Lake Winnipeg East System Improvement (LWESI) Transmission Project

Vegetation Technical Report

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EXECUTIVE SUMMARY

This report details the vegetation environment for the proposed Lake Winnipeg East System Improvement (LWESI), Pine Falls-Manigotagan 115 kv Transmission Line (Line PQ95), and the Manigotagan Corner Station. The vegetation and habitat types of the area, including sensitive sites and rare and uncommon vascular plants found in the greater Project Study Area are described. Existing information for sensitive habitats, and plant species of conservation concern is compiled from literature sources and the Forest Resource Inventory to select four valued environmental components (VECs). Vegetation VECs included three individual species (bog club moss, Hooker's orchid, and checkered rattlesnake plantain), and one forest assemblage type (black ash/ American elm).

Through data analysis and field survey data collected, three Alternative Routes and a Final Preferred Route are assessed for their effects on plants of conservation concern and sensitive vegetation sites. Two of the four VECs identified for the Project were observed in field visits of selected sites throughout the Project Study Area. In addition to VECs, other rare and uncommon species were observed throughout the Project Study Area, at times closely associated with the ash forest VEC. Aboriginal Traditional Knowledge (ATK) gathered through workshops and Key Person Interviews conducted by other specialists, is incorporated into data analysis and effects assessments.

Mitigation measures for clearing, construction and maintenance include: (1) avoiding or minimizing disturbance to existing VEC locations (e.g., ash forests) and sensitive sites (ATK Key Person Interview); (2) using winter construction phases, when many plants are dormant; (3) following established protocols to leave riparian buffer zones when clearing; (4) and minimizing weed seed introduction on construction equipment and fill materials. Follow-up monitoring activities should include an assessment of these measures of mitigation.

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%	percent
ATK	Aboriginal Traditional Knowledge
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EA	Environmental Assessment
EnvPP	Environmental Protection Plan
FRI	Forest Resource Inventory
GPS	Global Positioning System
ha	hectare
km	kilometres
km^2	square kilometres
KPI	key person interviews
kV	kiloVolt
Line PQ95	Pine Falls–Manigotagan 115 kV Transmission Line
LWESI	Lake Winnipeg East System Improvement
m	metre
MBCDC	Manitoba Conservation Data Centre
MBESA	*Manitoba Endangered Species Act*
PEP	Public Engagement Program
PR	Provincial Road
ROW	right-of-way
the Project	Lake Winnipeg East System Improvement Transmission Project
VEC	Valued Environmental Component

1 INTRODUCTION

1.1 Project Overview

The Lake Winnipeg East System Improvement (LWESI) Transmission Project (the Project) is required to provide system upgrades in the region east of Lake Winnipeg. The Project will serve existing and new load growth, and provide firm transformation and adequate voltage support for the communities located in and around the region. It is expected that this new development will meet the electrical requirements for at least the next 20 years.

The Project includes the construction of a new 115 kilovolt (kV) transmission line from Powerview-Pine Falls, Manitoba to Manigotagan [Pine Falls–Manigotagan 115 kV Transmission Line (Line PQ95)], approximately 75 kilometres (km) north of Powerview-Pine Falls. The project will require the development of a new 115-66 kV transmission station (Manigotagan Corner Station) west of the intersection of Provincial Road (PR) #304 and the Rice River Road, near the community of Manigotagan. This station will serve as the terminal for the new 115 kV transmission line as well as the existing 66 kV sub-transmission lines in the Manigotagan area.

This technical report supports the Environmental Assessment (EA) Report to meet the licensing requirements of the *Manitoba Environment Act* for a Class II Licence for this project.

1.2 Report Outline

This report describes the vegetation and habitat types, sensitive sites and rare and uncommon vascular plants found in the Project Study Area. Existing information for plant species of conservation concern and sensitive habitats is compiled and used to select Valued Environmental Components (VECs). Forest Resource Inventory (FRI) data is utilized to characterize forest composition. Aboriginal Traditional Knowledge (ATK) gathered through workshops and Key Person Interviews (KPI) conducted by other specialists is incorporated into data analysis and effects assessments. Three Alternative Routes are assessed for effects on plants of conservation concern and sensitive vegetation sites through data analysis and field survey data collected. A Preferred Route selected in late September is assessed in the same manner. Environmental effects and mitigation measures for clearing, construction and maintenance are discussed as well as monitoring activities.

The Vegetation Technical Report is organized into seven Sections (below), followed by a list of references and a glossary.

- **Section 1** provides an overview of the project and the purpose and outline of the project.
- **Section 2** describes the Project Study Area.
- **Section 3** outlines and describes the methods used in the preparation of this report.

- **Section 4** characterizes the vegetation environment existing in the Project Study Area.
- **Section 5** describes the processes used and the results of the evaluation of alternate routes, the Preferred Route and infrastructure.
- **Section 6** describes the effects of the Project phases on vegetation and suggests mitigation for adverse effects, monitoring and follow-up actions.
- **Section 7** provides a summary of conclusions reached.

2 STUDY AREA

2.1 General Regional Area Description

The Project Study Area includes an area of approximately 2,112 square kilometres (km^2) and extends from south of the community of Powerview-Pine Falls, north to the community of Manigotagan, and from the eastern boundary of Lake Winnipeg, to approximately 10 km east of Provincial Road (PR) #304. The Project Study Area was chosen to be of sufficient size to assess any potential Project effects on biophysical and socioeconomic components.

2.2 Study Area

2.2.1 Vegetation

The Project Study Area is a wide corridor centered on PR #304 from Powerview-Pine Falls to Manigotagan. It encompasses the alternate transmission line routes, and infrastructure including the Manigotagan Corner Station, and access routes for eventual construction and maintenance of the line and infrastructures. This corridor stretches from just south of the Winnipeg River in the south to the Wanipigow River in the north. It is bounded by Lake Winnipeg to the west and includes the area approximately 10 km to the east of PR #304 (Map 2-1).

The Project Study Area falls primarily in the Wrong Lake EcoDistrict of the Lac Seul Upland Ecoregion, within the boreal forest of Manitoba (Smith et al. 1998). In this area clay deposits are covered by deep or shallow peat or glacial deposits. Drainage is poor and where pastures and settlements exist channels have been constructed. Extensive wetlands consist of bog peatlands that support black spruce, shrub and moss communities and fens that are dominated by sedges with some tamarack and shrubs. Drier upland sites support aspen, jack pine, and white birch while white spruce, balsam fir and balsam poplar thrive in moister areas. Deciduous forests on the banks of streams include American elm, bur oak and ash with a diversity of herbs and shrubs as an understory. Coniferous stands often have a feather moss ground cover. Frequent forest fires affect the forest cover. In the northern portion of the Project Study Area the terrain consists of Precambrian bedrock outcrops and depressions of clay and silt glaciolacustrine sediments often covered with peat (Smith et al. 1998). Drainage flows to the west toward Lake Winnipeg via several rivers and creeks. The Manigotagan River is the largest river in the Project Study Area.

3 METHODS

3.1 Data Collection and Analysis

3.1.1 Landscape Analysis and Site Selection

In order to determine field sites, land cover information for the Project Study Area was inferred from the digital provincial FRI, interpreted from 1997 aerial photography. The FRI categorizes the landscape into vegetation communities, or irregularly shaped polygons, for productive forested land, non-productive or non-forested land, and water. The FRI is developed and used primarily for forested land, and therefore is concerned with areas capable of producing merchantable timber, regardless of the current stage of productivity (Becker at al. 1997). While use of the FRI would not be as helpful in selecting wetland sites, low-lying sites were determined to be of lower priority for sampling; with winter construction phases, many wetland species are dormant under snow and ice, and not as likely to be disturbed by the Project. Sampling efforts therefore focused on forested sites. Portions of the Project Study Area were burned as recently as 1999, adding uncertainty to the photo interpretation of these post-fire areas, (e.g., particularly the age of forested stands). However, because the underlying characteristics of the stand are not affected by fire, it is a reasonable assumption to expect that the post-fire canopy composition is very similar to pre-fire.

A total buffer width of 35 m either side of centre (70 metre [m] corridor) was marked along each Alternative Route and subsequently the Preferred Route, to calculate the extent of habitat disturbance during construction and maintenance of the proposed Line PQ95. An extra 5 m buffer on either side of the 60 m right-of-way (ROW) was used in area calculations, to take into account the possibility of edge effects. In some cases, new microclimatic conditions (i.e., levels of light, wind, humidity and temperature) at the forest edge can lead to changes in vegetation structure and composition (Kremsater and Bunnell 1999), which could in turn have consequences for rare species with particular habitat requirements.

To further inform site selection, known information on habitat preferences and/or previous locations for Valued Environmental Components (VECs) (Section 3.2) was taken from several sources including: literature sources where available (Martinsen et al. 2008; Punter 1994); species accounts and herbarium maps (Manitoba Museum, MMMN), flora (Flora of North America 2012; Ames et al. 2005; Cody 1989), species registries with the Manitoba Conservation Data Centre (MBCDC) and COSEWIC; as well as personal communications.

Each FRI polygon that was intersected by the 70 m wide Alternative Routes was analyzed by a number of attributes, including quantitative data on species composition of the dominant tree cover, moisture class, landform type, tree height, age class, and percent crown closure (ESRI 2009). These parameters were used to help determine sites for sampling, based on their potential to support VEC species, as well as any other rare species. The total area of all habitats

that were intersected by the ROW was also calculated for each route, in order to make route specific recommendations based on the estimation of where VEC or rare species were likely to occur.

Based on FRI analysis of potential VEC habitats, 36 possible sites were identified for field study. Due to time constraints, and the lateness of the floristic season, sites were prioritized for field visits, in order to make the most efficient use of field time.

3.1.1.1 Sampling at Site Level

A Project Study Area reconnaissance was conducted June 21 and 22, 2012, with 10 field sites visited along the Alternative Routes. A further 17 field sites were sampled again on September 18 - 20 2012, along the Preferred Route. Three of the five major river crossings were sampled, including the crossings at the Manigotagan, Sandy and O'Hanly rivers.

A random meander method (ANPC 2000) was chosen to search for targeted VEC occurrences, and other rare species. Provincial S-ranks were used to define species rarity and were obtained through the MBCDC (2012). All species encountered ranked S1 through S3 inclusive were recorded. These rankings include each plant that is Very Rare (S1), Rare (S2), or Uncommon (S3), throughout its range or within the province. Full definitions for S-rankings are in Appendix A. A general inventory of species composition for tree canopy cover, shrubs, and woody and herbaceous understory, was compiled to provide a community context for rare species. The location of VECs and rare species was marked by Global Positioning System (GPS). Rare plant surveys can confirm the presence of rare plants at a site however, rare taxa may be overlooked due to survey timing, a poor growing season, or dormancy of the plant (Bizecki-Robson 2000; Henderson 2010). A greater frequency of rare plant surveys will increase the likelihood of finding a rare plant population. Field sites sampled are summarized in Tables 3-1 and 3-2.

