	SNA	Not Assessed
Nodding Beggarticks	*Bidens cernua*	S5	Secure
Devil's Beggarticks	*Bidens frondosa*	S5	Secure
Daisy-leaved Moonwort	*Botrychium matricariifolium*	S4	Secure
Leathery Moonwort	*Botrychium multifidum*	S4	Secure
Northern Shorthusk	*Brachyelytrum septentrionale*	S5	Secure
Fringed Brome	*Bromus ciliatus*	S5	Secure
Bluejoint Reed Grass	*Calamagrostis canadensis*	S5	Secure
Pickering's Reed Grass	*Calamagrostis pickeringii*	S3	Secure
Wild Calla	*Calla palustris*	S5	Secure
Large Water-Starwort	*Callitriche heterophylla*	S4S5	Secure
Marsh Water-starwort	*Callitriche palustris*	S5	Secure
Tuberous Grass Pink	*Calopogon tuberosus*	S4	Secure
Hemp	*Cannabis sativa*	SNA	Exotic
Pennsylvania Bittercress	*Cardamine pensylvanica*	S5	Secure
Water Sedge	*Carex aquatilis*	S4S5	Secure
Drooping Woodland Sedge	*Carex arctata*	S5	Secure
Brownish Sedge	*Carex brunnescens*	S5	Secure
Silvery Sedge	*Carex canescens*	S5	Secure
Fibrous-Root Sedge	*Carex communis*	S5	Secure
Crawford's Sedge	*Carex crawfordii*	S5	Secure
Fringed Sedge	*Carex crinita*	S5	Secure

Table 8.7.3 Vascular Plant Species Observed in the LAA and Surrounding Areas

Common name	AC CDC binomial	AC CDC S-Rank	NBDNR/CESCC Status Rank
Hidden-scaled Sedge	*Carex cryptolepis*	S4	Secure
White-edged Sedge	*Carex debilis*	S5	Secure
Northern Sedge	*Carex deflexa*	S5	Secure
Dewey's Sedge	*Carex deweyana*	S5	Secure
Two-seeded Sedge	*Carex disperma*	S5	Secure
Star Sedge	*Carex echinata*	S5	Secure
Yellow Sedge	*Carex flava*	S5	Secure
Hay Sedge	*Carex foenea*	S4S5	Secure
Graceful Sedge	*Carex gracillima*	S5	Secure
Nodding Sedge	*Carex gynandra*	S5	Secure
Bladder Sedge	*Carex intumescens*	S5	Secure
Slender Sedge	*Carex lasiocarpa*	S5	Secure
Bristly-stalked Sedge	*Carex leptalea*	S5	Secure
Finely-Nerved Sedge	*Carex leptonervia*	S5	Secure
Mud Sedge	*Carex limosa*	S4	Secure
Sallow Sedge	*Carex lurida*	S5	Secure
Boreal Bog Sedge	*Carex magellanica*	S5	Secure
Michaux's Sedge	*Carex michauxiana*	S3	Secure
New England Sedge	*Carex novae-angliae*	S5	Secure
Few-Seeded Sedge	*Carex oligosperma*	S5	Secure
Necklace Spike Sedge	*Carex ormostachya*	S3	Secure
Few-Flowered Sedge	*Carex pauciflora*	S5	Secure
Necklace Sedge	*Carex projecta*	S5	Secure
Cyperuslike Sedge	*Carex pseudocyperus*	S5	Secure
Broom Sedge	*Carex scoparia*	S5	Secure
Awl-fruited Sedge	*Carex stipata*	S5	Secure
Tussock Sedge	*Carex stricta*	S5	Secure
Blunt Broom Sedge	*Carex tribuloides*	S4S5	Secure
Three-seeded Sedge	*Carex trisperma*	S5	Secure
Billings' Sedge	*Carex trisperma var. billingsii*	S4?	Secure
Northern Beaked Sedge	*Carex utriculata*	S5	Secure
Greenish Sedge	*Carex viridula*	S4	Secure
Wiegand's Sedge	*Carex wiegandii*	S3	Secure
Leatherleaf	*Chamaedaphne calyculata*	S5	Secure
Fireweed	*Chamerion angustifolium*	S5	Secure
White Turtlehead	*Chelone glabra*	S5	Secure
American Golden Saxifrage	*Chrysosplenium americanum*	S5	Secure
Bulbous Water-hemlock	*Cicuta bulbifera*	S5	Secure
Drooping Wood Reed Grass	*Cinna latifolia*	S5	Secure
Small Enchanter's Nightshade	*Circaea alpina*	S5	Secure
Broad-leaved Enchanter's Nightshade	*Circaea lutetiana*	S4	Secure
Swamp Thistle	*Cirsium muticum*	S5	Secure
Virginia Clematis	*Clematis virginiana*	S5	Secure
Yellow Bluebead Lily	*Clintonia borealis*	S5	Secure
Canada Horseweed	*Conyza canadensis*	S5	Secure
Goldthread	*Coptis trifolia*	S5	Secure
Spotted Coralroot	*Corallorhiza maculata var. occidentalis*	S2S3	Sensitive
Alternate-leaved Dogwood	*Cornus alternifolia*	S5	Secure
Bunchberry	*Cornus canadensis*	S5	Secure
Round-leaved Dogwood	*Cornus rugosa*	S4	Secure
Red Osier Dogwood	*Cornus sericea*	S5	Secure

Table 8.7.3 Vascular Plant Species Observed in the LAA and Surrounding Areas

Common name	AC CDC binomial	AC CDC S-Rank	NBDNR/CESCC Status Rank
Beaked Hazel	*Corylus cornuta*	S5	Secure
Pink Lady's-Slipper	*Cypripedium acaule*	S5	Secure
Orchard Grass	*Dactylis glomerata*	SNA	Exotic
Dewdrop	*Dalibarda repens*	S5	Secure
Poverty Oat Grass	*Danthonia spicata*	S5	Secure
Eastern Hay-Scented Fern	*Dennstaedtia punctilobula*	S5	Secure
Silvery Glade Fern	*Deparia acrostichoides*	S4	Secure
Woolly Panic Grass	*Dichanthelium acuminatum*	S5	Secure
a Panic Grass	*Dichanthelium acuminatum var. acuminatum*	SNA	-
Woolly Panic Grass	*Dichanthelium acuminatum var. fasciculatum*	S5	Secure
Northern Bush Honeysuckle	*Diervilla lonicera*	S5	Secure
Smooth Crab Grass	*Digitaria ischaemum*	SNA	Exotic
Hairy Flat-top White Aster	*Doellingeria umbellata*	S5	Secure
Spoon-Leaved Sundew	*Drosera intermedia*	S5	Secure
Round-leaved Sundew	*Drosera rotundifolia*	S5	Secure
Mountain Wood Fern	*Dryopteris campyloptera*	S5	Secure
Spinulose Wood Fern	*Dryopteris carthusiana*	S5	Secure
Crested Wood Fern	*Dryopteris cristata*	S5	Secure
Evergreen Wood Fern	*Dryopteris intermedia*	S5	Secure
a Hybrid Wood-fern	*Dryopteris x boottii*	SNA	Not Assessed
a Hybrid Wood-fern	*Dryopteris x triploidea*	SNA	Not Assessed
Three-Way Sedge	*Dulichium arundinaceum*	S5	Secure
Large Barnyard Grass	*Echinochloa crus-galli*	SNA	Exotic
Blunt Spikerush	*Eleocharis obtusa*	S5	Secure
Ovate Spikerush	*Eleocharis ovata*	S5	Secure
Common Spikerush	*Eleocharis palustris*	S5	Secure
Beechdrops	*Epifagus virginiana*	S4S5	Secure
Trailing Arbutus	*Epigaea repens*	S5	Secure
Northern Willowherb	*Epilobium ciliatum*	S5	Secure
Northern Willowherb	*Epilobium ciliatum ssp. glandulosum*	S5	Secure
Bog Willowherb	*Epilobium leptophyllum*	S5	Secure
Marsh Willowherb	*Epilobium palustre*	S5	Secure
Helleborine	*Epipactis helleborine*	SNA	Exotic
Field Horsetail	*Equisetum arvense*	S5	Secure
Water Horsetail	*Equisetum fluviatile*	S5	Secure
Woodland Horsetail	*Equisetum sylvaticum*	S5	Secure
Eastern Burnweed	*Erechtites hieraciifolia*	S5	Secure
Rough Fleabane	*Erigeron strigosus*	S5	Secure
White Buttons	*Eriocaulon aquaticum*	S5	Secure
Narrow-leaved Cottongrass	*Eriophorum angustifolium ssp. scabriusculum*	S5	Secure
Tussock Cottongrass	*Eriophorum vaginatum*	S5	Secure
Tawny Cottongrass	*Eriophorum virginicum*	S5	Secure
Yellow Trout Lily	*Erythronium americanum*	S5	Secure
Spotted Joe-pye-weed	*Eupatorium maculatum*	S5	Secure
Common Boneset	*Eupatorium perfoliatum*	S5	Secure
Common Eyebright	*Euphrasia nemorosa*	SNA	Exotic
Large-leaved Aster	*Eurybia macrophylla*	S5	Secure
Low Rough Aster	*Eurybia radula*	S5	Secure
Grass-leaved Goldenrod	*Euthamia graminifolia*	S5	Secure
American Beech	*Fagus grandifolia*	S5	Secure
Red Fescue	*Festuca rubra*	S5	Secure

