SECTION 3

TERRESTRIAL PLANTS

KEEYASK
Hydropower Limited Partnership

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3.0 TERRESTRIAL PLANTS

This section of the Terrestrial Environment Supporting Volume (TE SV) presents the assessment of Project **effect**s on **terrestrial plants** using the approach described in Section 1.1.

The terrestrial plants section begins with an overview of terrestrial plants in the Project area. **Key topic**s, which consist of **valued environmental component**s (VECs) and **supporting topic**s, were used to focus the plants assessment (Section 1.1). **Priority plant**s was the VEC while **invasive plant**s was the supporting topic for terrestrial plants. These two key topic sections are organized as follows:

- describe the methods and information sources used to conduct the assessment;
- describe the existing environment including historical conditions, current conditions and current trends;
- predict and assess potential Project effects before mitigation, including consideration of other past and existing developments and activities;
- identify credible mitigation measures where potential effects are greater than desired;
- assess residual Project effects after mitigation, including consideration of other past and existing developments and activities;
- evaluate the uncertainty of Project effects predictions; and
- describe monitoring and follow-up measures.

The residual effects assessment includes consideration of the combined effects of past developments and activities. The **cumulative effect**s of the Project combined with reasonably foreseeable future developments and activities are evaluated in Section 3.5. Section 3.5.3 evaluates the sensitivity of Project effects predictions to future climate change.

3.1 INTRODUCTION

3.1.1 Key Topics

Terrestrial plants perform key functions in Keeyask **ecosystem**s. Among other things, they provide food and shelter for wildlife, contribute to soil development, store carbon and ultimately are the source for most life because they convert solar energy to plant tissue. Some terrestrial plant species are particularly important for ecological reasons (*e.g.*, rare species) and/or social reasons (*e.g.*, food and cultural importance to Keeyask Cree Nations). For this reason, some EISs include rare plants (*e.g.* Mackenzie Gas Project 2004; Encana Corporation 2007) as a **valued ecosystem component** (VEC).

In contrast with plants that play particularly important roles in maintaining healthy ecosystems, invasive non-native plants are considered a threat to other plant species and to ecosystems because they can crowd out native species and alter ecosystems in some circumstances. The Invasive Species Council of

Manitoba (ISCM) defines **invasive plant** species as plants "that are growing outside of their country or region of origin and are out-competing or even replacing native organisms" (ISCM 2012).This definition is sufficiently broad to capture invasive plants that are native to Canada but not typically found in a region of interest.

Human activities are a major contributor to the introduction and/or spreading of invasive plants (White *et al.* 1993, ISCM 2012). Invasive plants may also spread through prolific seed dispersal by water (White *et al.* 1993), wind, birds or other animals (Richardson and Rejmanek 2011) or through changes in hydrologic regimes which favour establishment in new areas (Barnes 1999).

Invasive plants was selected as a supporting topic because they can be an important influence on other plants and ecosystems under certain conditions. Appendix 1A Table 1A-1 provides additional details explaining why invasive plants was selected as a supporting topic.

Priority plants was selected as a VEC to assesses how the Project is expected to affect plant species that particularly important for ecological and/or social reasons. Appendix 1A Table 1A-1 provides additional details explaining why priority plants was selected as a VEC.