Table 3-1: Location of all Vegetation Sampling Sites within the ROW for Alternative Routes

Date Visited	Site ID	Zone	Easting	Northing	Route
2012-06-21	38	14 U	690664	5664655	A
2012-06-21	39	14 U	690676	5664614	A
2012-06-21	40	14 U	690655	5664640	A
2012-06-21	41	14 U	690814	5658732	A
2012-06-21	42	14 U	690838	5658733	A
2012-06-21	43	14 U	690866	5658729	A
2012-06-21	44	14 U	690823	5658733	A
2012-06-21	45	14 U	691829	5657634	C
2012-06-21	46	14 U	691825	5657633	C
2012-06-21	47	14 U	691839	5657710	C
2012-06-22	74	14 U	694567	5650575	A
2012-06-22	75	14 U	695835	5648389	B
2012-06-22	76	14 U	696011	5646065	B
2012-06-22	77	14 U	704570	5614357	A,B
2012-06-22	78	14 U	701534	5607526	A,B,C
2012-06-22	80	14 U	701517	5607617	A,B,C

Table 3-2: Locations of all Vegetation Sampling Sites within the ROW for Preferred Route

Date Visited	Site ID	Zone	Easting	Northing
2012-09-18	1	14 U	695180	5667439
2012-09-18	2	14 U	695186	5667482
2012-09-18	4	14 U	695930	5667606
2012-09-18	5	14 U	691681	5666900
2012-09-18	7	14 U	691166	5664946
2012-09-18	325	14 U	695188	5667424
2012-09-18	327	14 U	692559	5666786
2012-09-18	ST25	14 U	691185	5664922
2012-09-19	6	14 U	701458	5607516
2012-09-19	8	14 U	701483	5607486
2012-09-19	9	14 U	701455	5607479
2012-09-19	10	14 U	701496	5607467
2012-09-19	12	14 U	696000	5630204
2012-09-19	13	14 U	696023	5630125
2012-09-19	14	14 U	696066	5630010
2012-09-19	15	14 U	696061	5629945
2012-09-19	16	14 U	695928	5630513

Table 3-2: Locations of all Vegetation Sampling Sites within the ROW for Preferred Route (continued)

Date Visited	Site ID	Zone	Easting	Northing
2012-09-19	18	14 U	698754	5627793
2012-09-19	19	14 U	698721	5627743
2012-09-19	118	14 U	694771	5634849
2012-09-19	149	14 U	695962	5630512
2012-09-19	151	14 U	696010	5630201
2012-09-19	171	14 U	698713	5627532
2012-09-19	ST22	14 U	696130	5629827
2012-09-20	21	14 U	691974	5657679
2012-09-20	22	14 U	692718	5655536
2012-09-20	23	14 U	694904	5650886
2012-09-20	25	14 U	700767	5625045
2012-09-20	26	14 U	700783	5625101
2012-09-20	27	14 U	700891	5625168
2012-09-20	72	14 U	700742	5625036
2012-09-20	312	14 U	691991	5657645
2012-09-20	319	14 U	692725	5655420
2012-09-20	ST24	14 U	694814	5650875

3.2 Valued Environmental Component Selection

The EA was focused on Valued Environmental Components, which are aspects of the natural and socio-economic environment that are particularly notable or valued because of their ecological, scientific, resource, socio-economic, cultural, health, aesthetic, or spiritual importance. To be considered as a VEC, a component must have the potential to be adversely affected by project development or have the potential to have an effect on the Project.

A workshop was held with discipline experts to select VECs for the Project which met one or more of the following criteria:

- identified regulatory requirements;
- consultation with regulatory authorities;
- information derived from published and unpublished date sources;
- information and comment received during the engagement of local communities;
- feedback through the Public Engagement Program (PEP); and
- biophysical and heritage assessment field surveys.

A preliminary list of VECs was proposed, and revised throughout the EA process which balanced biophysical and socioeconomic components, and represented both potential positive and negative effects of the Project.

The VECs selected for vegetation are summarized below.

Four VECs were identified as important in the Vegetation Study, including three individual species and one sensitive habitat forest type. The VECs chosen were: bog club moss (*Lycopodiella innundata* S1); Hooker's orchid (*Platanthera hookeri* S2); checkered rattlesnake plantain (*Goodyera tesselata* S2); and forests containing black ash/American elm (*Fraxinus nigra* S3/*Ulmus americana*).

Bog club moss was selected because MBCDC has ranked it as S1 (very rare). It has been found in Manitoba's Model Forest (Martinsen et al. 2008; Punter 1994), which overlaps the Project Study Area. It has been recorded so infrequently that little can be inferred about its habitat requirements.

Hooker's orchid was selected because MBCDC has ranked it as S2 (rare). It has been found near the Project Study Area in Manitoba's Model Forest (Martinsen et al. 2008; Punter 1994). It is usually found in dry mature coniferous and mixed forests. Logging and forest fires in the Project Study Area have probably reduced the habitats for this plant (MBCDC 2012).

Checkered rattlesnake plantain orchid was selected because MBCDC has ranked it as S2 (rare). It has been found in Manitoba's Model Forest (Martinsen et al. 2008; Punter 1994), which overlaps the Project Study Area. It is usually found in the deep shade of mature coniferous forests. Logging and forest fires in the Project Study Area have probably reduced the habitats where this plant is found.

Ash forest was selected because black ash is ranked S3 (uncommon). Ash forests are confined to the southern quarter of Manitoba; most commonly in the southeast. American elm is also commonly found associated with the ash, although Dutch Elm Disease is causing elm population numbers to decline. Field work and literature review has confirmed that many S3 – uncommon plant species are found associated with forests where green and black ash are components of the canopy cover.

The VECs for this project were chosen specifically for their susceptibility to Project effects. Clearing, construction and maintenance activities associated with the Project could adversely affect forested habitat and therefore population numbers of species of those habitats. There are several other rare and uncommon plants (MBCDC ranks S2 – S3) that have previously been found in the Project Study Area, (see Section 4). However, not all rare species that occur in the area are as susceptible to disturbance by the Project. The targeted VECs were chosen because they require mature forest growth, and were therefore given priority over other rare species.

Table 3-3: Vegetation Valued Environmental Components

Valued Environmental Component	Environmental Indicator	Measureable Parameter/Variable
Bog club-moss	Species of conservation concern Very rare – S1	• presence/absence • area of potential habitat (ha) to be affected
Hooker's orchid	Species of conservation concern Rare – S2	• presence/absence • area of potential habitat (ha) to be affected
Checkered rattlesnake plantain	Species of conservation concern Rare – S2	• presence/absence • area of potential habitat (ha) to be affected
Ash forests (>10% canopy ash)	forest type supports many uncommon plant species (S3)	• area of potential habitat (ha) to be affected

% = percent; ha = hectare

A discussion of key information and the process used to evaluate the alternative transmission line routes and provide recommendations for Preferred Route is provided below in Section 5, Evaluation of Alternative Routes and Infrastructure.

4 EXISTING ENVIRONMENT

4.1 Overview

4.1.1 Vegetation

The Project Study Area, as described in Section 2, contains forested areas dominated by black spruce with a mix of aspen, white birch and white spruce occurring in drier sites. Balsam fir is a component in moist sites, while bogs and fens support black spruce and tamarack in wetter sites. Wetland areas are characterized by sparsely treed bogs, willow swamps, fens and sedge meadows. The area is largely Crown Land with a history of Aboriginal settlement, hydroelectric development, resource extraction and recreation. A small amount of agricultural land is located near the Winnipeg River. As a result of the construction of Provincial Road #304, drainage channels were built at right angles to the road. Logging activity in previous years has resulted in many access trails being constructed. Both these activities have altered the natural landscape by removing tree cover. Forest fires (the most recent in 1999) are frequent and result in continual forest regeneration. Forest resource inventory data allowed a preliminary assessment of the vegetation communities in the Project Study Area. Table 4-1 below summarizes the findings.

Table 4-1: Areas of Vegetation Communities within the ROW for Preferred and Alternate Routes

Tree Species	A	B	C	Preferred
Treed Habitats				
Ash	5.22	7.18	2.95	5.80
Balsam Fir 1-50%-spruce	14.62	11.83	24.56	13.87
Balsam Fir 40-70%-spruce	6.17	11.55	5.14	8.38
Balsam Fir 50-100%		0.84	1.36	0.84
Balsam Poplar	0.02	1.49	1.47	0.02
Black Spruce 1-50%-balsam fir	5.76	1.94	2.85	3.76
Black Spruce 1-50%-jack pine	6.36	0.02	6.36	xx
Black Spruce 1-50%-tamarack	2.06		1.99	
Black Spruce 40-70%-balsam fir, white spruce	26.73	37.85	10.57	30.74
Black Spruce 40-70%-jack pine	5.77	7.50	6.19	7.50
Black Spruce 40-70%-tamarack	47.35	48.99	57.91	32.15
Black Spruce 50-100%	1.38	1.38	1.62	2.34
Black Spruce 71-100%	47.02	40.48	42.06	49.36
Black Spruce Treed Muskeg	20.05	18.23	24.81	31.62
Black Spruce Treed Rock	1.20	1.16	2.49	
Jack Pine 1-50%-spruce	3.00		0.92	1.31
Jack Pine 40-70%-spruce	2.69	6.42	5.02	6.18
Jack Pine 50-100%	1.50	0.85	0.02	0.58
Jack Pine 71-100%	8.89	8.87	8.95	2.58
Jack Pine Treed Rock	1.43	2.07	2.29	1.66
Tamarack 1-50%-spruce	2.17		2.15	
Tamarack 40-70%-spruce	30.32	31.33	29.78	29.61
Tamarack 71-100%	12.42	17.70	27.49	21.84
Tamarack Treed Muskeg	4.17	3.12	11.87	12.82
Trembling Aspen 50-100%	88.80	83.31	77.18	75.50
Trembling Aspen-jack pine	37.18	30.68	36.77	20.16
Trembling Aspen-spruce, balsam fir, tamarack	46.13	51.16	41.95	56.66
White Spruce 1-50%-balsam fir, jack pine, black spruce	3.16	1.40	1.03	4.08
White Spruce 40-70%-balsam fir, jack pine, black spruce	3.12	3.23	3.10	6.72
Non treed habitats				
Beaver Floods	14.76	15.45	18.35	7.32
Drainage Ditched	1.39	0.76	1.43	
Gravel Pits/Mine/Dump Sites	2.92	1.38	0.28	3.01
Hayland	7.48	8.52	8.68	7.48
Lakes	0.32	0.03	0.57	0.32
Marsh	0.13		0.20	0.20
Moist Prairie	2.82		xx	2.82
Rivers	0.99	1.01	1.10	1.00
Roads/Railroads/Dikes/Dams	2.27	5.03	5.04	2.26
Townsite/Residential Sites	2.04	4.45	4.64	1.91
Wet Prairie	0.03			
Willow	33.73	32.83	26.61	27.85
Total Hectares[1]	497.21	506.38	501.41	486.61

Notes:

Vegetation communities are based on SubType descriptions from the Forest Resource Inventory (Manitoba Conservation 2007).