Table 8.7.3 Vascular Plant Species Observed in the LAA and Surrounding Areas

Common name	AC CDC binomial	AC CDC S-Rank	NBDNR/CESCC Status Rank
Wild Strawberry	*Fragaria virginiana*	S5	Secure
Glossy Buckthorn	*Frangula alnus*	SNA	Exotic
White Ash	*Fraxinus americana*	S5	Secure
Black Ash	*Fraxinus nigra*	S5	Secure
Common Hemp-nettle	*Galeopsis tetrahit*	SNA	Exotic
Rough Bedstraw	*Galium asprellum*	S5	Secure
Common Marsh Bedstraw	*Galium palustre*	S5	Secure
Dyer's Bedstraw	*Galium tinctorium*	S5	Secure
Three-petaled Bedstraw	*Galium trifidum*	S5	Secure
Three-petaled Bedstraw	*Galium trifidum ssp. trifidum*	S5	Secure
Three-flowered Bedstraw	*Galium triflorum*	S5	Secure
Creeping Snowberry	*Gaultheria hispidula*	S5	Secure
Eastern Teaberry	*Gaultheria procumbens*	S5	Secure
Rough Avens	*Geum laciniatum*	S5	Secure
Large-Leaved Avens	*Geum macrophyllum*	S5	Secure
Water Avens	*Geum rivale*	S5	Secure
Northern Manna Grass	*Glyceria borealis*	S5	Secure
Canada Manna Grass	*Glyceria canadensis*	S5	Secure
Common Tall Manna Grass	*Glyceria grandis*	S5	Secure
Northern Mannagrass	*Glyceria laxa*	S4?	Secure
Slender Manna Grass	*Glyceria melicaria*	S5	Secure
Fowl Manna Grass	*Glyceria striata*	S5	Secure
Marsh Cudweed	*Gnaphalium uliginosum*	SNA	Exotic
Lesser Rattlesnake-plantain	*Goodyera repens*	S4	Secure
Checkered Rattlesnake-Plantain	*Goodyera tesselata*	S4	Secure
Clammy Hedge-Hyssop	*Gratiola neglecta*	S4	Secure
Common Oak Fern	*Gymnocarpium dryopteris*	S5	Secure
Giant Cow Parsnip	*Heracleum mantegazzianum*	SNA	Exotic
Common Cow Parsnip	*Heracleum maximum*	S5	Secure
Orange Hawkweed	*Hieracium aurantiacum*	SNA	Exotic
Field Hawkweed	*Hieracium caespitosum*	SNA	Exotic
Canada Hawkweed	*Hieracium canadense*	S5	Secure
Wall Hawkweed	*Hieracium murorum*	SNA	Exotic
Mouse-ear Hawkweed	*Hieracium pilosella*	SNA	Exotic
Tall Hawkweed	*Hieracium piloselloides*	SNA	Exotic
King Devil Hawkweed	*Hieracium praealtum*	SNA	Exotic
Rough Hawkweed	*Hieracium scabrum*	S5	Secure
Common Mare's-Tail	*Hippuris vulgaris*	S4S5	Secure
Shining Firmoss	*Huperzia lucidula*	S5	Secure
Stairstep Moss	*Hylocomium splendens*	S5	Secure
Northern St. John's-Wort	*Hypericum boreale*	S5	Secure
Canada St. John's-wort	*Hypericum canadense*	S5	Secure
Pale St. John's-Wort	*Hypericum ellipticum*	S5	Secure
Common St. John's-wort	*Hypericum perforatum*	SNA	Exotic
Common Winterberry	*Ilex verticillata*	S5	Secure
Spotted Jewelweed	*Impatiens capensis*	S5	Secure
Harlequin Blue Flag	*Iris versicolor*	S5	Secure
Short-tailed Rush	*Juncus brevicaudatus*	S5	Secure
Toad Rush	*Juncus bufonius*	S5	Secure
Soft Rush	*Juncus effusus*	S5	Secure
Thread Rush	*Juncus filiformis*	S5	Secure

Table 8.7.3 Vascular Plant Species Observed in the LAA and Surrounding Areas

Common name	AC CDC binomial	AC CDC S-Rank	NBDNR/CESCC Status Rank
Brown-Fruited Rush	*Juncus pelocarpus*	S5	Secure
Path Rush	*Juncus tenuis*	S5	Secure
Sheep Laurel	*Kalmia angustifolia*	S5	Secure
Pale Bog Laurel	*Kalmia polifolia*	S5	Secure
Tall Blue Lettuce	*Lactuca biennis*	S5	Secure
Canada Lettuce	*Lactuca canadensis*	S5	Secure
Tamarack	*Larix laricina*	S5	Secure
Common Labrador Tea	*Ledum groenlandicum*	S5	Secure
Rice Cut Grass	*Leersia oryzoides*	S5	Secure
Lesser Duckweed	*Lemna minor*	SNA	Not Assessed
Fall Dandelion	*Leontodon autumnalis*	SNA	Exotic
Oxeye Daisy	*Leucanthemum vulgare*	SNA	Exotic
Butter-And-Eggs	*Linaria vulgaris*	SNA	Exotic
Yellow-seeded False Pimperel	*Lindernia dubia*	S4	Secure
Twinflower	*Linnaea borealis*	S5	Secure
Broad-Leaved Twayblade	*Listera convallarioides*	S4	Secure
Heart-leaved Twayblade	*Listera cordata*	S4	Secure
Indian Tobacco	*Lobelia inflata*	S5	Secure
Canada Fly Honeysuckle	*Lonicera canadensis*	S5	Secure
Mountain Fly Honeysuckle	*Lonicera villosa*	S5	Secure
Northern Bog Clubmoss	*Lycopodiella inundata*	S4S5	Secure
Stiff Clubmoss	*Lycopodium annotinum*	S5	Secure
Running Clubmoss	*Lycopodium clavatum*	S5	Secure
Northern Clubmoss	*Lycopodium complanatum*	S4S5	Secure
Round-branched Tree-clubmoss	*Lycopodium dendroideum*	S5	Secure
Southern Clubmoss	*Lycopodium digitatum*	S5	Secure
Hickey's Tree-clubmoss	*Lycopodium hickeyi*	S4	Secure
One-cone clubmoss	*Lycopodium lagopus*	S4	Secure
Flat-branched Tree-clubmoss	*Lycopodium obscurum*	S5	Secure
Ground-Fir	*Lycopodium sabinifolium*	S3	Secure
American Water Horehound	*Lycopus americanus*	S5	Secure
Northern Water Horehound	*Lycopus uniflorus*	S5	Secure
Swamp Yellow Loosestrife	*Lysimachia terrestris*	S5	Secure
Wild Lily-of-The-Valley	*Maianthemum canadense*	S5	Secure
Large False Solomon's Seal	*Maianthemum racemosum*	S5	Secure
Large False Solomon's Seal	*Maianthemum racemosum ssp. racemosum*	S5	Secure
Starry False Solomon's Seal	*Maianthemum stellatum*	S4S5	Secure
Three-leaved False Soloman's Seal	*Maianthemum trifolium*	S5	Secure
Green Adder's-Mouth	*Malaxis unifolia*	S4	Secure
Pineapple Weed	*Matricaria discoidea*	SNA	Exotic
Ostrich Fern	*Matteuccia struthiopteris*	S5	Secure
Indian Cucumber Root	*Medeola virginiana*	S5	Secure
American Cow Wheat	*Melampyrum lineare*	S5	Secure
Yellow Sweet-clover	*Melilotus officinalis*	SNA	Exotic
Wild Mint	*Mentha arvensis*	S5	Secure
Bog Buckbean	*Menyanthes trifoliata*	S5	Secure
Partridgeberry	*Mitchella repens*	S5	Secure
Naked Bishop's-Cap	*Mitella nuda*	S5	Secure
One-flowered Wintergreen	*Moneses uniflora*	S5	Secure
Pinesap	*Monotropa hypopithys*	S4	Secure
Indian Pipe	*Monotropa uniflora*	S5	Secure

Table 8.7.3 Vascular Plant Species Observed in the LAA and Surrounding Areas

Common name	AC CDC binomial	AC CDC S-Rank	NBDNR/CESCC Status Rank
Bog Muhly	*Muhlenbergia uniflora*	S5	Secure
Sweet Gale	*Myrica gale*	S5	Secure
Slender Water Milfoil	*Myriophyllum tenellum*	S4	Secure
Mountain Holly	*Nemopanthus mucronatus*	S5	Secure
Variegated Pond-lily	*Nuphar lutea*	S5	Secure
Whorled Wood Aster	*Oclemena acuminata*	S5	Secure
Bog Aster	*Oclemena nemoralis*	S5	Secure
a hybrid White Panicled American-Aster	*Oclemena x blakei*	SNA	Not Assessed
Common Evening Primrose	*Oenothera biennis*	S5	Secure
Perennial Evening Primrose	*Oenothera perennis*	S5	Secure
Woodland Cudweed	*Omalotheca sylvatica*	S4	Secure
Sensitive Fern	*Onoclea sensibilis*	S5	Secure
One-sided Wintergreen	*Orthilia secunda*	S5	Secure
Cinnamon Fern	*Osmunda cinnamomea*	S5	Secure
Interrupted Fern	*Osmunda claytoniana*	S5	Secure
Royal Fern	*Osmunda regalis*	S5	Secure
Common Wood Sorrel	*Oxalis montana*	S5	Secure
European Wood Sorrel	*Oxalis stricta*	S5	Secure
Schweinitz's Groundsel	*Packera schweinitziana*	S4	Secure
Common Witch Grass	*Panicum capillare*	S5	Secure
Tuckerman's Panic Grass	*Panicum tuckermanii*	S4S5	Secure
Northern Sweet Coltsfoot	*Petasites frigidus*	S4S5	Secure
Northern Beech Fern	*Phegopteris connectilis*	S5	Secure
Common Timothy	*Phleum pratense*	SNA	Exotic
Black Chokeberry	*Photinia melanocarpa*	S5	Secure
Norway Spruce	*Picea abies*	SNA	Exotic
White Spruce	*Picea glauca*	S5	Secure
Black Spruce	*Picea mariana*	S5	Secure
Red Spruce	*Picea rubens*	S5	Secure
Jack Pine	*Pinus banksiana*	S5	Secure
Eastern White Pine	*Pinus strobus*	S5	Secure
Scotch Pine	*Pinus sylvestris*	SNA	Exotic
Common Plantain	*Plantago major*	SNA	Exotic
Tall Northern Green Orchid	*Platanthera aquilonis*	S4	Secure
White Fringed Orchid	*Platanthera blephariglottis*	S3	Secure
Club Spur Orchid	*Platanthera clavellata*	S4	Secure
White Bog Orchid	*Platanthera dilatata*	S4	Secure
White Bog Orchid	*Platanthera dilatata var. dilatata*	S4	Secure
Blunt-leaved Orchid	*Platanthera obtusata*	S4	Secure
Small Round-leaved Orchid	*Platanthera orbiculata*	S4	Secure
Canada Blue Grass	*Poa compressa*	SNA	Exotic
Fowl Blue Grass	*Poa palustris*	S5	Secure
Kentucky Blue Grass	*Poa pratensis*	S5	Secure
Marshpepper Smartweed	*Polygonum hydropiper*	SNA	Exotic
Spotted Lady's-thumb	*Polygonum persicaria*	SNA	Exotic
Dotted Smartweed	*Polygonum punctatum*	S3	Secure
Arrow-leaved Smartweed	*Polygonum sagittatum*	S5	Secure
Appalachian Polypody	*Polypodium appalachianum*	S3	Secure
Rock Polypody	*Polypodium virginianum*	S5	Secure
Christmas Fern	*Polystichum acrostichoides*	S5	Secure
Balsam Poplar	*Populus balsamifera*	S5	Secure