3.1.2 Plant Processes and Drivers

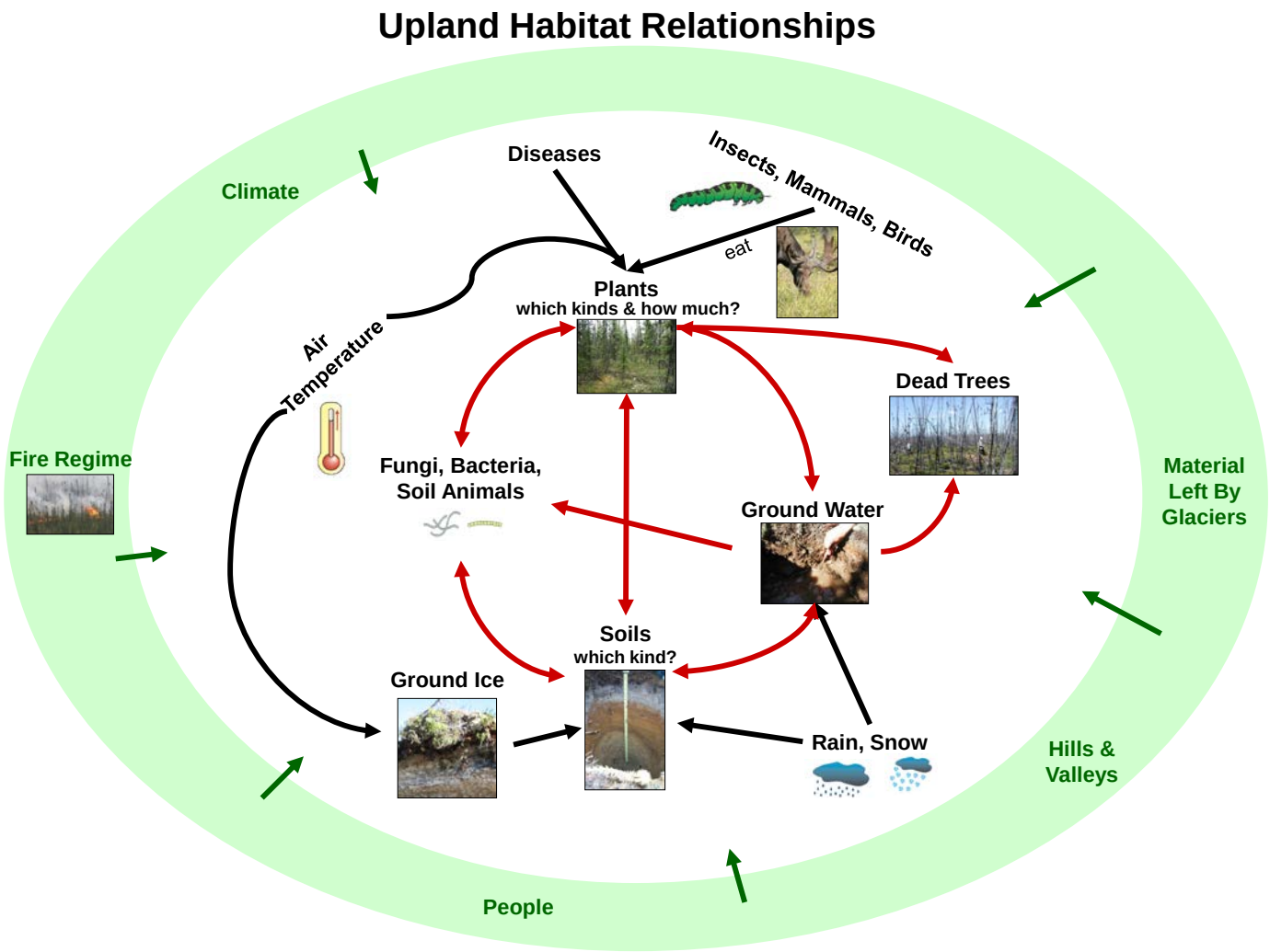
An ecosystem-based approach was used to understand the terrestrial environment and to evaluate the potential effects of the Project on it (Section 1.1). The ecosystem-based approach recognized that the Keeyask region terrestrial ecosystem (Section 1.3.5) is a complex, hierarchically organized system in which changes to one component directly and/or indirectly affect many other components (*i.e.*, elements, patterns, linkages, processes and functions). A key element of the ecosystem-based approach was identifying linkages between components of Keeyask ecosystems at multiple levels.

Figure 3-1 shows a portion of the web of relationships that exist between plants and soils in a stand level ecosystem, illustrating how a change in one ecosystem component can be transferred throughout the web of ecosystem relationships. These patterns and relationships are constrained by climate, fire regime, material left by glaciers and glacial lakes, topography and people (see green outer ring in figure), which are themselves patterns and processes that are produced at higher ecosystem levels such as the biome or biosphere (Section 1.1). Figure 3-2 provides a more detailed perspective on ecosystem linkages through a network linkage diagram for the potential effects of vegetation clearing on plants.