Figures are calculated using a ROW width of 60 m, plus a 5 m on buffer on each side, for a total width of 70 m.

4.1.2 Species of Conservation Concern

A request for information was made (July 16, 2012) to the MBCDC for rare and uncommon vascular plant species known to occur in the Project Study Area. The plants are listed in the following table (Table 4-2).

Table 4-2: Provincially Rare and Uncommon Plants Previously Found in the Project Study Area

Scientific Name	Common Name	Conservation Rank
Arethusa bulbosa	Swamp-pink	S2
Carex gracillima	Slender Sedge	S3
Carex normalis	Larger Straw Sedge	SNA
Carex pedunculata	Stalked Sedge	S3?
Carex projecta	Necklace Sedge	S2?
Cyperus houghtonii	Houghton's Sedge	S2
Dicanthelium linearifolium	White-haired Panic Grass	S2
Dryopteris fragrans	Fragrant Shield Fern	S3S4
Juncus vaseyi	Vasey's Rush	S4?
Leucophysalis grandiflora	Large-flowered Ground Cherry	S3
Malaxis unifolia	Green Adder's-mouth	S2?
Onoclea sensibilis	Sensitive Fern	S3S4
Potamogeton amplifolius	Large-leaved Pondweed	S2?
Pyrola americana	Round-leaved Pyrola	S2
Sagittaria rigida	Sessile-fruited Arrowhead	S2
Sisyrinchium campestre	White-eyed Grass	SU
Sparganium glomeratum	Clustered Burreed	S1?
Taxus canadensis	Canada Yew	S3

Source: Manitoba Conservation Data Centre, 2012.

Vascular Plant Species at Risk

There are no records of vascular plant species occurring in the Project Study Area that are protected by legislation under the federal *Species at Risk Act* and the *Manitoba Species at Risk Act* (Canada Species at Risk 2012), or listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). None of the plants protected by these federal and provincial acts would be expected to occur and none were found during field studies.

Previous studies conducted in the Manitoba Model Forest (Martinsen et al. 2008; Punter 1997) confirmed the presence of additional rare and uncommon plants in the Project Study Area. These are listed in the following table (Table 4-3).

Field investigations found eleven plant species ranked as species of conservation concern by the Manitoba Conservation Data Centre. Three of these species are ranked as rare (S2): Hooker's orchid (*Platanthera hookeri*), sessile-fruited arrowhead (*Sagittaria rigida*) and running club-moss (*Lycopodium clavatum var. clavatum*). Three uncommon species (S3) were found: black ash (*Fraxinus nigra*), slender sedge (*Carex gracillima*) and dwarf blueberry (*Vaccinium caespitosum*). One plant, swollen sedge (*Carex intumescens*), is ranked as possibly uncommon (S3?). In addition, there were three plants ranked as uncommon to widespread (S3S4): wild ginger (*Asarum canadense*), sensitive fern (*Onoclea sensibilis*) and wintergreen (*Gaultheria procumbens*). The following table (Table 4-4) lists locations where these plants were found during field studies. Map 4 shows the locations where these plants were found.

Table 4-3: Additional Rare and Uncommon Plants Found in the Manitoba Model Forest

Scientific Name	Common Name	Conservation Rank
Calopogon pulchellus	Grass Pink	S2
Goodyera tesselata	Checkered Rattlesnake Plantain	S2
Hudsonia tomentosa	False Heather	S3
Lycopodiella inundata	Bog Club Moss	S1
Lycopodium clavatum var. *clavatum*	Running Club Moss	S2?
Platanthera hookeri	Hooker's Orchid	S2
Platanthera orbiculata	Pad-leaved Orchid	S3

Source: Martinson et al. 2008.

Note: Recent taxonomic revisions (Flora of N.A.) do not consider the variety *Lycopodium clavatum* var. *clavatum* as a separate species, but include it with the common *Lycopodium clavatum.*

Table 4-4: Locations of Rare Species Recorded in Vegetation Sample Sites within the ROW of Preferred and Alternate Routes

Species/VEC	Common name	S-Rank	Route Segment	UTM East	UTM North
Asarum canadense	Wild Ginger	S3S4	A, B, C	701534	5607526
Asarum canadense	Wild Ginger	S3S4	Preferred	701483	5607486
Carex gracillima	Slender Sedge	S3	A, B, C	701534	5607526
Carex gracillima	Slender Sedge	S3	Preferred	701496	5607467
Carex intumescens	Swollen Sedge	S3	A, B, C	701517	5607617
Carex intumescens	Swollen Sedge	S3	Preferred	701496	5607467
Carex intumescens	Swollen Sedge	S3	Preferred	696023	5630125
Carex intumescens	Swollen Sedge	S3	Preferred, O'Hanly River Crossing	696061	5629945
Carex intumescens	Swollen Sedge	S3	Preferred	700783	5625101
Fraxinus nigra	Black Ash	S3	Preferred	701483	5607486
Fraxinus nigra	Black Ash	S3	Preferred	696023	5630125
Fraxinus nigra	Black Ash	S3	Preferred	696066	5630010

Table 4-4: Locations of Rare Species Recorded in Vegetation Sample Sites within the ROW of Preferred and Alternate Routes (continued)

Species/VEC	Common name	S-Rank	Route Segment	UTM East	UTM North
Fraxinus nigra	Black Ash	S3	Preferred, O'Hanly River Crossing	696061	5629945
Fraxinus nigra	Black Ash	S3	Preferred, Sandy River Crossing	694814	5650875
Gaultheria procumbens	Teaberry	S3S4	A	690655	5664640
Lycopodium clavatum var.*clavatum*	Running-pine	S2	Preferred	698754	5627793
Lycopodium clavatum var. *clavatum*	Running-pine	S2	Preferred	700891	5625168
Onoclea sensibilis	Sensitive fern	S3	Preferred, Manigotagan Corner Stn	695930	5667606
Onoclea sensibilis	Sensitive fern	S3	Preferred, Sandy River Crossing	694904	5650886
Platanthera hookeri	Hooker's orchid	S2	C	691825	5657633
Sagittaria rigida	Sessile-fruited Arrowhead	S2	Preferred, Sandy River Crossing	694814	5650875
Vaccinium caespitosum	Dwarf Blueberry	S3	Preferred	695186	5667482

Sensitive Sites

Habitats that are known to support, or have the potential to support rare plants (CDC species ranked S1-S3) will be affected by clearing, construction and maintenance activities for Line PQ95. Areas affected include areas of mature conifer and mixed wood forests and Ash/Elm forests. Riparian areas located on the banks of rivers and creeks, are also sensitive to disturbance and often provide specialized habitats that support plant communities not found outside those areas. Field sampling determined that some riparian areas contained ash, and a species assemblage that often included rare or uncommon plants.

4.2 Valued Environmental Components

Two of the four VECs selected were observed during field studies. The Hooker's orchid was found in one location, while ash forests were found throughout the Project Study Area. There were no field observations recorded for bog club moss or checkered rattlesnake plantain orchids. Map 3 shows the locations of the ash forests and the Hooker's orchid. Table 4-5 summarizes the locations for the VECs.

Table 4-5: Locations of Valued Environmental Components Recorded in Vegetation Sample Sites within the ROW of Preferred and Alternate Routes

Species/VEC	Common name	S-Rank	Route Segment	UTM East	UTM North
Platanthera hookeri	Hooker's orchid	S2	C	691825	5657633
Ash Forest	Black Ash	S3	C	691829	5657634
Ash Forest	Black Ash	S3	A	690664	5664655
Ash Forest	Black Ash	S3	A	694567	5650575
Ash/ Elm Forest	Black Ash/Elm	S3	A, B, C	701534	5607526
Ash/ Elm Forest	Black Ash/Elm	S3	A, B, C	701517	5607617
Ash Forest	Black Ash	S3	Preferred	692830	5640490
Ash Forest	Black Ash	S3	Preferred	694577	5632931
Ash/ Elm Forest	Black Ash/Elm	S3	Preferred	701458	5607510

4.3 Aboriginal Traditional Knowledge

An Aboriginal Traditional Knowledge study was undertaken to provide relevant information on local knowledge and land use that were absent from the Project Study Area data record. Data on ATK was gathered during five workshops and one KPI that were held in the communities of Hollow Water, Manigotagan, Black River, and Seymourville. Workshops were guided by a series of questions provided by discipline leads. Information was summarized in a series of map biographies on traditional and current land use practices, and interview summaries, and land use maps. Relevant information was integrated into the technical reports which support the EA Report.

Aboriginal peoples have traditionally occupied lands in the Project Study Area and used the resources provided by the land for their sustenance and well-being. Plants are an important resource. Other specialists have identified traditional and current collecting areas and the specific plants used by community members in both the Hollow Water and Black River First Nations and Seymourville and Manigotagan. Specific plant collecting areas that could be affected by the project footprint have also been identified by other specialists (Cultural Resources Technical Report, NLHS 2012).

Particular plant species identified in community interviews and workshops were also found during field investigations in areas other than those mapped by community members. The names and locations of those plants are not reported here due to confidentiality concerns. (NLHS pers. comm.). A polygon showing an area of special concern near the Manigotagan Corner Station has been identified (NLHS 2012).

5 EVALUATION OF ALTERNATIVE ROUTES AND INFRASTRUCTURE

5.1.1 Description and Evaluation of Alternative and Preferred Routes

The overall route selection process for the Line PQ95 component is described in Chapter 3.0 of the main EA Report. Evaluation of the Alternative Routes focused on a predetermined set of evaluation criteria. The evaluation criteria reflected the importance of known factors that are identified from various perspectives including socio-economic, biophysical, cost and technical aspects. These criteria, as well as valuable feedback obtained from the Public Engagement Program (PEP), became the basis from which the Final Preferred Route was identified.

The Manigotagan Corner Station Site was selected on the basis of engineering and technical criteria. The Preferred Station Site was integrated into the PEP and received favorable feedback from local community representatives.