Table 8.7.3 Vascular Plant Species Observed in the LAA and Surrounding Areas

Common name	AC CDC binomial	AC CDC S-Rank	NBDNR/CESCC Status Rank
Large-toothed Aspen	*Populus grandidentata*	S5	Secure
Trembling Aspen	*Populus tremuloides*	S5	Secure
Alpine Pondweed	*Potamogeton alpinus*	S5	Secure
Ribbon-leaved Pondweed	*Potamogeton epihydrus*	S5	Secure
Variable-leaved Pondweed	*Potamogeton gramineus*	S5	Secure
Silvery Cinquefoil	*Potentilla argentea*	SNA	Exotic
Tall Cinquefoil	*Potentilla arguta*	S3S4	Secure
Rough Cinquefoil	*Potentilla norvegica*	S5	Secure
Old Field Cinquefoil	*Potentilla simplex*	S5	Secure
Tall Rattlesnakeroot	*Prenanthes altissima*	S5	Secure
Three-leaved Rattlesnakeroot	*Prenanthes trifoliolata*	S5	Secure
Common Self-heal	*Prunella vulgaris*	S5	Secure
Chokecherry	*Prunus virginiana*	S5	Secure
Bracken Fern	*Pteridium aquilinum*	S5	Secure
Pink Pyrola	*Pyrola asarifolia*	S5	Secure
Shinleaf	*Pyrola elliptica*	S5	Secure
Northern Red Oak	*Quercus rubra*	S5	Secure
Common Buttercup	*Ranunculus acris*	SNA	Exotic
Bristly Buttercup	*Ranunculus hispidus*	S4S5	Secure
Pennsylvania Buttercup	*Ranunculus pensylvanicus*	S4	Secure
Creeping Buttercup	*Ranunculus repens*	SNA	Exotic
Rhodora	*Rhododendron canadense*	S5	Secure
White Beakrush	*Rhynchospora alba*	S5	Secure
Brown Beakrush	*Rhynchospora fusca*	S3	Secure
Wild Black Currant	*Ribes americanum*	S4	Secure
Skunk Currant	*Ribes glandulosum*	S5	Secure
Bristly Black Currant	*Ribes lacustre*	S5	Secure
Swamp Red Currant	*Ribes triste*	S5	Secure
One-rowed Yellowcress	*Rorippa microphylla*	SNA	Exotic
Watercress	*Rorippa nasturtium-aquaticum*	SNA	Exotic
Bog Yellowcress	*Rorippa palustris*	S5	Secure
Shining Rose	*Rosa nitida*	S5	Secure
Allegheny Blackberry	*Rubus allegheniensis*	S5	Secure
Smooth Blackberry	*Rubus canadensis*	S5	Secure
Cloudberry	*Rubus chamaemorus*	S3	Secure
Bristly Dewberry	*Rubus hispidus*	S5	Secure
Red Raspberry	*Rubus idaeus*	S5	Secure
Dwarf Red Raspberry	*Rubus pubescens*	S5	Secure
Black-Eyed Susan	*Rudbeckia hirta*	SNA	Exotic
Garden Sorrel	*Rumex acetosa*	SNA	Exotic
Sheep Sorrel	*Rumex acetosella*	SNA	Exotic
Curled Dock	*Rumex crispus*	SNA	Exotic
Greater Water Dock	*Rumex orbiculatus*	S5	Secure
Northern Arrowhead	*Sagittaria cuneata*	S5	Secure
Broad-leaved Arrowhead	*Sagittaria latifolia*	S5	Secure
Bebb's Willow	*Salix bebbiana*	S5	Secure
Pussy Willow	*Salix discolor*	S5	Secure
Cottony Willow	*Salix eriocephala*	S5	Secure
Shining Willow	*Salix lucida*	S5	Secure
Bog Willow	*Salix pedicellaris*	S3	Secure
Balsam Willow	*Salix pyrifolia*	S5	Secure

Table 8.7.3 Vascular Plant Species Observed in the LAA and Surrounding Areas

Common name	AC CDC binomial	AC CDC S-Rank	NBDNR/CESCC Status Rank
Black Elderberry	*Sambucus nigra ssp. canadensis*	S5	Secure
Red Elderberry	*Sambucus racemosa*	S5	Secure
Maryland Sanicle	*Sanicula marilandica*	S4S5	Secure
Northern Pitcher Plant	*Sarracenia purpurea*	S5	Secure
Marsh Scheuchzeria	*Scheuchzeria palustris*	S4	Secure
Water Bulrush	*Schoenoplectus subterminalis*	S5	Secure
Black-girdled Bulrush	*Scirpus atrocinctus*	S5	Secure
Common Woolly Bulrush	*Scirpus cyperinus*	S5	Secure
Mosquito Bulrush	*Scirpus hattorianus*	S4	Secure
Small-fruited Bulrush	*Scirpus microcarpus*	S5	Secure
Marsh Skullcap	*Scutellaria galericulata*	S5	Secure
Mad-dog Skullcap	*Scutellaria lateriflora*	S5	Secure
Yellow Foxtail	*Setaria glauca*	SNA	Exotic
Bladder Campion	*Silene vulgaris*	SNA	Exotic
Mountain Blue-eyed-grass	*Sisyrinchium montanum*	S5	Secure
Common Water Parsnip	*Sium suave*	S5	Secure
Canada Goldenrod	*Solidago canadensis*	S5	Secure
Zigzag Goldenrod	*Solidago flexicaulis*	S5	Secure
Early Goldenrod	*Solidago juncea*	S5	Secure
Large-leaved Goldenrod	*Solidago macrophylla*	S4	Secure
Downy Goldenrod	*Solidago puberula*	S5	Secure
Rough-stemmed Goldenrod	*Solidago rugosa*	S5	Secure
Stout Goldenrod	*Solidago squarrosa*	S4	Secure
American Mountain Ash	*Sorbus americana*	S5	Secure
Showy Mountain Ash	*Sorbus decora*	S4S5	Secure
American Burreed	*Sparganium americanum*	S5	Secure
Narrow-leaved Burreed	*Sparganium angustifolium*	S5	Secure
Green-fruited Burreed	*Sparganium emersum*	S5	Secure
Broad-fruited Burreed	*Sparganium eurycarpum*	S4S5	Secure
Ruby Sandspurrey	*Spergularia rubra*	SNA	Exotic
White Meadowsweet	*Spiraea alba*	S5	Secure
Steeplebush	*Spiraea tomentosa*	S5	Secure
Nodding Ladies'-Tresses	*Spiranthes cernua*	S2	Sensitive
Slender Ladies'-tresses	*Spiranthes lacera*	S5	Secure
Hooded Ladies'-Tresses	*Spiranthes romanzoffiana*	S4	Secure
Clasping-leaved Twisted-stalk	*Streptopus amplexifolius*	S5	Secure
Rose Twisted-stalk	*Streptopus lanceolatus*	S5	Secure
Heart-leaved Aster	*Symphyotrichum cordifolium*	S5	Secure
Calico Aster	*Symphyotrichum lateriflorum*	S5	Secure
Calico Aster	*Symphyotrichum lateriflorum var. lateriflorum*	S5	Secure
New York Aster	*Symphyotrichum novi-belgii*	S5	Secure
Purple-stemmed Aster	*Symphyotrichum puniceum*	S5	Secure
Common Dandelion	*Taraxacum officinale*	SNA	Exotic
Canada Yew	*Taxus canadensis*	S5	Secure
Tall Meadow-Rue	*Thalictrum pubescens*	S5	Secure
New York Fern	*Thelypteris noveboracensis*	S5	Secure
Eastern Marsh Fern	*Thelypteris palustris*	S5	Secure
Eastern White Cedar	*Thuja occidentalis*	S5	Secure
Heart-leaved Foamflower	*Tiarella cordifolia*	S4	Secure
Pale False Manna Grass	*Torreyochloa pallida*	S5	Secure
Fraser's Marsh St. John's-wort	*Triadenum fraseri*	S5	Secure

Table 8.7.3 Vascular Plant Species Observed in the LAA and Surrounding Areas

Common name	AC CDC binomial	AC CDC S-Rank	NBDNR/CESCC Status Rank
Alpine Clubrush	*Trichophorum alpinum*	S4	Secure
Northern Starflower	*Trientalis borealis*	S5	Secure
Rabbit's-foot Clover	*Trifolium arvense*	SNA	Exotic
Yellow Clover	*Trifolium aureum*	SNA	Exotic
Low Hop Clover	*Trifolium campestre*	SNA	Exotic
Alsike Clover	*Trifolium hybridum*	SNA	Exotic
Red Clover	*Trifolium pratense*	SNA	Exotic
White Clover	*Trifolium repens*	SNA	Exotic
Red Trillium	*Trillium erectum*	S5	Secure
Painted Trillium	*Trillium undulatum*	S5	Secure
Eastern Hemlock	*Tsuga canadensis*	S5	Secure
Coltsfoot	*Tussilago farfara*	SNA	Exotic
Broad-leaved Cattail	*Typha latifolia*	S5	Secure
Stinging Nettle	*Urtica dioica*	S4	Secure
Horned Bladderwort	*Utricularia cornuta*	S5	Secure
Flat-leaved Bladderwort	*Utricularia intermedia*	S5	Secure
Greater Bladderwort	*Utricularia macrorhiza*	S5	Secure
Eastern Purple Bladderwort	*Utricularia purpurea*	S4	Secure
Sessile-leaved Bellwort	*Uvularia sessilifolia*	S5	Secure
Late Lowbush Blueberry	*Vaccinium angustifolium*	S5	Secure
Large Cranberry	*Vaccinium macrocarpon*	S5	Secure
Velvet-leaved Blueberry	*Vaccinium myrtilloides*	S5	Secure
Small Cranberry	*Vaccinium oxycoccos*	S5	Secure
Mountain Cranberry	*Vaccinium vitis-idaea*	S5	Secure
Wild Celery	*Vallisneria americana*	S4	Secure
Green False Hellebore	*Veratrum viride*	S4	Secure
Common Mullein	*Verbascum thapsus*	SNA	Exotic
Common Speedwell	*Veronica officinalis*	S5	Exotic
Purslane Speedwell	*Veronica peregrina*	S4	Secure
Marsh Speedwell	*Veronica scutellata*	S5	Secure
Squashberry	*Viburnum edule*	S4	Secure
Hobblebush	*Viburnum lantanoides*	S5	Secure
Northern Wild Raisin	*Viburnum nudum*	S5	Secure
Highbush Cranberry	*Viburnum opulus var. americanum*	S5	Secure
Tufted Vetch	*Vicia cracca*	SNA	Exotic
Marsh Blue Violet	*Viola cucullata*	S5	Secure
Small White Violet	*Viola macloskeyi*	S5	Secure
Kidney-leaved White Violet	*Viola renifolia*	S4S5	Secure

Notes:

* Incidental observation only.

** AC CDC nomenclature.

*** Status/ranking definitions:

NBDNR Status:

At Risk — Species for which a formal assessment has been completed, and determined to be at risk of extirpation or extinction. Includes species either listed as "Endangered" or "Threatened" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or as Endangered or Regionally Endangered under the NB ESA and accompanying regulations.

May Be At Risk — Species or populations that may be at risk of extirpation or extinction, and are therefore candidates for a detailed risk assessment.

Sensitive — Species which are not believed to be at risk of extirpation or extinction, but which may require special attention or protection to prevent them from becoming at risk.

Secure — Species that are not believed to be "At Risk", "May Be At Risk", or "Sensitive". These were generally species that were widespread and/or abundant.

Table 8.7.3 Vascular Plant Species Observed in the LAA and Surrounding Areas

Common name	AC CDC binomial	AC CDC S-Rank	NBDNR/CESCC Status Rank

AC CDC Status Ranks:

S1	Extremely rare: May be especially vulnerable to extirpation (typically 5 or fewer occurrences or very few remaining individuals).
S2	Rare: May be vulnerable to extirpation due to rarity or other factors (6 to 20 occurrences or few remaining individuals).
S3	Uncommon, or found only in a restricted range, even if abundant at some locations (21 to 100 occurrences).
S4	Usually widespread, fairly common, and apparently secure with many occurrences, but of longer-term concern (e.g., watch list) (100+ occurrences).
S5	Widespread, abundant, and secure, under present conditions.
S#S#	Numeric range rank: A range between two consecutive ranks for a species/community. Denotes uncertainty about the exact rarity (e.g., S1S2).
Qualifiers:	
B	Breeding (Migratory species).
N	Non-breeding (Migratory species).

One vascular plant SOCC (Nodding ladies'-tresses, *Spiranthes cernua,* ranked as S2/Sensitive by AC CDC) was found at one location within the LAA (Figure 8.7.3). Nodding ladies'-tresses is a small, inconspicuous orchid typically found in damp, open, somewhat disturbed habitats (Gleason and Cronquist 1991; Hinds 2000). It was found on a damp gravel road located within the portion of the PDA associated with the 345 kV transmission line relocation and the associated site access road. Spotted coralroot (*Corallorhiza maculata var. occidentalis*; S2S3/Sensitive) was also found during vegetation surveys conducted in support of the Project, but is located approximately 150 m outside of the LAA and is therefore not discussed further.

Glossy buckthorn (*Frangula alnus*) and woodland angelica (*Angelica sylvestris*) were found within the LAA and are the only two exotic species found that are commonly considered as a problematic invasive species in New Brunswick. Glossy buckthorn is a tall shrub that is adapted to a wide range of habitats and its seeds are spread widely by birds and small mammals. It is spreading aggressively in the lower St. John and Miramichi River valleys and in Charlotte County and can be found at numerous locations due to its adaptability, and ability to disperse widely. Woodland angelica is spreading quickly within the lower St. John River valley and is abundant in the Fredericton region. It produces heavy seed crops and is aggressively invading riverine flood plains in the area. Given the proximity of the LAA to known areas where these species are present, it was expected that they would be found in the LAA.

Based on the geographic location of the LAA near the St. John and Miramichi Rivers and Fredericton, it is likely that other well-known invasive species such as Japanese knotweed (*Fallopia japonica*), reed canary grass (*Phalaris arundinacea*), and purple loosestrife (*Lythrum salicaria*) occur near the LAA, and may expand their range to encompass the LAA in the future.

8.7.3 Potential Project-VEC Interactions

Table 8.7.4 below lists each Project activity and physical work for the Project, and ranks each interaction as 0, 1, or 2 based on the level of interaction each activity or physical work will have with the Vegetated Environment.

Table 8.7.4 Potential Project Environmental Effects to the Vegetated Environment

Project Activities and Physical Works	Potential Environmental Effects Change in the Vegetated Environment
Construction	
Site Preparation of Open Pit, TSF, and Buildings	2
Physical Construction and Installation of Project Facilities	1
Physical Construction of Transmission Lines and Associated Infrastructure	2
Physical Construction of Realigned Fire Road, New Site Access Road, and Internal Site Roads	2
Implementation of Fish Habitat Offsetting/Compensation Plan	1
Emissions and Wastes	1
Transportation	0
Employment and Expenditure	0
Operation	
Mining	0
Ore Processing	0
Mine Waste and Water Management	1
Linear Facilities Presence, Operation, and Maintenance	1
Emissions and Wastes	1
Transportation	0
Employment and Expenditure	0
Decommissioning, Reclamation and Closure	
Decommissioning	1
Reclamation	1
Closure	1
Post-Closure	0
Emissions and Wastes	1
Transportation	0
Employment and Expenditure	0

Project-Related Environmental Effects

Notes:

Project-Related Environmental Effects were ranked as follows:

0 No substantive interaction. The environmental effects are rated not significant and are not considered further in this report.

1 Interaction will occur. However, based on past experience and professional judgment, the interaction would not result in a significant environmental effect, even without mitigation, or the interaction would clearly not be significant due to application of codified practices and/or permit conditions. The environmental effects are rated not significant and are not considered further in this report.

2 Interaction may, even with codified mitigation and/or permit conditions, result in a potentially significant environmental effect and/or is important to regulatory and/or public interest. Potential environmental effects are considered further and in more detail in the EIA.

Some of the Project Activities listed in Table 8.7.4 are not expected to have any substantive interaction with the Vegetated Environment and were thus ranked as 0. These activities include: Transportation (in all phases) of goods, materials, and personnel; Employment and Expenditure (in all phases); Mining (blasting and movement of waste rock and ore will not affect vegetation communities); Ore Processing (conducted in an enclosed environment within a building); and Post-Closure (the presence of the water-filled former open pit and TSF). These Project activities will not affect plant communities or individuals, and as such, their interaction with the Vegetated Environment is ranked as 0 in Table 8.7.4; their environmental effects (including cumulative environmental effects) are rated not significant, and they are not discussed further.

The following Project Activities may interact with the Vegetated Environment, but will not likely result in any significant adverse residual environmental effects or are addressed in other VECs, and are thus ranked as 1 in Table 8.7.4:

- Physical Construction and Installation of Project Facilities;
- Implementation of Fish Habitat Offsetting/Compensation Plan;
- Emissions and Wastes (during all phases);
- Mine Waste and Water Management;
- Linear Facilities Presence, Operation, and Maintenance;
- Decommissioning;
- Reclamation; and
- Closure.

The interaction between the Vegetated Environment and these activities will be mitigated by the use of standard construction and best management practices including particularly the identification and avoidance of the plant SOCC identified within the LAA, and will be low enough in magnitude (area of total disturbance) so as to not result in a significant adverse residual environmental effect on plant communities or individuals, or are addressed in other VECs (*i.e.*, the Wetland Environment VEC).

Physical Construction and Installation of Project Facilities was ranked as 1 in Table 8.7.4; this activity will be conducted in areas that have been previously cleared through site preparation activities and should not be double-counted. Therefore, these activities will not interact with the Vegetated Environment as vegetation communities and individuals will have been previously removed and accounted for in the discussion of Site Preparation. If some time has elapsed between site preparation and construction and installation of facilities, this activity may affect some regenerated vegetation, but this vegetation would likely only include scattered, weedy species, and any adverse residual environmental effect is expected to be negligible and not significant.

Implementation of Fish Habitat Offsetting/Compensation Plan was ranked as 1 in Table 8.7.4. This activity involves the replacement of the Nashwaak Lake culvert, an old wooden box culvert at the exit of Nashwaak Lake that is a partial to full barrier to fish passage, with a standard woods road bridge, thereby opening up fish passage into the lake and the tributaries that drain to it. The removal of the Lower Lake Dam is no longer proposed. The replacement of the Nashwaak Lake culvert will require some limited construction activity within less than 100 m on either side of the current culvert location, thereby providing a limited interaction with the Terrestrial Environment during its limited period of Construction. The construction area will be minimized to that necessary for construction activities to occur, and the area will be surveyed by a terrestrial biologist prior to construction and any SAR and SOCC populations that might be present in the proposed road will be avoided or otherwise mitigated in consultation with the appropriate regulatory authorities. Measures to avoid the spread of invasive species will be applied as appropriate and pre-disturbance surveys for these will identify areas for

avoidance. Adverse environmental effects to the Vegetated Environment are expected to be minimal and easily addressed through avoidance, limiting the footprint of disturbance, and standard mitigation techniques.