The section below describes the inputs for Line PQ95 Alternative Routes and the Manigotagan Corner Station Site from the vegetation perspective.

The main effect of the project on the selected vegetation VECs, is disturbance and habitat loss. Habitat loss will be caused by clearing of the ROW and for access roads during the construction and maintenance phases of the project. In order to evaluate the alternative transmission line routes, focus was kept on the area of habitat that intersected the ROW of each Alternative Route. Specifically of interest is habitat occupied and potentially occupied by VEC species.

Three of the vegetation VECs selected are individual species (bog club moss, Hooker's orchid, checkered rattlesnake plantain). The fourth VEC is a forest type, which was broadened to include forests containing ash, both black and green, as these sites tended to include a number of other species ranked S2 and S3 by the MBCDC. All four VECs selected either require or represent a canopy of mature trees.

To identify and assess effects for vegetation VECs, a landscape level analysis was used. Tabular information associated with the FRI intersect (i.e., the portion of the FRI selected by a 70 m buffer centered on each route) was exported into excel. The area (in hectares) of all habitat types, described by dominant tree species cover, was calculated across all routes (Table 5-1).

This single parameter was helpful in locating areas of the ash forest VEC, by selecting forests that were either dominated by ash, or more frequently, forests where Ash accounted for at least ten percent of the total canopy cover. Once in the field, this method of using the ash forest as an indicator proved successful, as several other species listed as S2 and S3 with MBCDC were located in conjunction with a tree canopy containing ash, even at sub-dominant levels. Black

ash and green ash were often intermixed at a site. In all cases where either ash species was present, other species of conservation concern occurred as well.

However, the FRI habitat types were not sufficient on their own to predict possible occurrences of other VECs species. Information on the habitat requirements and preferences of bog club moss, Hooker's orchid, and checkered rattlesnake plantain was gathered from the literature where available, to determine the particular range of forest communities that were most likely to support each of these VEC species.

The other attributes derived from the FRI, (along with canopy cover), included tree age class, site moisture, landform, and crown closure. The analysis of FRI data for each individual polygon, intersecting each Alternative Route, enabled a more tailored selection of sites where VEC occurrence was possible. In this way an estimate of total hectares of potential habitat for VECs could be calculated for each route. Consideration of the total area of high potential habitats to be affected along each alternative, as well as location along the route lead to a recommendation on a preferred Alternative Route, that would serve to minimize effects to selected vegetation VECs.

5.1.2 Alternative Routes

Landscape level analysis with the FRI showed that potential habitats for the other selected VECs were all located south of the O'Hanly River. The bog club moss's most northern potential habitat site occurred between the Black and O'Hanly rivers, and followed the wetter habitat south along Alternative Route C. Potential habitat for Hooker's orchid and checkered rattlesnake plantain appeared to occur along Alternative Route A, generally south from O'Hanly River. While checkered rattlesnake plantain was not observed during field work, Hooker's orchid was recorded north of Sandy River. Table 5-1 shows the number of hectares of potential estimated habitat for each VEC across each route.

Initial recommendations for the alternative transmission line routes sought primarily to avoid any forest sites containing ash trees. However, according to the FRI (Manitoba Conservation 2007) and confirmed by field visits, ash forests occur throughout the Project Study Area. Furthermore, ash in the canopy proved to be an important indicator for the presence of other rare species in field sites visited.

Table 5-1: Area (hectares) of Potential Habitat for Vegetation VECs along the Alternate and Preferred Routes

Route	Bog Club Moss	Hooker's Orchid	Checkered Rattlesnake Plantain	Ash Forests (Ash >10%)
Alternative A	22.42	9.51	18.34	22.88
Alternative B	20.38	10.57	12.35	25.49
Alternative C	26.49	0.19	10.16	25.94
Preferred	16.73	11.75	11.66	31.50

Source: Manitoba Conservation 2007.

Note: Total area in hectares is calculated based on a 70 m buffer width for each route.

Alternative Route A is favoured as it avoids the greatest area of ash/elm forests and it is the second choice to avoid potential habitat for bog club-moss. Alternative Route B is favoured to minimize effects on potential habitat for bog club-moss. It is also the close second choice to avoid habitat for checkered rattlesnake plantain.

Alternative Route C is favoured to minimize effects on checkered rattlesnake plantain and Hooker's orchid habitats. Overall, Route A is slightly preferred.

The alignments to Alternative Route A avoid the location where the Hooker's orchids (VEC species) were found. Route A remains the optimal choice at this point to avoid known and potential areas for VECs' occurrence. The Manigotagan Corner Station Site was surveyed in September. At that time a fern (Sensitive Fern, *Onoclea sensibilis*) listed as S3S4 was identified on the site. This fern is not uncommon and was found at other field sites as well. Finally, an area of special interest for plants, identified during KPIs, is within 100 m of the station site. No other issues for rare plants have been identified at this time.

6 EFFECTS AND MITIGATION

6.1 Overview

The effects assessment followed the methods outlined in Chapter 3 of the EA Report. Table 6-2 provides a summary of the effects assessment.

Based on the site selection process outlined in Chapter 6 of the main EA Report, a Preferred Route was selected based on route comparison using several criteria, including Vegetation Resources (Maps 3 and 4). The Preferred Route is a combination of Routes A, B and C. The Manigotagan Corner Station Site was selected on the basis of engineering and technical criteria. The following effects assessment Section was completed on the Final Preferred Route and Manigotagan Corner Station Site.

Clearing will result in forest being lost. Plants and plant habitats that rely on the forest canopy cover and the microclimate conditions that exist in that environment will also be lost. Clearing will alter habitats and maintenance activities will prevent regeneration of the forest to its current composition. One area of special concern identified in the ATK KPI may be affected by clearing activities.

6.2 Effects Assessment

Trees and forest habitats will be lost and altered due to clearing of the ROW for the Project. As shrubs and trees are removed the ground vegetation will be disturbed and exposed to more sunlight. These conditions will be harmful to plants requiring the microclimates of a shady forest environment and benefit vegetation that thrives in more exposed conditions. During the maintenance phases of the Project, vegetation will regenerate forming altered habitats having shrubs and young trees as the tallest cover components. Non-treed and sparsely treed areas will likely experience little effect if the vegetation ground cover is not disturbed

Mature forests in the Project Area support plants considered rare and uncommon in Manitoba. They also support plants gathered by local Aboriginal peoples. Clearing for the ROW will result in loss of portions of different mature forests. Plants relying on the forest cover in these habitats will be lost

Plants considered valued environmental components (VECs) will be affected. Clearing for the ROW will result in an estimated total of 16.73 ha of potential habitat for bog club moss to be lost (3.4% of total area to be cleared). Hooker's orchid potential habitat loss is estimated at 11.73 ha (2.4% of total area to be cleared) and an estimate of 11.66 ha of potential habitat for checkered rattlesnake plantain will be lost (2.4% of total area to be cleared). Loss of ash forest intersected by the Preferred Route totals 31.50 ha (6.5% of total area to be cleared) (Table 6-1).

Clearing and construction activities may result in further loss and alteration of plant habitats if access trails have to be cleared. Clearing and construction activities can result in associated fuel spills and accidental fires that would be detrimental to vegetation and plant habitats. Equipment and fill materials used in construction phases can often be contaminated by seeds from other work sites in other regions. Movement of such contaminated equipment and fill materials during clearing and construction phases has potential to introduce invasive and non-native plant species in to the area.

Table 6-1: Area (hectares) of Potential Loss of Habitat for Vegetation Valued Environmental Components

Bog Club Moss	Hooker's Orchid	Checkered Rattlesnake Plantain	Ash Forests (Ash >10%)
16.73	11.75	11.66	31.50

Source: Manitoba Conservation 2007.

6.3 Proposed Mitigation Measures and Residual Effects

Proposed Mitigation Measures

Winter construction when the ground is frozen and plants are dormant is preferred to minimize damage to vegetation. In wetlands where tree cover is minimal or absent, heavy equipment can move with little damage to the ground cover. The use of existing trails is encouraged so that no further clearing is required.

Manitoba Hydro's Environmental Protection Program (outlined in Chapter 8 of the main EA Report) provides the framework for implementing, managing, monitoring and evaluating environmental and socioeconomic protection measures. The program describes the creation of an Environmental Protection Plan (EnvPP) specific to this project. The EnvPP is the main implementation tool for achieving effective implementation of mitigation measures and follow-up requirements identified in the environmental assessment. The EnvPP should be prepared with input from all disciplines in advance to define the best practices to be followed for clearing and construction. Protocols should be outlined to avoid accidental spills, fires and the introduction of invasive plants.

Sensitive Sites

Appropriate buffer zones at river and creek crossings should be implemented to protect the aquatic and emergent plants and bank vegetation. Clearing in the adjacent forest should be done on frozen ground conditions using methods that minimize disturbance to ground cover and soils. Construction during the winter when the ground is frozen should help minimize damage to vegetation by heavy equipment. When American elm trees are encountered for clearing, handling and disposal protocols should be followed to avoid the introduction of insects that transmit the fungus that cause Dutch elm disease.

Areas of special concern for plants identified by ATK KPI were avoided by routing where feasible.

Plants of Conservation Concern

Avoidance, or minimally an offset of 30 m should be applied to locations of plants of conservation concern where possible. Known locations of S1 and S2 plants can be located and flagged in pre-construction surveys conducted during the peak of the growing season.

Residual Effects

The clearing of the forest cover for the proposed Pine Falls-Manigotagan 115 kv Transmission Line and the Manigotagan Corner Station will result in a permanent loss of the forest itself and the habitats sustained by the forest. Plant species associated with mature forest cover will be lost, including species of conservation concern and any forest plants gathered and used by Aboriginal peoples.

Vegetation maintenance on the ROW will ensure that a shrub layer is maintained in suitable areas that were previously forested. Open areas created by removing the forest canopy will encourage growth of plants and ground cover species that thrive with more light. Species such as blueberries will likely increase in numbers.

There is potential for invasive plant species to proliferate in areas disturbed by construction and clearing activities.

Table 6-2: Potential Project Effects on Vegetation

Potential Effect	Project Phase	Key Mitigation Measures	Residual Effect	Significance Criteria
Removal of 31.5 ha of Ash forest	Construction	Routing to avoid	Loss of 31.5 ha of Ash forest	• Direction: negative • Magnitude: moderate • Geographic Extent: regional • Duration: long-term • Reversibility: permanent for the life of the project • Frequency: infrequent
Removal of very rare bog club-moss	Construction	Routing to avoid	Loss of 16.73 ha of potential habitat	• Direction: negative • Magnitude: moderate • Geographic Extent: project footprint • Duration: medium-term • Reversibility: permanent for the life of the project • Frequency: sporadic

Table 6-2: Potential Project Effects on Vegetation (continued)

Potential Effect	Project Phase	Key Mitigation Measures	Residual Effect	Significance Criteria
Removal of rare Hooker's orchid	Construction	Routing to avoid	Loss of 11.75 ha of potential habitat	• Direction: negative • Magnitude: moderate • Geographic Extent: local • Duration: medium-term • Reversibility: permanent for the life of the project • Frequency: infrequent
Removal of checkered rattlesnake plantain	Construction (clearing)	Routing to avoid	Loss of 11.66 ha of potential habitat	• Direction: negative • Magnitude: moderate • Geographic Extent: local • Duration: medium-term • Reversibility: permanent for the life of the project • Frequency: infrequent
Removal of ground vegetation	Construction (clearing)	Winter construction when ground is frozen and snow covered	Loss of low shrubs, herbs and mosses Expose bare ground for introduction of invasive and non-native plants	• Direction: negative • Magnitude: moderate • Geographic Extent: project-footprint • Duration: short-term • Reversibility: reversible • Frequency: infrequent
Removal of portions of community plant collecting site	Construction (clearing)	Routing to avoid	Loss of plant resources for community use	• Direction: negative • Magnitude: moderate • Geographic Extent: project-footprint • Duration: medium-term • Reversibility: reversible • Frequency: infrequent
Introduction of invasive plant species	Construction (clearing) Maintenance	Follow protocols for using clean equipment and fill materials as outlined in EnvPP	Loss of native plants due to competition with invasive plants	• Direction: negative • Magnitude: moderate • Geographic Extent: local • Duration: short-term • Reversibility: reversible • Frequency: periodic
Accidental spread of Dutch Elm Disease	Construction (clearing) Maintenance	Follow protocols for cutting and disposal of elm trees as outlined in EnvPP	Loss of elm trees outside Project footprint	• Direction: negative • Magnitude: moderate • Geographic Extent: regional • Duration: long-term • Reversibility: permanent • Frequency: infrequent
Removal of forest cover in drier habitats	Construction Maintenance	No adverse effect	Potential increase in suitable habitat for blueberries	• Direction: positive • Magnitude: moderate • Geographic Extent: project footprint • Duration: long-term • Reversibility: permanent • Frequency: regular

6.4 Interactions with Other Projects

The spatial boundary for the interactions with other projects is the Project Study Area. Potential interactions were determined for adverse residual effects to VECs that have the potential to interact with the effects of other past, current, or future projects and human activities. VECs with no residual effect or a positive residual effect are not included in the assessment. Finally, the assessment only includes adverse residual effects on VECs that overlap both spatially and temporally with the effects of other projects and human activities.

Project and human activities were selected for inclusion in the assessment based on the following criteria:

- Past Projects: Projects within the Project Study Area whose ongoing effects can be reasonably expected to change in the future and, as a result of those changes, interact with this Project's adverse residual effects.
- Current Projects: Projects in construction, development or operation within the Study Area.
- Future Projects: Projects approved for construction/development or in the permitting pipeline within the Study Area.
- Prospective Projects: Projects announced in the Study Area (e.g., wind farms, transmission expansion, government vision statements) but not yet moving along a development or permitting pathway, and any projected changes in land use patterns (e.g., changes in agricultural activity).

Table 6-3 lists the projects that were considered to have a potential interaction with the Project.

Table 6-3: List of Known Projects in the Area, Considered for Assessment of Interactions with the Project

Sector	Project	Description	Location	Status	Timelines
Mining	San Gold Mine Expansion	• Planned expansion of San Gold's Gold Mine and tailings pond in Bissett, northeast of Project Study Area • Production is expected to double	Northeast of Project Study Area	Ongoing	
	Mineral Exploration	• The north end of the Project Study area overlaps with many mining claims and exploration activities (e.g., drill holes) • Mining claims are held by Golden Pocket Resources, DLW Gold Ventures Inc., Canada Bay Resources Ltd., and San Gold Corp.	North of Project Study Area	Ongoing/ Planned	
	Quarry Development	• There are 83 quarry leases within the Project Study Area, several in close proximity to the Project • Lease holders include private companies, as well as Manitoba Infrastructure and Transportation (MIT), and the East Side Road Authority • Development and expansion of existing and new quarries is likely, particularly for projects such as the East Side Road	Within the Project Study Area	Ongoing/ Planned	
Forestry	Timber Resource Harvesting	• Request for Proposal (RFP) to for timber resource harvesting in FML01 by Manitoba Conservation and Water Stewardship (Manitoba Conservation and Water Stewardship [MCWS]) • A potential respondent to the RFP would be a community and forest industry joint venture being spearheaded by the Manitoba Model Forest (Winnipeg River Integrated Wood and Biomass Project) • This would result in an estimated 400 to 450 direct jobs, up to 400,000 m^3 softwood/year and 200,000 m^3 hardwood/year	Within the Project Study Area	Planned	Within 1 – 3 years
Wildlife	Closure of Licensed and Rights Based Moose Hunting	• As of January 26, 2012, all licensed hunting in Game Hunting Area (GHA) 26 is closed • In addition, moose protection zones in areas of heavy moose concentration areas along roads and rivers are closed to hunting for rights-based peoples • Proposed decommissioning of roads by MCWS	GHA 26 within the Project Study Area	Ongoing/ Planned	2012

Table 6-3: List of Known Projects in the Area, Considered for Assessment of Interactions with the Project (continued)

Sector	Project	Description	Location	Status	Timelines
Transportation & Communication Infrastructure	East Side Road Authority	• Construction of a 156 km all season gravel road along the east side of Lake Winnipeg from Provincial Road #304 east of Hollow Water to Berens River First Nation	North of Project Study Area	Ongoing	2010 - 2014
	Fibre Optic Cable	• The San Gold Mine in Bissett, and several community members have expressed an interest in fibre optic cable service in the area	Within and northeast of Project Study Area	Potential	Unknown
Cottage Development	Black River First Nation Cottage Development Initiative	• Expansion of cottage development within the Black River First Nations territory in conjunction with MCWS • Phase I of the project is underway with road development underway for servicing of 50 cottage lots • Future phases are planned for an additional 550 additional cottage lots	Black River First Nation Reserve at the west of the Project Study Area	Ongoing/ Planned	Phase I: underway (year 1 of 5) Phase II:– 5 – 10 years
	Hollow Water First Nation Cottage Development Plans	• Considering cottage development projects with MCWS	Hollow Water First Nation Reserve at the north end of the Project Study Area	Potential	Unknown
	Sagkeeng First Nation Cottage Development Plans	• Considering cottage development projects with MCWS	Sagkeeng First Nation Reserve at the southwest end of the Project Study Area	Potential	Unknown

Of the projects listed in Table 6-3, the following projects will have potential adverse effects to vegetation that overlap both spatially and temporally with the Project.

Table 6-4: Known Projects in the Area, Considered for Assessment of Interactions with the Project Vegetation VECs

Sector	Project	Description	Potential Effect
Forestry	Timber Resource Harvesting	Manitoba Conservation and Water Stewardship (MCWS) planned RFP for timber resource harvesting in FML 01	Loss of mature forest habitat for VEC species
	Winnipeg River Integrated Wood and Biomass Project	??	Loss of mature forest habitat for VEC species
Cottage Development	Black River First Nation Cottage Development Initiative	Expansion of cottage development within the Black River FN territory in conjunction with MCWS is planned for the near future.	Loss of mature forest habitat for VEC species
	Hollow Water First Nation Cottage Development Plans	Considering cottage development projects with MCWS	Loss of mature forest habitat for VEC species
	First Nation Cottage Development Plans	Considering cottage development projects with MCWS	Loss of mature forest habitat for VEC species

As discussed in 6.2 Effects Assessment, removal of certain mature forest stands will reduce the amount of potential habitat for VEC plant species (ash forest, bog club-moss, Hooker's orchid and checkered rattlesnake plantain). Any development projects that remove mature forest cover will add to these effects.

Future timber harvesting will further reduce forests in the area and thus have a detrimental effect on VEC plant species. Quarrying, road construction and cottage developments will also compound these adverse effects depending on the area cleared.

There is potential for other cumulative effects if other projects do not implement appropriate mitigation measures and do not adhere to appropriate environmental protection measures.

6.5 Monitoring and Follow-Up

Sensitive Sites

Locations in the project footprint where plant species of conservation concern (S1 and S2 listed species) have been identified for avoidance (within 30 m) should be revisited annually for a period of three to five years to evaluate project effects. Monitoring for incursion of invasive plant species should be conducted at the same time.

Preferred Route selection occurred after the blooming and growing season for most plants in the Project Study Area including several rare species. Frost had made some species'

identification impossible. Therefore Pre-construction surveys for rare plants and sensitive habitats should be undertaken.

An Environmental Protection Plan should be prepared in advance of project construction.

7 CONCLUSIONS

Settlement, logging, mining and agriculture over many years have altered the vegetation landscape in the Project Study Area. Forest fires have provided continual regeneration and renewal of the forests. As the Project is located in the most southern extent of the boreal forest in Manitoba there are plants and vegetation found that are typical to the southern boreal forest. Field studies and literature surveys have confirmed that species ranked by Manitoba Conservation Data Centre as very rare, rare and uncommon are found in the Project Area. Through KPIs and community meetings, other specialists have confirmed that plants in the Project Study Area are gathered and used by local Aboriginal people. No plant species protected by the *Species at Risk Act*, listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and protected by *The Endangered Species Act* (MBESA 2012) have been found in the area.

Three rare plants and one forest type were chosen as valued environmental components because of their potential to be adversely affected by the Project. The evaluation of alternate routes and infrastructure location selection focused on the effects of removing their potential forest habitats. For the Preferred Route forest clearing calculated for a 70 m ROW results in estimated losses of potential habitat for the very rare bog club moss (16.73 ha {3.4% of total area to be cleared}) and the rare Hooker's orchid (11.73 ha {2.4% of total area to be cleared}) and checkered rattlesnake plantain (11.66 ha {2.4% of total area to be cleared}). Ash forests were found to support other uncommon tree and plant species. The total area of ash forest to be affected is estimated at 31.5 ha (6.5% of total area to be cleared).

Construction, clearing and maintenance activities have potential to cause damage to vegetation by:

- clearing of additional vegetation for access trails during construction;
- causing accidental spills;
- causing accidental forest fires;
- causing the loss of elm trees outside the Project footprint by the accidental spread of Dutch Elm Disease.
- introducing invasive and non-native plants through the use of contaminated equipment and fill materials.