Emissions and Wastes arising from Construction and Operation activities were ranked as 1 in Table 8.7.4 and may include: air contaminants; sound emissions; vibration; wastewater storage, treatment, and release; and solid waste removal for disposal at an approved site. Air contaminants (*e.g.*, dust), wastewater, and solid waste will be within regulated limits and as such are unlikely to affect the health of Vegetated Environment. Emissions and Wastes arising from Decommissioning, Reclamation and Closure were also ranked as 1 in Table 8.7.4 and will likely include the generation of noise and dust, and/or the management, treatment, and release of surplus water. The generation of dust from earth-moving during Decommissioning and Reclamation is expected to be negligible when compared to dust generation during Construction.

During Operation, Mine Waste and Water Management activities such as pit dewatering, sequestration of water in the TSF, and surplus water release may interact with wetlands, potentially resulting in a change in vegetation composition of those wetlands; however, this will be addressed in the Wetland Environment VEC. This activity was ranked as 1 in Table 8.7.4. While the progressive construction of the TSF embankments, and filling of the TSF, over the life of the mine may further affect vegetation communities, most of the environmental effects to vegetation will occur during Construction, and any further disturbance of vegetation communities would be limited spatially to areas within the TSF footprint which does not include, based on surveys, any SAR or SOCC vascular plants.

Linear Facilities Presence, Operation, and Maintenance was ranked as 1 in Table 8.7.4 and will include vegetation maintenance, (*i.e.*, removing trees and shrubs that may impede reliable operation of transmission lines, or to a lesser extent, removing vegetation that may encroach upon or interfere with lines of sight on site access roads). Vegetation maintenance will interact with the Vegetated Environment, but in a minor way, as the maintenance will occur in areas that have been previously cleared and accounted for elsewhere in the assessment of the VEC. In addition, NB Power will follow an established vegetation management plan and EPP for vegetation maintenance along electrical transmission lines. Measures to avoid the spread of invasive species will be applied as appropriate and pre-disturbance surveys for these will identify areas for avoidance. One location of the nodding ladies'-tresses (*Spiranthes cernua*; S2/Sensitive) located in the proposed relocated corridor for the 345 kV transmission line (Figure 8.7.3) will be avoided.

Decommissioning, which will include removal of buildings and equipment from the site, was ranked as 1 in Table 8.7.4 and may affect some regenerated vegetation, but this vegetation would likely only include scattered weedy species, and any adverse residual environmental effect is expected to be negligible. Measures to avoid the spread of invasive species will be applied as appropriate.

Reclamation of the site was ranked as 1 in Table 8.7.4 and will include activities intended to restore habitat, such as capping and re-vegetating the TSF beaches, and reclaiming the TSF embankments, abandoned facility sites and roads. These activities will create and/or improve the quality of some habitat for vegetation within the LAA, resulting in a positive interaction with the Vegetated Environment.

Closure was ranked as 1 in Table 8.7.4 and will include filling the open pit with water from direct precipitation onto it, and from water discharged via a spillway from the reclaimed TSF.

Thus, in consideration of the nature of the interactions and the planned implementation of known and proven mitigation, the potential environmental effects of all Project activities and physical works that were ranked as 0 or 1 in Table 8.7.4, including cumulative environmental effects, on the Vegetated Environment during any phase of the Project are rated not significant, with a high level of confidence. They are not considered further in this EIA.

The potential environmental effects of the activities ranked as 2 in Table 8.7.4 are considered further and in more detail in the following sections.

8.7.4 Assessment of Project-Related Environmental Effects

A summary of the environmental effects assessment and prediction of residual environmental effects resulting from interactions ranked as 2 on the Vegetated Environment is provided in Table 8.7.5. Only those interactions with activities ranked as 2 in Table 8.7.4 are considered in this table.

Table 8.7.5 Summary of Residual Project-Related Environmental Effects on the Vegetated Environment

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up or Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/ Socioeconomic Context					
Change in the Vegetated Environment	Construction: • Site Preparation of Open Pit, TSF, Buildings and Ancillary Facilities. • Physical Construction of Transmission Lines and Associated Infrastructure. • Physical Construction of Realigned Fire Road, New Site Access Road, and Internal Site Roads.	Mitigation to be implemented in Construction is as follows. • Clearing activities will be restricted to necessary portions of the PDA, and not beyond. • Standard erosion and sedimentation control measures will be employed, including: ● erosion control fencing; ● check dams; ● sedimentation control ponds where appropriate; ● construction sequencing to minimize soil exposure; ● retaining existing vegetation as long as possible; ● vegetation and mulching of denuded areas; ● diverting runoff away from denuded areas; ● optimizing length and steepness of slope; ● keeping surface water runoff velocities low; ● proper sizing and protecting of drainage ways and outlets; ● intercepting of sediments on site; and ● inspecting and maintaining the above-mentioned control measures.	A	L	L	LT/C	R	D	N	H	--	Y	Flag the population of nodding ladies'-tresses (*Spiranthes cernua*) for avoidance during Construction, and monitor at Years 1, 3, and 5 following the completion of Construction to confirm effectiveness of mitigation.

Table 8.7.5 Summary of Residual Project-Related Environmental Effects on the Vegetated Environment

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up or Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/ Socioeconomic Context					
		• Clean, coarse fill material will be used for grading, to minimize the risk of introducing or spreading exotic and/or invasive vascular plant species. • Construction machinery will be cleaned prior to entering and leaving wetlands to minimize the risk of introducing or spreading exotic and/or invasive species from one wetland to another. • Any vascular plant SAR or SOCC within or adjacent to the PDA will be flagged and/or fenced off, and construction activities will be minimized in areas adjacent to SAR or SOCC, whenever possible. • NB Power will follow an EPP during the construction of the transmission line and associated infrastructure, which includes mitigation measures for vascular plant SAR or SOCC within the transmission line ROW. • Construction activities will be minimized in wetland areas to reduce the potential environmental effects of disturbance, such as erosion and sedimentation, and the introduction or spread of exotic and/or invasive vascular plant species. • Forested Crown land that will be removed from the PDA will be accounted for by NBDNR in consideration of the results of this											

Table 8.7.5 Summary of Residual Project-Related Environmental Effects on the Vegetated Environment

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up or Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/ Socioeconomic Context					
		assessment and the appropriate forest licensee in the management plans of the subsequent forest cycle.. • Conservation Vegetation Communities within the PDA will be replaced within the ecoregion and license block whenever stands meeting the criteria are available. The licensees, the regional NBDNR office, and the NBDNR Fish and Wildlife Branch will collaborate to identify replacement stands.											
	Operation												
	Decommissioning, Reclamation and Closure												
	Residual Environmental Effects for all Phases								N	H	--	Y	

Table 8.7.5 Summary of Residual Project-Related Environmental Effects on the Vegetated Environment

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up or Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/ Socioeconomic Context					

KEY

Direction
P Positive.
A Adverse.

Magnitude
L Low: <5% of vegetation communities or SOCC populations within the RAA will be exposed to the effect, or no measurable change in vegetation communities or population size relative to baseline conditions. SAR are not affected.
M Medium: 5% - 25% of vegetation communities or SOCC populations within the RAA will be exposed to the effect, or a measurable change in vegetation communities or population size relative to baseline conditions that does not cause management concern. SAR are not affected.
H High: >25% of vegetation communities or SOCC populations within the RAA will be exposed to the effect, or a measurable change in vegetation communities or population size relative to baseline conditions that does cause management concern. SAR may be affected.

Geographic Extent
S Site-specific: Within the PDA.
L Local: Within the LAA.
R Regional: Within the RAA.

Duration
ST Short-term: Occurs and lasts for short periods (*e.g.,* days/weeks).
MT Medium-term: Occurs and lasts for extended periods of time (*e.g.,* years).
LT Long-term: Occurs during Construction and/or Operation and lasts for the life of Project.
P Permanent: Occurs during Construction and Operation and beyond.

Frequency
O Occurs once.
S Occurs sporadically at irregular intervals.
R Occurs on a regular basis and at regular intervals.
C Continuous.

Reversibility
R Reversible.
I Irreversible.

Ecological/Socioeconomic Context
U Undisturbed: Area relatively or not adversely affected by human activity.
D Developed: Area has been substantially previously disturbed by human development or human development is still present.
N/A Not Applicable.

Significance
S Significant.
N Not Significant.

Prediction Confidence
Confidence in the significance prediction, based on scientific information and statistical analysis, professional judgment and known effectiveness of mitigation:
L Low level of confidence.
M Moderate level of confidence.
H High level of confidence.

Likelihood
If a significant environmental effect is predicted, the likelihood of that significant environmental effect occurring is determined, based on professional judgment:
L Low probability of occurrence.
M Medium probability of occurrence.
H High probability of occurrence.

Cumulative Environmental Effects?
Y Potential for environmental effect to interact with the environmental effects of other past, present or foreseeable future projects or activities in RAA.
N Environmental effect will not or is not likely to interact with the environmental effects of other past, present or foreseeable future projects or activities in RAA.

8.7.4.1 Potential Project Environmental Effects Mechanisms

The following Project Activities associated with the Construction phase that were ranked as 2 in Table 8.7.4 have potential to result in significant adverse residual environmental effects, and are thus considered in more detail in this EIA:

- Site Preparation of Open Pit, TSF, and Buildings and Ancillary Facilities;
- Physical Construction of Transmission Lines and Associated Infrastructure; and
- Physical Construction of Realigned Fire Road, New Site Access Road, and Internal Site Roads.

The interaction between these Project Activities and the Vegetated Environment will be discussed below in the context of measurable parameters.