Mitigation measures for clearing, construction and maintenance are suggested including: (1) avoiding or minimizing disturbance to existing VEC locations (e.g., ash forests), sensitive sites and sites of special interest (ATK KPI); (2) using winter construction phases, when many plants are dormant and ground is frozen and protected by snow; (3) following established protocols to leave riparian buffer zones when clearing; (4) and minimizing weed seed introduction on construction equipment and fill materials.

The effects of the Project on vegetation are confined to the footprint area and the negative effects of the loss of forested habitat will be permanent for the life of the Project. The loss of habitat for very rare, rare and uncommon plants is estimated to be small.

Pre-construction surveys for sensitive sites are recommended. The development of a multi-discipline Environmental Protection Plan (EnvPP) is proposed. Monitoring to assess the effectiveness of mitigation measures and the adherence to the EnvPP are also recommended.

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9 GLOSSARY

buffer The area immediately surrounding an area of interest, often imposed to surround or protect an area.

COSEWIC Committee on the Status of Endangered Wildlife in Canada.

cover type A parameter in the FRI, it is a measure of vegetation community attributes within a polygon, including dominant tree cover composition, site, age class, and height class.

crown closure The degree to which the canopy of trees shades the ground of an area, generally measured as the percentage of cover.

endangered MBESA status category. A species indigenous to Manitoba, which is threatened with imminent extinction or with extirpation throughout all or a significant portion of its Manitoba range.

extirpated MBESA status category. A species formerly indigenous to Manitoba, which no longer exists in the wild.

flora A list of plants of a specific area.

floristic survey A survey that identifies all plant species that occur in an area.

forest edge effects The measureable environmental changes when a new edge is created within a forest The alteration to structure and composition of vegetation is generally caused by changes to the microclimate.

FRI The provincial digital Forest Resource Inventory is a collection of attributes describing vegetation across the landscape interpreted from aerial photography.

GIS Geographical Information System.

GPS Global Position System. Garmin GPSMap 60 CSx was used for this study.

MBESA The Manitoba Endangered Species Act.

microclimate The levels of temperature, humidity, light and wind that occur at a site.

MMMN The herbarium at the Manitoba Museum of Nature.

peatlands A term describing all types of peat-covered terrain including bogs, swamps and fens.

polygon An irregularly shaped area used in an FRI to describe the boundaries of a vegetation community.

random meander The random meander survey covers areas that appear likely to have rare taxa, based on habitat and the judgment of the investigator.

ROW The right-of-way

S-ranks The conservation status ranks given to all plants in the provincial to describe their frequency of occurrence and security within their range. The status of all species in Manitoba is monitored and updated by the Manitoba Conservation Data Centre, in conjunction with other Data Centres across Canada.

site class	A parameter in the FRI, it is a measure of the moisture characteristics at a site, based on soil type, depth, topography and vegetation cover.
target survey	A plant survey that is meant to search only for species that have already been reported in the area.
taxa	Any taxonomic units within a classification system.
threatened	MBESA status category. A species indigenous to Manitoba, which is likely to become endangered; or is, because of low or declining numbers in Manitoba, particularly at risk if the factors affecting its vulnerability do not become reversed.
understory	The assemblage of woody and herbaceous plants that make up the vegetation found between 0 cm (ground level) to 50 cm tall.
vascular	Having tissues that transport water, sap and nutrients – refers to flowering plants not mosses, lichens and algae.
vegetation community	An area with more or less homogeneous environmental conditions of soils, dominant tree cover, shrub structure and herbaceous plants.
vulnerable	COSEWIC status category. A species of special concern because of characteristics that make it particularly sensitive to human activities

Lake Winnipeg East System Improvement Transmission Project

Project Infrastructure

- Manigotagan Corner Station
- Alternative Route A
- Alternative Route B
- Alternative Route C

Infrastructure

- Generating Station
- Electrical Station

Landbase

- Community
- Provincial Highway
- Provincial Road
- Local Road
- Protected Area
- Town
- First Nation
- Watercourse
- Waterbody
- Provincial Park
- Wildlife Management Area
- Study Area

Lake Winnipeg
Black Island
Hecla/Grindstone Provincial Park
Aghaming
Seymourville
Rice River Road
Hollow Water First Nation
Wanipigow River
Manigotagan
Observation Point Wildlife Management Area
304
Manigotagan River
Manigotagan River Provincial Park
Duncan Creek
Alternative Route C
Alternative Route B
Alternative Route A
Sandy River
Black River
O'Hanly River
Black River First Nation
Elk Island Provincial Park
504
Victoria Beach
Traverse Bay
59
11
Bélair
Grand Beach Provincial Park
Catfish Creek Wildlife Management Area
Sagkeeng First Nation
Fort Alexander
Winnipeg River
Powerview-Pine Falls
Pine Falls G.S. & Transmission Station
Broadlands Road
St-Georges

INSET B
Scale 1:100,000

Hollow Water First Nation
Rice River Road
Wanipigow River
304
F
Manigotagan Corner Station
E
Manigotagan
Manigotagan River

INSET A
Scale 1:75,000

304
Broadlands Road
Powerview-Pine Falls
E
Pine Falls G.S. & Transmission Station
11

Calyx Consulting

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN
Date Created:December 03, 2012

N

0 6 12 Kilometres
0 4 8 Miles
1:200,000

Project Study Area

Map 1

Lake Winnipeg East System Improvement Transmission Project

Project Infrastructure

- Manigotagan Corner Station
- Final Preferred Route (PQ95)
- Alternative Route A
- Alternative Route B
- Alternative Route C

Infrastructure

- Generating Station
- Electrical Station
- 66 kV SubTransmission Line

Vegetation Sampling Site

- June 2012 Survey
- September 2012 Survey

Landbase

- Community
- Provincial Highway
- Provincial Road
- Local Road
- Town
- First Nation
- Watercourse
- Waterbody
- Provincial Park
- Wildlife Management Area
- Study Area

Black Island
Hecla/Grindstone Provincial Park
Lake Winnipeg
Aghaming
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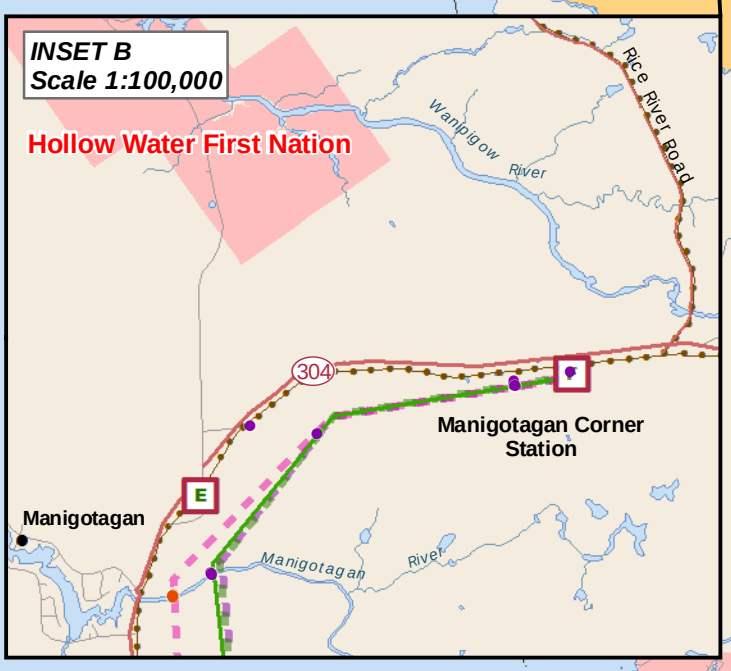
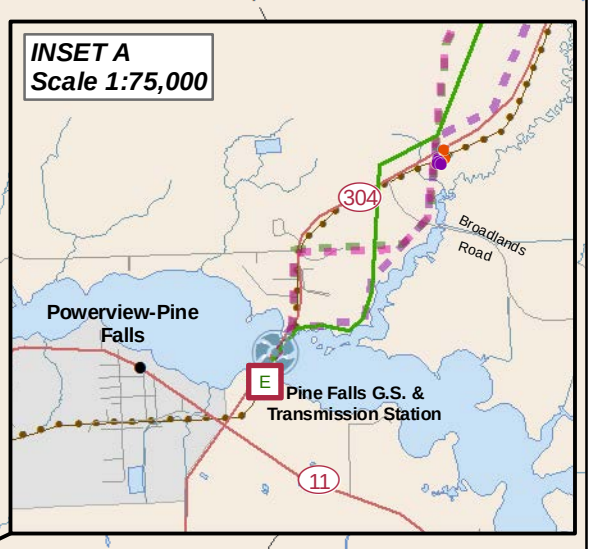
304
Observation Point Wildlife Management Area
Manigotagan River
Manigotagan River Provincial Park
Duncan Creek
Alternative Route C
Alternative Route B
Alternative Route A
Final Preferred Route
Sandy River
Black River
O'Hanly River
Black River First Nation
Elk Island Provincial Park
504
Victoria Beach
Traverse Bay
59
Sagkeeng First Nation
11
Fort Alexander
Winnipeg River
Bélair
Catfish Creek Wildlife Management Area
Grand Beach Provincial Park
Powerview-Pine Falls
Pine Falls G.S. & Transmission Station
Broadlands Road
St-Georges

INSET B
Scale 1:100,000



INSET A
Scale 1:75,000



Calyx Consulting

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN, CALYX
Date Created: December 03, 2012

0 6 12 Kilometres
0 4 8 Miles
1:200,000

N

Vegetation Sampling Sites

Map 2

Lake Winnipeg East System Improvement Transmission Project

Project Infrastructure
- Manigotagan Corner Station
- Final Preferred Route (PQ95)
- Alternative Route A
- Alternative Route B
- Alternative Route C

Infrastructure
- Generating Station
- Electrical Station
- 66 kV SubTransmission Line

Rare Plant Observation
- Ash Forest and Ash/Elm Forest VEC
- Hooker's Orchid VEC

Landbase
- Community
- Provincial Highway
- Provincial Road
- Local Road
- Town
- First Nation
- Watercourse
- Waterbody
- Provincial Park
- Wildlife Management Area
- Study Area

Black Island
Hecla/Grindstone Provincial Park
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Catfish Creek Wildlife Management Area
Fort Alexander
Winnipeg River
Sagkeeng First Nation
Powerview-Pine Falls
Pine Falls G.S. & Transmission Station
Broadlands Road
St-Georges
Alternative Route C
Alternative Route B
Alternative Route A
Final Preferred Route
304
504
59
11
E
F

INSET B
Scale 1:100,000

Hollow Water First Nation
Rice River Road
Wanipigow River
Manigotagan Corner Station
Manigotagan
Manigotagan River