Site Preparation of the Open Pit, TSF, and Buildings and Ancillary Facilities includes some activities likely to affect the Vegetated Environment, such as clearing vegetation, grubbing, and removing topsoil and overburden. These activities will result in a loss of vegetation communities, primarily through the direct mortality of vascular plants, as clearing and grubbing will completely remove vegetation from the area and removing topsoil and overburden will remove the seed bank. Vegetation communities may be lost or changed through a resulting change in habitat quality, as removing topsoil and overburden will change the quality of the soil and habitat previously used by those plants. In addition, areas adjacent to direct disturbance associated with activities such as clearing and grubbing will likely experience some edge effects; *i.e.*, change in conditions such as light availability, humidity, temperature, wind, and possibly herbivory (allowing increased access by larger herbivores). These edge effects often result in a change in conditions outside of the range of tolerance for some existing species, which typically leads to an overall change in species composition, as some species die off and others (including exotic and/or invasive plants) colonize newly available space with more favourable conditions (particularly light availability). Vascular plant SAR or SOCC can be affected through direct mortality, if those plants are located within directly disturbed areas of the PDA; through a change in habitat outside of tolerable environmental conditions through edge and other effects for those plants in areas adjacent to direct disturbance; or through competition following the introduction of exotic and/or invasive plants. Site Preparation may lead to increased sedimentation or change drainage patterns leading to wetland habitat outside of the immediate PDA, which could result in a change in hydrological conditions to an extent that leads to changes in vegetation communities. Most of the PDA is on Crown land and is part of an actively managed Crown timber license. These activities will remove the area from active management for timber values, which has the potential to indirectly affect the vegetation community in the remainder of the Crown timber license by forcing licensees to alter harvest plans to compensate for the newly non-productive area within the PDA. As Crown forest management by licensees is designed for sustainable values and management of the license will need to adapt to compensate for the loss of productive forest, the effect of this will not be cumulative with forest harvesting but will be realized through changes to future management of the licence.

Physical Construction of the Transmission Lines and Associated Infrastructure, including the required site preparation for the infrastructure, will likely interact with the Vegetated Environment by mechanisms similar to those for Site Preparation of the Open Pit, TSF, and Buildings and Ancillary Facilities, as described above. Vegetation communities will be lost or changed through the direct mortality of

vascular plants (in particular, taller, woody vegetation such as trees and shrubs) which will occur through clearing activities, as well as through indirect edge effects in areas adjacent to transmission lines which could result in a change in environmental conditions and subsequent change in vegetation communities (as described above). Management of the Crown land in the affected Crown land license area will also need to adapt to the loss of productive forest within the PDA. Construction of the transmission line and associated infrastructure may result in a loss of vascular plant SAR or SOCC, if any are present, either through direct mortality from disturbance, or through a change in habitat as described above.

Physical Construction of Realigned Fire Road, New Site Access Road, and Internal Site Roads will likely interact with the Vegetated Environment in a manner similar both activities described above. Vegetation communities will primarily be lost through direct mortality of individuals resulting from clearing and grubbing of road beds and immediately adjacent areas, or through changes in habitat resulting from edge effects, through the mechanisms described above. Construction of watercourse crossings can lead to increased siltation or sedimentation and, as will be discussed in the wetland environment VEC, a change in hydrology in wetlands adjacent to the roadway, which can lead to changes to vegetation communities in those areas.

8.7.4.2 Mitigation of Project Environmental Effects

Project planning, design, and the application of known and proven mitigation measures will be implemented as part of the Project to avoid or minimize environmental effects through the use of the ESMS. Final decisions on mitigation measures will be made by SML in consultation with experts, and where appropriate, regulatory authorities. Standard practices and general environmental protection measures for mining projects will address most issues likely to arise during the Project. The following mitigation measures, through careful design and planning, will be employed to avoid or reduce the environmental effects of the Project on the Vegetated Environment potentially resulting from the environmental effects mechanisms described above.

- Clearing activities will be restricted to necessary portions of the PDA, and not beyond.
- Standard erosion and sedimentation control measures will be employed, including:
  - erosion control fencing;
  - check dams;
  - sedimentation control ponds where appropriate;
  - construction sequencing to minimize soil exposure;
  - retaining existing vegetation as long as possible;
  - vegetation and mulching of denuded areas;
  - diverting runoff away from denuded areas;
  - optimizing length and steepness of slope;

  - keeping surface water runoff velocities low;
  - proper sizing and protecting of drainage ways and outlets;
  - intercepting of sediments on site; and
  - inspecting and maintaining the above-mentioned control measures.
- Clean, coarse fill material will be used for grading, to minimize the risk of introducing or spreading exotic and/or invasive vascular plant species.
- Construction machinery will be cleaned prior to entering and leaving wetlands to minimize the risk of introducing or spreading exotic and/or invasive species from one wetland to another.
- Any vascular plant SAR or SOCC identified within or adjacent to the PDA will be flagged and/or fenced off, and construction activities will be minimized in areas adjacent to SAR or SOCC, whenever possible.
- NB Power will follow an Environmental Protection Plan (EPP) during the construction of the transmission line and associated infrastructure, which includes mitigation measures for vascular plant SAR or SOCC within the transmission line ROW.
- Construction activities will be minimized in wetland areas to reduce the potential environmental effects of disturbance, such as erosion and sedimentation, and the introduction or spread of exotic and/or invasive vascular plant species.
- Forested Crown land that will be removed from the PDA will be accounted for by NBDNR in consideration of the results of this assessment and the appropriate forest licensee in the management plans of the subsequent forest cycle.
- NBDNR Conservation Vegetation Communities within the PDA will be replaced within the ecoregion and license block whenever stands meeting the criteria are available. The licensees, the regional NBDNR office, and the NBDNR Fish and Wildlife Branch will collaborate to identify replacement stands.

As discussed in the ESMS, a Project-specific Environmental Protection Plan (EPP) will be developed for the Project prior to Construction. Activities such as handling and storage of fuel and other hazardous materials are regulated by law and will comply with all applicable standards and regulations, guidelines, and reference documents.

As part of infrastructure maintenance, access roads will be periodically re-graded and ditched to improve water flow, reduce erosion and/or to deter excessive vegetation growth.

The Reclamation and Closure Plan for remediating the mine site and associated infrastructure will establish procedures for decommissioning infrastructure or facilities (*e.g.*, access roads, transmission lines, marshalling areas). Owing to the nature of the Project consisting of open pit mining, restoration of the mine footprint upon Decommissioning, Reclamation and Closure is unlikely to result in complete reversal of a number of the environmental effects associated with the Project; however, portions of the

site will be re-vegetated using plant species native to the RAA, thereby partially restoring vegetation communities.

8.7.4.3 Characterization of Residual Project Environmental Effects

Specific vegetation community types found within the LAA and their areas are given in Table 8.7.2 in sub-section 8.7.2. These vegetation communities were developed from NBDNR forest inventory data, and augmented by field observations. As these two data sources are not readily available for the entire RAA, NBDNR ecosites were used to characterize populations in the RAA. This data source is available for the entire province of New Brunswick, and was used to determine what percentage of various habitats of the RAA will be lost or altered within the LAA. As ecosite descriptions vary slightly between ecoregions, ecosite values within the LAA and RAA are described separately for the Central Uplands Ecoregion and the Valley Lowlands Ecoregion (Table 8.7.6). A complete description of ecosite classification is available in Appendix 1 of the document entitled “Our Landscape Heritage: The Story of Ecological Land Classification” (NBDNR 2007).

Approximately 2,404 ha of vegetation communities will be lost or altered as a result of the Project; 2,167.2 ha of which is in the Central Uplands Ecoregion and 236.8 ha is in the Valley Lowlands Ecoregion (including 11.7 ha in the Grand Lake Lowlands Ecoregion). Overall, the Project will result in the loss or alteration of less than 0.7% of any one ecosite type, and less than 0.08% of the RAA in total. The extent of this loss and/or alteration will be limited to the footprint of the Project (*i.e.,* the PDA) and adjacent areas that may be indirectly influenced by Project activities (*i.e.,* the LAA). Therefore, this area of vegetation community loss or change is likely conservative, as no Project activities will occur in a portion of the LAA located to the south of the open pit, though hydrological changes as a result of groundwater or surface water drawdown may occur. The upland vegetation communities in this area are unlikely to be lost or changed.

In addition, wetlands and other environmentally sensitive areas, such as the location of any plant SAR or SOCC, will be spanned by the transmission line wherever possible. It is assumed that no transmission line structures will be located within wetlands. Clearing activities will be minimal and areas will only be cleared where required for Construction or for safety purposes.

The Project is expected to result in the direct loss (*i.e.*, within the PDA) of 1,189 ha of forested Crown land. Approximately 14.4% (or 171 ha) of this forested area consists of regenerating stands that have been recently harvested, and would not be part of forest harvesting plans for close to an entire harvesting cycle (*i.e.*, 60-80 years). Forest harvesting and other activities are managed by NBDNR through provincial objectives and standards that are revisited and updated every five years.

Table 8.7.6 Ecosites Within the LAA and RAA, and % of RAA That May Be Lost or Altered as a Result of the Project

Ecosite Type[a]	Central Uplands Ecoregion (Madawaska Uplands)			Valley Lowlands Ecoregion			% of Ecosite Type in the RAA Lost or altered due to the Project (%)
	Area of Ecosite Type within LAA that is Lost or Altered due to Project (ha)	Total Area of Ecosite Type within the Ecoregion (ha)	% of Ecosite Type in the Ecoregion Lost or Altered due to Project (%)	Area of Ecosite Type within LAA that is Lost or Altered due to Project (ha)	Total Area of Ecosite Type within the Ecoregion (ha)	% of Ecosite Type in the Ecoregion Lost or Altered due to Project (%)	
1	-	3,266	-	-	15,259	-	-
2	1,071.3	170,222	0.63%	26.0	402,493	0.006%	0.19%
2c	-	26,578	-	-	75,968	-	-
2h	-	4210	-				-
3	245.0	42,780	0.57%	4.5	93,333	0.005%	0.18%
3o	-	7,069	-	-	56,898	-	-
4	11.5	21,690	0.05%	-	15,481	-	0.03%
4c				-	4,542	-	-
5	839.3	308,342	0.27%	114.2 (+10.4 in GLL[b])	538,107	0.02%	0.11%
5c	-	76,961	-	-	198,604	-	-
6	-	46,141	-	16.9	159,197	0.01%	0.01%
6c	-	28,838	-	0 (+1.3 in GLL[b])	94,162	0.001%	-
6f	-	3,607	-	-	33,803	-	-
7	-	215,204	-	52.9	201,345	0.03%	0.01%
7c	-	47,691	-	3.6	69,681	0.005%	0.003%
8	-	48,765	-	7.1	32,110	0.02%	0.01%
Unclassified	-	7,172	-	-	25,811	-	-
Total	**2,167.2**	**1,058,536**	**0.205%**	**236.8**	**2,016,794**	**0.012%**	**0.08%**

Notes:

[a] Ecosite modifiers are as follows: c= calcareous, h = high elevation, o = organic, f = periodically flooded.

[b] GLL = Grand Lake Lowlands. Though the GLL is not part of the RAA as discussed in Section 8.7.2.1, a small portion of the southern extent of the transmission line is within the GrandLake Lowlands Ecoregion.

The "Standards and Guidelines for Identification of the 2012 Old Forest Community and Old Forest Wildlife Habitat Land Base" (NBDNR 2009) document outlines objectives and targets for conserving Old Forest Communities (OFC) and Old Forest Wildlife Habitats (OFWH), including specific targets for each ecoregion, and each forest license within each ecoregion. The PDA and LAA cross some OFCs identified by NBDNR in their Standards and Guidelines document, which are outlined in Table 8.7.7, as well as objective totals for each OFC within the two ecoregions of the RAA. There are other types of OFC within the RAA but they will not be affected by the Project.

Table 8.7.7 NBDNR Old Forest Communities within PDA, LAA (but outside PDA), and Ecoregion

Old Forest Community	Old Forest Community in PDA (Direct Loss)		Old Forest Community in LAA but outside PDA (Indirect Effects)*		Total Objective within Ecoregion
	Area (ha)	% of Total Objective in Ecoregion	Area (ha)	% of Total Objective in Ecoregion	
Central Uplands Ecoregion (Madawaska Uplands)					
Red Spruce	7.9	0.23	16.1	0.47	3,442
Tolerant Hardwood – Softwood	12.5	0.30	20.3	0.49	4,103
Black Spruce – Poor	1	0.12	1.6	0.20	806
Valley Lowlands Ecoregion					
Red Spruce	3.8	0.02	6.2	0.04	15,427
Tolerant Hardwood Pure	0.6	0.01	0.9	0.01	8,550
Tolerant Hardwood – Softwood	1.1	0.02	1.5	0.02	6,962
Total (both ecoregions)	**26.9**	**0.07**	**46.6**	**0.12**	**39,290**

Notes:
* These areas represent the worse-case potential environmental effects on OFC outside the PDA, although the environmental effects to the full extent listed are unlikely.

The loss of designated OFCs will be temporary, until replacement stands are located and designated. The definite temporary loss is not more than 0.3% of any one OFC type, and 0.07% of affected OFCs within the RAA. As a worst case scenario, there is potential for additional loss within the LAA, but outside the PDA, of up to 0.12% of the OFC within the two ecoregions, but the full amount is unlikely.

Project-related loss or change to the Vegetated Environment will be a permanent change for the life of the Project, and likely several years following reclamation activities until the re-vegetated growth implemented for site reclamation has matured. Although the environmental effects to the Vegetated Environment are long-term, there are no vegetation community types within the LAA that are rare or uncommon within the RAA, and the total area of vegetation loss or change as a result of the Project represents less than 0.7% of the RAA for any one ecotype, and less than 0.08% in total (Table 8.7.6). Thus, the residual environmental effects on vegetation communities will be not significant.

No plant SAR were recorded during field surveys for the Project, and the potential for encountering plant SAR within the LAA has been determined to be low based on an assessment of the vegetation communities within the LAA. Therefore, the residual environmental effects on SAR are rated not significant.

One plant SOCC, nodding ladies'-tresses (*Spiranthes cernua*; S2/Sensitive), was observed at one location within the LAA. The location is on a damp gravel road located within the LAA directly beneath the planned 345 kV transmission line relocation. The location of this plant will be flagged and disturbance in adjacent areas will be minimized by avoiding the placement of transmission line towers at or immediately adjacent to the identified plant location, and any required clearing activities in this area will be conducted by hand. Nodding ladies'-tresses is typically found in damp, open, somewhat disturbed conditions (Gleason and Cronquist 1991; Hinds 2000); therefore, if direct disturbance (*e.g.*, crushing) is avoided, the residual environmental effects on SOCC will be not significant.

With respect to potential ecological risks from the Project, for terrestrial plants, potential ecological health risks were identified for arsenic, boron, manganese and vanadium for both the existing and predicted future soil concentrations. Comparison of the existing soil concentrations to the predicted future soil concentrations revealed less than 0.001% increase. Therefore, ore dust deposition is expected to negligibly affect soil quality, or COPC concentrations in terrestrial plants in areas that are not directly disturbed by mining activity. Environmental effects to vegetation will not be significant.

First Nations have raised the concern that the large contiguous block of Crown land within which the Project is situated is one of the remaining areas in close proximity to the St. Mary's and Woodstock First Nations, and that the Project could adversely affect their ability to practice traditional activities as a result of the loss of habitat to the Project. The Study Team carried out additional research in this area, and the results are provided in Appendix F to the EIA Report. This additional research demonstrates that the Project site is not unique in the Crown Land Block (or "CLB", for short), and with the exception of the presence of nodding ladies'-tresses in the LAA (an SOCC), all other vegetation communities located within the PDA are part of secure populations within the CLB and, indeed, in New Brunswick. While such resources would indeed likely be no longer found in the PDA until Closure, the availability of these secure species in the CLB and in New Brunswick is such that there will be no significant environmental effects to these vegetation communities.

Though vegetation will be lost as a result of the Construction of the Project, the extent of the loss will not adversely affect populations in the RAA and the likelihood of long-term survival within New Brunswick of any plant species will not be substantially reduced. No SAR are present in the LAA, and disturbance will be avoided for the one SOCC plant present in the relocated 345 kV transmission line corridor.

8.7.5 Assessment of Cumulative Environmental Effects

In addition to the Project environmental effects discussed above, an assessment of the potential cumulative environmental effects was conducted for other projects or activities that have potential to cause environmental effects that overlap with those of the Project, as identified in Table 8.7.5. Table 8.7.8 below presents the potential cumulative environmental effects to the Vegetated Environment, and ranks each interaction with other projects or activities as 0, 1, or 2 with respect to the nature and degree to which important Project-related environmental effects overlap with those of other projects or activities that have been or will be carried out.

Table 8.7.8 Potential Cumulative Environmental Effects to the Vegetated Environment

Other Projects or Activities With Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects Change in the Vegetated Environment
Past or Present Projects or Activities That Have Been Carried Out	
Industrial Land Use (Past or Present)	0
Forestry and Agricultural Land Use (Past or Present)	1
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons (Past or Present)	1
Recreational Land Use (Past or Present)	1
Residential Land Use (Past or Present)	0
Potential Future Projects or Activities That Will Be Carried Out	
Industrial Land Use (Future)	0
Forestry and Agricultural Land Use (Future)	2
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons (Future)	1
Recreational Land Use (Future)	1
Planned Residential Development (Future)	0

Cumulative Environmental Effects

Notes:

Cumulative environmental effects were ranked as follows:

0 Project environmental effects do not act cumulatively with those of other projects or activities that have been or will be carried out.

1 Project environmental effects act cumulatively with those of other projects or activities that have been or will be carried out, but are unlikely to result in significant cumulative environmental effects; or Project environmental effects act cumulatively with existing significant levels of cumulative environmental effects but will not measurably change the state of the VEC.

2 Project environmental effects act cumulatively with those of other projects or activities that have been or will be carried out, and may result in significant cumulative environmental effects; or Project environmental effects act cumulatively with existing significant levels of cumulative environmental effects and may measurably change the state of the VEC.

Past, present and future industrial land use within the RAA is limited and not predicted to act cumulatively with the Project on the Vegetated Environment. Past, present, and future residential land use, though common in some areas of the RAA, is most prevalent in urban areas that are not near the LAA. There are no residential developments planned for the vicinity of the LAA. The interaction between the environmental effects of these activities and of Project activities should in no way affect plant communities or individuals (particularly SAR or SOCC), and as such, their interaction with the Vegetated Environment is ranked as 0 in Table 8.7.8; their cumulative environmental effects are rated not significant during all phases, and they are not discussed further.

Forestry and agricultural land use has occurred and continues to occur in the RAA. Interactions with past or present Forestry and Agricultural Land Use have been ranked as 1 in Table 8.7.8; however, interactions with future Forestry and Agricultural Land Use have been ranked as 2 in Table 8.7.8 and are evaluated further below. Active forest management is widespread throughout the LAA, particularly in the northern portion surrounding the mine location (*i.e.*, where direct loss of vegetation communities is expected), which is Crown land. Agricultural activities in the LAA primarily occur in the southern regions (*i.e.*, along the new 138 kV transmission line corridor) that contain more private land. While these activities have shaped the current vegetation communities present in the RAA, they are common and long-standing practices throughout the province and are authorized activities by the NBDNR through the issuance of Crown timber licences. Currently, approximately 38% of the forested area of the LAA is composed of regenerating or sapling-aged forest, and would not be scheduled for harvest for at least several decades (likely 45-80 years). Though both past and present forestry and agricultural land use have and will result in a change in forested habitat and a (potentially temporary)

loss of mature forested habitat, and though the Project will further contribute to this change, it is not expected to be so great that the sustainability of vegetation communities and vascular plant SAR or SOCC are affected within the two ecoregions of the RAA. Therefore, the interaction is not expected to result in an adverse residual cumulative environmental effect on the Vegetated Environment.

Land and resources within the RAA have been, and will continue to be used for traditional purposes by Aboriginal persons. With respect to the Vegetated Environment, this includes activities such as timber harvesting and gathering of particular plant species for subsistence or other traditional purposes. Though limited information currently exists on these activities within the RAA, they are very likely to be currently occurring at sustainable levels and within the overall forest management regulatory framework. The interactions of past, present and future current use of land and resources for traditional purposes by Aboriginal persons in combination with the Project's environmental effects on the Vegetated Environment have been ranked as 1 in Table 8.7.8 as they are not expected to adversely affect the sustainability of vegetation communities and/or vascular plant SAR or SOCC within the RAA, and are therefore not likely to have any significant adverse residual cumulative environmental effects on the Vegetated Environment.