INSET A
Scale 1:75,000

Powerview-Pine Falls
Pine Falls G.S. & Transmission Station
Broadlands Road

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN, CALYX
Date Created: December 03, 2012

0 6 12 Kilometres
0 4 8 Miles
1:200,000

N

Calyx Consulting

Location of Valued Environmental Components (VECs), Vegetation

Map 3

Lake Winnipeg East System Improvement Transmission Project

Project Infrastructure

- Manigotagan Corner Station
- Final Preferred Route (PQ95)
- Alternative Route A
- Alternative Route B
- Alternative Route C

Infrastructure

- Generating Station
- Electrical Station
- 66 kV SubTransmission Line

Rare Plant Location

- S2 and S3 Ranked Plant

Landbase

- Community
- Provincial Highway
- Provincial Road
- Local Road
- Town
- First Nation
- Watercourse
- Waterbody
- Provincial Park
- Wildlife Management Area
- Study Area

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Grand Beach Provincial Park
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Pine Falls G.S. & Transmission Station
Broadlands Road
St-Georges

INSET B
Scale 1:100,000

Hollow Water First Nation
Wanipigow River
Rice River Road
304
Manigotagan Corner Station
Manigotagan
Manigotagan River

INSET A
Scale 1:75,000

304
Broadlands Road
Powerview-Pine Falls
Pine Falls G.S. & Transmission Station
11

Calyx Consulting

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN, CALYX,
Date Created: December 03, 2012

0 6 12 Kilometres
0 4 8 Miles
1:200,000

N

Location of Rare and Uncommon Plant Species of Concern

Map 4

Appendix A Manitoba Conservation Data Centre Definitions of the conservation status ranks (S-ranks) for plant species.

Definitions of the conservation status ranks (S-ranks) for plant species.
Rank
Definition
Occurrences

- S1
  - Very rare throughout its range or in the province. May be especially vulnerable to extirpation.
  - 5 or fewer, or very few remaining individuals
- S2
  - Rare throughout its range or in the province. May be vulnerable to extirpation.
  - 6 to 20 occurrences
- S3
  - Uncommon throughout its range or in the province.
  - 21 to 100 occurrences
- S4
  - Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern.
  - >100 occurrences
- S5
  - Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially impossible to eradicate under present conditions.

Source: Manitoba Conservation Data Centre 2012.

Appendix B Summary of Field Data Collected

Appendix B Summary of all Vascular Plants Observed in Vegetation Sampling Sites in the Project Study Area

FAMILY/Species	Common Name	Site Name
EQUISETACEAE	**HORSETAIL FAMILY**	
Equisetum arvense	Common Horsetail	6, 45, 47, 76, 78, 80, 319, 325, ST24F
Equisetum fluviatile	Swamp Horsetail	ST25
Equisetum hyemale	Common Scouring-rush	6
Equisetum pratense	Meadow Horsetail	47, 76, 80, 319
Equisetum scirpoides	Dwarf Scouring-rush	ST25, ST25F
Equisetum sylvaticum	Wood Horsetail	44, 45, 47, 74, 76, 319
LYCOPODIACEAE	**CLUB-MOSS FAMILY**	
Lycopodium annotinum	Stiff Club-moss	327
Lycopodium clavatum	Running-pine	42, 171
Lycopodium clavatum var. clavatum	Running-pine	72, 171
Lycopodium obscurum	Ground-pine	72, 171
OPHIOGLOSSACEAE	**ADDER'S TONGUE FAMILY**	
Botrychium virginianum	Common Grape-fern	78
POLYPODIACEAE	**POLYPODY FAMILY**	
Polypodium virginianum	Parsley Fern	42, 45, 312
DRYOPTERIDACEAE	**WOOD FERN FAMILY**	
Athyrium felix-femina	Lady Fern	6,38
Matteuccia struthiopteris	Ostrich Fern	6
Onoclea sensibilis	Sensitive Fern	4, ST24B
Woodsia ilvensis	Rusty Woodsia	40, 42
Fern	Unknown Fern	13, 149
DENNSTAEDTIACEAE	**BRACKEN FAMILY**	
Pteridium aquilinum	Bracken	4, 45, 72, 74, 78, 80, 327, ST25F
PINACEAE	**PINE FAMILY**	
Abies balsamea	Balsam Fir	14, 42, 45, 72, 76, 149, 151, 171, 312, 325, ST22, ST25, ST25F
Larix laricina	Tamarack	4, 72, 149
Picea glauca	White Spruce	38, 42, 44, 45, 76, 80
Picea mariana	Black Spruce	72, 149, 171, 312, 319, 325
Pinus banksiana	Jack Pine	4, 42, 45, 47, 312, 319, ST22
TYPHACEAE	**CAT-TAIL FAMILY**	
Typha angustifolia	Narrow-leaved Cat-tail	47
Typha spp.	Unknown Cat-tail	42, 44, ST25
ALISMATACEAE	**ARROWHEAD FAMILY**	
Sagittaria latifolia	Water Plantain	ST24B
Sagittaria rigida	Northern Arrowhead	ST24B
POACEAE	**GRASS FAMILY**	

FAMILY/Species	Common Name	Site Name
Agrostis scabra	Ticklegrass	72
Agrostis stolonifera	Creeping Bent	ST24B
Bromus ciliatus	Fringed Brome	42, 44, 47, 319
Calamagrostis canadensis	Canada Reed Grass	ST25, 4, 47, 74, 76, 78, 319, 327
Cinna latifolia	Slender Wood-reed Grass	80, 38, 40, 44, 74, 78, 171, ST24F
Elymus virginicus	Virginia Wild Rye	6
Oryzopsis asperifolia	Rice Grass	6, 38, 40, 42, 45, 47, 78, 149, 151, 312, 319, 325, 327, ST25F
Piptatherum pungens	Sharp Piptatherum	42
Panicum capillare	Panic Grass	42
Phragmites australis	Common Reed	ST25
Poa palustris	Fowl Bluegrass	80
Poa sp.	Unknown Bluegrass	38, 40, 76
Schizachne purpurascens	False Melic	40, 42, 45
Sporobolus cryptandrus	Sand Dropseed	42, 312
Grass	Unknown Grass	312, ST24F
CYPERACEAE	**SEDGE FAMILY**	
Carex atherodes	Awned edge	42, 44
Carex canescens	Grey Sedge	74
Carex capillaris	Hair-like Sedge	78, 80
Carex deweyana	Dewey's Sedge	80
Carex gracillima	Slender Sedge	6, 78, 80
Carex intumescens	Swollen Sedge	80, 6, 13, 72, ST22
Carex inops Carex pennsylvanica	Sun-loving Sedge	80, ST25, ST25F
Carex retrorsa	Turned Sedge	ST24B
Carex rostrata	Beaked Sedge	38, 74
Carex sartwellii	Sartwell's Sedge	38
Carex trisperma	Three-seeded Sedge	80, 76
Carex spp.	Unknown Sedges	6, 72, 149, 151, 312, ST22, ST24F
Carex sp. *A*	Sedge sp. A	80
Carex sp. *B*	Sedge sp. B	6, ST24B

FAMILY/Species	Common Name	Site Name
Schoenoplectus tabernaemontani	Soft-stem Bulrush	ST25
Scirpus sp.	Unknown bulrush	319
ACORACEAE	**SWEET-FLAG FAMILY**	
Acorus americanus	Sweet Flag	ST24B, ST25
LEMNACEAE	**DUCKWEED FAMILY**	
Spirodela polyrrhiza	Water-flaxseed	ST25
JUNCACEAE	**RUSH FAMILY**	
Luzula multiflora	Wood-rush	78, 80
LILIACEAE	**LILY FAMILY**	
Allium cernuum	Nodding Onion	40
Clintonia boreale	Blue Bead-lily	4, 14, 38, 42, 45, 47, 72, 151, 312, 319, 325, 327, ST25, ST25F
Maianthemum canadense	Canada May Flower	6, 38, 42, 45, 47, 76, 78, 80, 151, 312, 319, 325, 327, ST25
Maianthemum stellatum	Solomon's Seal	6, 78, 151
Maianthemum trifolium	Three-leaved Solomon's Seal	6, 76
Streptopus lanceolatus	Twisted Stalk	38, 45, 78, 80
Trillium cernuum	Nodding Trillium	78, 80
SMILACACEAE	**CATBRIER FAMILY**	
Smilax lasioneura	Carrion Vine	38
IRIDACEAE	**IRIS FAMILY**	
Iris versicolor	Blue Flag	171, ST24B, ST24F
ORCHIDACEAE	**ORCHID FAMILY**	
Coeloglossom viride	Long-bracted Orchid	45
Platanthera hookeri	Hooker's Orchid	45
Orchid	Unknown Orchid	171
SALICACEAE	**WILLOW FAMILY**	
Populus balsamifera	Balsam Poplar	38, 42, 78, 80, ST24F
Populus tremuloides	Trembling Aspen	4, 6, 38, 42, 45, 47, 72, 74, 78, 80, 149, 151, 171, 312, 319, 325, 327, ST22, ST25, ST25F
Salix bebbiana	Beaked Willow	4, 42, 47, 72, 74, 312, ST25
Salix planifolia	Tea-leaved Willow	47, 74
Salix spp.	Unknown Willows	6, 44, 47, 72, 76, 319, 327
BETULACEAE	**BIRCH FAMILY**	
Alnus incana spp. rugosa	Speckled Alder	4, 42, 44, 47, 319
Alnus viridis	Green Alder	72, 325, 327
Betula papyrifera	White Birch	42, 44, 45, 47, 72, 74, 76, 149, 151, 171, 312, 319, 325, 327, ST22, ST25
Corylus cornuta	Beaked Hazelnut	6, 38, 45, 78, 80, 149, 151, 312, 319, 325, 327, ST22, ST25, ST25F
Corylus cornuta	Beaked Hazelnut	6, 38, 45, 78, 80, 149, 151, 312, 319, 325, 327, ST22, ST25, ST25F

FAMILY/Species	Common Name	Site Name
FAGACEAE	**BEECH FAMILY**	
Quercus macrocarpa	Bur Oak	6, 14, 38, 78, 80, ST22
ULMACEAE	**ELM FAMILY**	
Ulmus americana	American Elm	6, 78, 80
URTICACEAE	**NETTLE FAMILY**	
Urtica dioica	Stinging Nettle	74
SANTALACEAE	**SANDALWOOD FAMILY**	
Comandra umbellata	Bastard Toadflax	45, 47, 327
POLYGONACEAE	**BUCKWHEAT FAMILY**	
Polygonum amphibium	Water Smartweed	38, ST25
Polygonum convolvulus	Black Bindweed	38, 44, ST22
CARYOPHYLLACEAE	**PINK FAMILY**	
Stellaria calycantha	Northern Starwort	40
Stellaria longifolia	Long-leaved Stitchwort	74
Stellaria sp.	Unknown Chickweed	78
RANUNCULACEAE	**CROWFOOT FAMILY**	
Actaea rubra	Red Baneberry	151, 6, 44, 72, 78, 319, ST25, ST25F
Anemone sp.	Unknown Anemone	ST22, 6, 38, 47
Anenome canadensis	Canada Anemone	38
Aquilegia canadensis	Wild Columbine	40, 42, 45, 47, 78, 80
Caltha palustris	Marsh Marigold	44, 80
Coptis trifolia	Goldthread	327
Ranunculus sp.	Unknown Buttercup	38
Thalictrum dasycarpum	Tall Meadow-rue	78, 80
Thalictrum venulosum	Veiny Meadow-rue	6, 149, ST22
Thalictrum sp.	Unknown meadow-rue	38, 40, 42, 45, 151, 325
FUMARIACEAE	**FUMATORY FAMILY**	
Corydalis sempervirens	Pink Corydalis	42
BRASSICACEAE	**MUSTARD FAMILY**	
Arabis sp.	Unknown Rock Cress	40
Mustard	Unknown Mustard	38
GROSSULARIACEAE	**CURRANT FAMILY**	
Ribes americanum	Wild Black Currant	78, 80
Ribes hudsonianum	Northern Wild Black Currant	319
Ribes oxyacanthoides	Bristly Wild Gooseberry	40, 42, 45, 47, 74
Ribes triste	Wild Red Currant	38, 42, 45, 74, 76, 80, 149, 319
SAXIFRAGACEAE	**SAXIFRAGE FAMILY**	
Heuchera richardsonii	Alumroot	40
Mitella nuda	Mitrewort	45, 76, 151, ST22
ROSACEAE	**ROSE FAMILY**	
Amelanchier alnifolia	Saskatoon	4, 38, 40, 42, 47, 149, 312, 325, ST24F,

FAMILY/Species	Common Name	Site Name
		ST25
Crataegus chrysocarpa	Round-leaved Hawthorn	38, ST25
Fragaria virginiana	Smooth Wild Strawberry	6, 38, 40, 42, 45, 47, 78, 80, 151, 312, 319, 327, ST22, ST25, ST25F
Geum aleppicum	Yellow Avens	80
Prunus pennsylvanica	Pin Cherry	72, 312, 325, 327, ST25
Prunus virginiana	Choke Cherry	40, 42, 78, 80, 151, ST25
Prunus sp.	Unknown Cherry	38
Rosa spp.	Unknown Rose	6, 38, 40, 42, 45, 47, 72, 76, 149, 319, 325, 327, ST25
Rubus arcticus ssp. acaulis	Stemless Raspberry	4, 38, 45, 74, 76, 149, 151, 319, 325, 327, ST22, ST25F
Rubus idaeus	Wild Red Raspberry	38, 42, 45, 47, 72, 74, 80, 171, 312, 319, 325, 327, ST22
Rubus pubescens	Dewberry	45, 47, 76, 80, 149, 151, 319
Sibbaldiopsis tridentate	Three-toothed Cinquefoil	42, 45
Sorbus decora	Mountain-ash	42
Spiraea alba	Meadowsweet	6, 38, 74, ST25
FABACEAE	**PEA FAMILY**	
Lathyrus ochroleucus	Pale Vetchling	42, 47, 74, 78
Lathyrus venosus	Wild Peavine	38, 40, ST22
Trifolium hybridum	Alsike Clover	42
Trifolium pretense	Red Clover	42, 78
Trifolium sp.	Unknown Clover	312
Vicia americana	Common Vetch	42, 47, 312, 319, ST22
GERANIACEAE	**CRANESBILL FAMILY**	
Geranium bicknellii	Bicknell's Geranium	42
ANACARDIACEAE	**SUMAC FAMILY**	
Rhus glabra	Smooth Sumac	40
Toxicodendron rydbergii	Poison-ivy	38, ST22
ACERACEAE	**MAPLE FAMILY**	
Acer negundo	Manitoba Maple	14, 78
Acer spicatum	Mountain Maple	6, 13, 14, 78, ST25, ST25F
BALSAMINACEAE	**TOUCH-ME-NOT FAMILY**	
Impatiens sp.	Unknown Touch-me-not	44, 74
RHAMNACEAE	**BUCKTHORN FAMILY**	
Rhamnus alnifolia	Alder-leaved Buckthorn	6, 38, 74, 78
VIOLACEAE	**VIOLA FAMILY**	
Viola spp.	Unknown Violets	38, 40, 45, 78
ONAGRACEAE	**EVENING PRIMROSE FAMILY**	
Chamerion angustifolium	Fireweed	4, 42, 47, 74, 171, 319
Circaea alpina	Small Enchanter's-nightshade	45, 74, 80

FAMILY/Species	Common Name	Site Name
ARALIACEAE	**GINSENG FAMILY**	
Aralia hispida	Bristly Sarsaparilla	40
Aralia nudicaulis	Wild Sarsaparilla	6, 38, 40, 42, 44, 45, 47, 74, 76, 78, 80, 149, 151, 325, 327, ST25, ST25F
APIACEAE	**CARROT FAMILY**	
Osmorhiza longistylis	Sweet Cicely	6, 78
Sanicula marilandica	Seneca Snakeroot	6, 38, 78, 80, 149, 151, ST25, ST25F
Sium suave	Water Parsnip	ST24B, ST25
CORNACEAE	**DOGWOOD FAMILY**	
Cornus canadensis	Bunchberry	4, 38, 42, 45, 47, 72, 151, 171, 319, 325, 327, ST22, ST25, ST25F
Cornus sericea	Red Osier Dogwood	4, 38, 45, 47, 74, 78, 80, 312, 319, ST22
PYROLACEAE	**PYROLA FAMILY**	
Chimaphila umbellata	Prince's-pine	45
Moneses uniflora	One-flowered Pyrola	76
Orthilia secunda	One-sided Pyrola	45, 76, 149, 151
Pyrola asarifolia	Pink Pyrola	45, 78, 149
Pyrola spp.	Unknown Wintergreen	6, 38, 151, 325, ST25, ST25F
ERICACEAE	**HEATH FAMILY**	
Arctostaphylos uva-ursi	Bearberry	42, 45
Gaultheria hispidula	Creeping Snowberry	72
Gaultheria procumbens	Teaberry	40
Rhododendron groenlandicum	Labrador-tea	4, 319, 327
Vaccinium angustifolium	Low Sweet Blueberry	72
Vaccinium caespitosum	Dwarf Blueberry	325
Vaccinium myrtilloides	Velvet-leaf Blueberry	4, 42, 45, 47, 72, 312, 325, 327
Vaccinium vitis-idaea	Dry-ground Cranberry	72, 171
PRIMULACEAE	**PRIMROSE FAMILY**	
Lysimachia ciliata	Fringed Loosestrife	6, 38, 78, ST24F
Trientalis borealis	Northern Starflower	6, 14, 42, 44, 45, 76, 149, 151, 327
OLEACEAE	**OLIVE FAMILY**	
Fraxinus nigra	Black Ash	6, 13, 14, ST22, ST24B, ST24F
Fraxinus pennsylvanica	Green Ash	6, 13, 74, 78, 151, ST22, ST24B, ST24F
Fraxinus spp.	Ash	38, 45, 74, 80, 149
APOCYNACEAE	**DOGBANE FAMILY**	
Apocynum sp.	Unknown Dogbane	ST22, 6, 38, 74
BORAGINACEAE	**BORAGE FAMILY**	
Mertensia paniculata	Tall Lungwort	45, 78, 319
LAMIACEAE	**MINT FAMILY**	
Agastache foeniculum	Blue Giant Hyssop	40

FAMILY/Species	Common Name	Site Name
Lycopus americanus	Water Hore-hound	76
Lycopus sp.	Unknown Hore-hound	6, 38
Mentha arvensis	Common Mint	6
Stachys palustris	Marsh Hedge-nettle	44
SCROPHULARIACEAE	**FIGWORT FAMILY**	
Melampyrum lineare	Cow-wheat	42
LENTIBULARIACEAE	**BLADDERWORT FAMILY**	
Utricularia sp.	Unknown bladderwort	74
RUBIACEAE		
Galium boreale	Northern Bedstraw	6, 38, 40, 42, 45, 47, 78, 319, ST22
Galium triflorum	Sweet-scented Bedstraw	6, 42, 44, 45, 47, 74, 76, 78, 80, 151, 325
CAPRIFOLIACEAE	**HONEYSUCKLE FAMILY**	
Diervilla lonicera	Bush-honeysuckle	38, 40, 42, 45, 47, 72, 151, 312, 319, 325, 327, ST22, ST25F
Linnaea borealis	Twinflower	42, 45, 72, 76, 151, 319
Lonicera involucrata	Black Twinberry	38, 47
Lonicera sp.	Unknown Honeysuckle	80
Symphoricarpos albus	Snowberry	6, 14, 38, 40, 42, 47, 78, 149, 151
Viburnum opulus	Highbush-cranberry	6, 13, 45, 78, 80, 151, ST24F
Viburnum rafinesquianum	Downy Arrow-wood	38, 47, 151, 325
CAMPANULACEAE	**HAREBELL FAMILY**	
Campanula rotundifolia	Bluebell	40
ARISTOLOCHIACEAE	**BIRTHWORT FAMILY**	
Asarum canadense	Wild Ginger	6, 78
ASTERACEAE	**ASTER FAMILY**	
Achillia millefolium	Yarrow	38, 40, 42, 45, 47
Antennaria spp.	Unknown Pussytoes	42
Cirsium arvense	Canada Thistle	42, 74, 319, ST22, ST24F
Cirsium undulatum	Pasture Thistle	44
Doellingeria umbellata	Flat-topped White Aster	6, 319
Lactuca sp.	Unknown Lettuce	44
Petasites frigidus var. palmatus	Palmate-leaved Colt's-foot	4, 14, 38, 44, 45, 47, 72, 74, 149, 319, 325
Petasites frigidus var. sagittatus	Arrow-leaved Colt's-foot	38, 78, 80, 325
Sonchus arvensis	Field Sow-thistle	76
Symphyotrichum ciliolatum	Lindley's Aster	4, 6, 42, 47, 78, 149, 151, 312, 319, 325, 327, ST25, ST25F
Symphyotrichum leave	Smooth Aster	38, 40, 42
Symphyotrichum novae-angliae	New England Aster	319, 325
Taraxacum officinale	Common Dandelion	6, 38, 40, 42, 47, 74, 78, 80