Recreational land use, including trail development and all-terrain vehicle use, has been and will continue to occur within the RAA. These activities may have some minimal environmental effect on vegetation communities through the disturbance or removal of vegetation, but even when combined with the Project, is not expected to affect the sustainability of vegetation communities and/or vascular plant SAR or SOCC within the RAA. Therefore, the interactions between past and present or future recreational land use and the Project have been ranked as 1 in Table 8.7.8 and are not expected to have any significant adverse residual cumulative environmental effects on the Vegetated Environment.

In summary, for those projects or activities for which the interaction with the Project have been ranked as 0 or 1 in Table 8.7.8, the cumulative environmental effects of the Project in combination with those other projects or activities that have been or will be carried out are rated not significant for all Project phases, with a high level of confidence. They are not discussed further.

The environmental effects of other projects or activities that will potentially overlap with the environmental effects of the Project include future forestry and agricultural land use—this interaction has been ranked as 2 in Table 8.7.8 (and thus has the potential to result in cumulative environmental effects with the Project, which must be further evaluated).

To address the potential cumulative interactions listed above and ranked as 2, a cumulative environmental effects assessment for Change in the Vegetated Environment was conducted in relation to the Project. The cumulative environmental effect mechanisms, mitigation measures, and characterization of residual cumulative environmental effects are presented in Table 8.7.9 below.

Table 8.7.9 Summary of Residual Cumulative Environmental Effects on the Vegetated Environment

Cumulative Environmental Effects	Case	Other Projects, Activities and Actions	Mitigation / Compensation Measures	Residual Cumulative Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Recommended Follow-up or Monitoring
				Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/ Socioeconomic Context				
Change in the Vegetated Environment	Cumulative Environmental Effects with Project	• Forestry and Agricultural Land Use (Future).	• Forested Crown land that will be removed from the PDA will be accounted for by NBDNR and the appropriate forest licensee in the management plans of the subsequent forest cycle. • NBDNR Conservation Vegetation Communities within the PDA will be replaced within the ecoregion and license block whenever stands meeting the criteria are available. The licensee, the regional NBDNR office, and the NBDNR Fish and Wildlife Branch will collaborate to identify replacement stands.	A	L	R	LT/ O	R	D	N	H	--	None recommended.
	Project Contribution to Cumulative Environmental Effects			A	L	S	LT/ O	R	D	N	H	--	

Table 8.7.9 Summary of Residual Cumulative Environmental Effects on the Vegetated Environment

Cumulative Environmental Effects	Case	Other Projects, Activities and Actions	Mitigation / Compensation Measures	Residual Cumulative Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Recommended Follow-up or Monitoring
				Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/ Socioeconomic Context				

KEY

Direction
P Positive.
A Adverse.

Magnitude
L Low: <5% of vegetation communities or SOCC populations within the RAA will be exposed to the effect, or no measurable change in vegetation communities or population size relative to baseline conditions. SAR are not affected.
M Medium: 5% - 25% of vegetation communities or SOCC populations within the RAA will be exposed to the effect, or a measurable change in vegetation communities or population size relative to baseline conditions that does not cause management concern. SAR are not affected.
H High: >25% of vegetation communities or SOCC populations within the RAA will be exposed to the effect, or a measurable change in vegetation communities or population size relative to baseline conditions that does cause management concern. SAR may be affected.

Geographic Extent
S Site-specific: Within the PDA.
L Local: Within the LAA.
R Regional: Within the RAA.

Duration
ST Short-term: Occurs and lasts for short periods (*e.g.,* days/weeks).
MT Medium-term: Occurs and lasts for extended periods of time (*e.g.,* years).
LT Long-term: Occurs during Construction and/or Operation and lasts for the life of Project.
P Permanent: Occurs during Construction and Operation and beyond.

Frequency
O Occurs once.
S Occurs sporadically at irregular intervals.
R Occurs on a regular basis and at regular intervals.
C Continuous.

Reversibility
R Reversible.
I Irreversible.

Ecological/Socioeconomic Context
U Undisturbed: Area relatively or not adversely affected by human activity.
D Developed: Area has been substantially previously disturbed by human development or human development is still present.
N/A Not Applicable.

Significance
S Significant.
N Not Significant.

Prediction Confidence
Confidence in the significance prediction, based on scientific information and statistical analysis, professional judgment and known effectiveness of mitigation:
L Low level of confidence.
M Moderate level of confidence.
H High level of confidence.

Likelihood
If a significant environmental effect is predicted, the likelihood of that significant environmental effect occurring is determined, based on professional judgment:
L Low probability of occurrence.
M Medium probability of occurrence.
H High probability of occurrence.

Other Projects, Activities, and Actions
List of specific projects or activities that would contribute to the cumulative environmental effects.

8.7.5.1 Cumulative Environmental Effects Mechanisms

The cumulative environmental effects mechanisms for a Change in the Vegetated Environment are described below. Projects or activities with the potential to overlap with the environmental effects of the Project include future Forestry and Agricultural Land Use. Future agricultural land use is not expected to act cumulatively with the Project on the Vegetated Environment; the PDA currently overlaps with 0.89 ha of agricultural land along the transmission line near Keswick, and there are no known planned agricultural developments within the LAA. Thus, the cumulative environmental effects of the Project and future agricultural land use are rated not significant. The following discussion therefore focuses on future forestry land use.

The interacting environmental effects between the Project and future forestry land use will primarily result from the loss of forested stands within the PDA, and the potential alteration of stands within the remaining LAA (outside of the PDA).

8.7.5.2 Mitigation of Cumulative Environmental Effects

Mitigation measures to be implemented by the Proponent were discussed previously for Project-related environmental effects (sub-section 8.7.4). These mitigation measures are anticipated to be effective in mitigating cumulative environmental effects, as would the mitigation associated with other past, present or future projects or activities (*e.g.,* forestry management plans). Beyond these previously described mitigation measures, the following additional mitigation measures will need to be employed by parties other than the Proponent to avoid or reduce the cumulative environmental effects of the Project on the Vegetated Environment.

- Forested Crown land that will be removed from the PDA will be accounted for by NBDNR in consideration of the results of this assessment and the appropriate forest licensee in the management plans of the subsequent forest cycle.

- NBDNR Conservation Vegetation Communities within the PDA will be replaced within the ecoregion and license block whenever stands meeting the criteria are available; however, the anticipated reductions that will require replacement will be minimal, falling within the ranges listed in Table 8.7.7. The licensees, the regional NBDNR office, and the NBDNR Fish and Wildlife Branch will collaborate to identify replacement stands.

8.7.5.3 Characterization of Residual Cumulative Environmental Effects

Cumulative environmental effects are likely to result from the Project in combination with future forestry activities, as both will result in the removal or change in vegetation communities. With mitigation, these cumulative environmental effects will be limited to a temporary change in the planned removal or change in vegetation communities within the RAA related to forest harvesting and the removal of timber. Assuming potential replacement stands are available within the RAA, there will also be a temporary loss in currently designated NBDNR Conservation Vegetation Communities as discussed in Section 8.7.4.3.

Forestry activities have occurred in much of the RAA for several decades, and will continue to occur for the foreseeable future. While these past or present activities have likely affected the current vegetation

communities present in the RAA at some time in the past, they are common and long-standing practices throughout the province. In particular, forest harvesting on Crown land is strictly managed by NBDNR through provincial objectives and standards that are revisited and updated every five years (NBDNR 2005). This active management is intended to ensure that forestry activities do not substantively affect the sustainability of the vegetation communities. Although a new Forest Management Strategy was recently released by the provincial government, it is not known how this strategy will be administered or how increased cutting on Crown land will be apportioned and managed by the Province. It can only be presumed that such activity, if it proceeds in the RAA, will be managed in a sustainable and responsible way by the Province and in consideration of other planned or active developments such as the Sisson Project to an extent that cumulative environmental effects are not significant. Though forestry land use has resulted and will result in a change in vegetation communities, and even though the Project will also result in these changes, the magnitude of the loss is not expected to be so great that the sustainability of these populations is adversely affected in a significant way within the RAA, due to the active management of forestry activities by NBDNR.

One plant SOCC is located within the LAA, and the location of this plant will be flagged and disturbance in adjacent areas will be minimized. With planned mitigation, it is anticipated that there will be no loss of regional biodiversity as a result of the Project. As such the contribution of the Project to cumulative environmental effects on SOCC and SAR is considered negligible. Therefore, the cumulative environmental effects of the Project in combination with those of other projects or activities that have been or will be carried out on Future Forestry and Agricultural Land Use are rated not significant during all Project phases, with a high level of confidence.

8.7.6 Determination of Significance

8.7.6.1 Residual Project Environmental Effects

Though vegetation will be lost as a result of the construction of the Project, the extent of the loss will not adversely affect populations in the RAA and the likelihood of long-term survival within New Brunswick of any plant species will not be substantially reduced. No SAR are present in the LAA, and disturbance will be avoided for the one SOCC plant present in the realigned 345 kV transmission line corridor. With the proposed mitigation and environmental protection measures, the potential residual environmental effects of a Change in the Vegetated Environment during all phases of the Project are rated not significant. This conclusion has been determined with a high level of confidence.

8.7.6.2 Residual Cumulative Environmental Effects

The cumulative environmental effect of a Change in the Vegetated Environment of the Project in combination with other projects or activities that have been or will be carried out will be limited in extent, and the viability of plant populations or vegetation communities in New Brunswick and the RAA in particular will not be substantially reduced. There will be no cumulative environmental effects to SAR as none are present within the LAA. Accordingly, the residual cumulative environmental effects of a Change in the Vegetated Environment in combination with other projects or activities that have been or will be carried out are rated not significant. This determination has been made with a high level of confidence, given the limited temporal and spatial nature of the potential residual cumulative environmental effects, the professional knowledge and experience of the Study Team, as well as the associated mitigation.

8.7.7 Follow-up or Monitoring

No follow-up is proposed to verify the environmental effects prediction or the effectiveness of mitigation.

A monitoring program will be implemented for the Vegetated Environment, as outlined in Table 8.7.5. The population of nodding ladies'-tresses (*Spiranthes cernua*) will be flagged during Construction, and monitored at years 1, 3, and 5 following the completion of Construction. If at year 3 or 5, the population appears to be declining, a mitigation plan will be developed at that time. If the population appears to be stable, no further work will be recommended.