In Canada's boreal shield ecozone (Ecological Stratification Working Group 1996), site type, age, disturbance type and pre-disturbance conditions are typically the strongest influences on boreal plant species distribution and abundance at the landscape or regional levels over periods of less than a century, with site conditions often exerting the strongest influence (see Ehnes 1998 for a literature review and results from the Manitoba boreal shield). The strongest site related distinctions generally occur at the extremes of the moisture regime gradient, which are typically represented at the very dry extreme by outcrops or gravelly ridges and at the very wet extreme by riparian peatlands or shallow surface water.

Historically, wildfire has been the dominant driver for plant community change on a particular site type. Boreal plant species are well adapted to regenerate from the individuals that were there when the fire occurred and this imparts inherent resistance and resilience to fire at the plant community level (Rowe

1983; Payette 1992; Ehnes 1998]). Boreal post-fire vegetation dynamics generally involve immediate regeneration of the **vascular plant**s that were present prior to the fire, the rapid growth and demise of post-fire thrivers (*e.g.*, green-tongue liverwort (*Marchantia polymorpha*), Bicknell's geranium (*Geranium bicknellii*), fireweed (*Chamerion angustifolium*)) and gradual changes in the moss and lichen community (Ehnes 1998; Ehnes 2003). Most **herbaceous** post-fire pioneers disappear within about 10 years of the fire, typically leaving a group of plant species that is similar to what was there prior to fire. For further details see Section 2.3.2.



Arrows show linkages, or relationships, between ecosystem components. Red arrows are direct linkages while black arrows are indirect linkages. The outer green ring shows the factors that provide the context and constraints on site level patterns and processes.

Figure 3-1: Plant and Soil Relationships in a Stand Level Ecosystem

3.2 ASSESSMENT APPROACH AND METHODS

3.2.1 Overview

The ecosystem-based assessment approach used for the terrestrial plants assessment was the same as that generally used throughout the TE SV, as described in Section 1.2.4. Notably, potential Project effects on terrestrial plants were assessed by comparing the status of measureable indicators for the key topics with and without the Project in place. The ecosystem-based approach to assessing Project effects on plants considered direct and indirect Project effects in combination with other past, existing and reasonably foreseeable future developments.

While the invasive plants supporting topic considered all plant species growing outside of their country or region of origin, the focus was on the moderately to highly invasive species since these are the species that pose the greatest threats to plant populations and ecosystems. The key issue of concern for the terrestrial plants assessment was how the Project could to contribute to increasing the rate at which invasive plants are introduced and/or further spread.

The priority plants VEC considered plant species that are particularly important for ecological and/or social reasons. Priority plants were the native plant species that are highly sensitive to Project features, make high contributions to ecosystem function and/or are of particular interest to the KCNs (*e.g.*, spiritually important, used as medicine or food). A plant species was considered to be highly sensitive to human features if it is globally, nationally, provincially or regionally rare, near a range limit, has low reproductive capacity, depends on rare environmental conditions and/or depends on the natural disturbance regime. Plant species that are critical for the survival and/or reproduction of an animal species are addressed in the relevant wildlife sections of the TE SV.

Indicators for priority plants varied with the degree of concern related to the species and the availability of sufficient local information to evaluate the distribution, abundance and habitat associations of a species. Depending on the species, indicators included distribution, abundance, number of known locations and/or amounts of available habitat.

The general assessment approach and methods for terrestrial plants were the same as those used for all of the key topics (see Sections 1.3, 1.4) Details specific to terrestrial plants are provided below.

3.2.2 Study Areas

As described in Section 1.3, each terrestrial VEC and supporting topic had its own set of nested study areas referred to as the **Local Study Area**, **Regional Study Area** and **context area**. The Local Study Area for a key topic captured the potential zone of Project influence on individual plants. The Regional Study Area captured the area needed to assess how local effects were expected to affect population viability. The context area provided control for conditions or factors that could confound the interpretation of information, such as higher or lower plant dispersal into the Regional Study Area due to unusual conditions in the surrounding area. Following the rationale described in Section 1.3, the Local Study Area, Regional Study Area and context area for each VEC and supporting topic were selected from

the six nested study zones shown in Map 1-1. Due to the manner in which it was derived, the Regional Study Area selected for a key topic was also used as its cumulative effects assessment area.

The Terrestrial Plants Local and Regional Study Areas (Map 3-1) were Study Zones 2 and 5 (Map 1.1-1), respectively.

The 18,689 ha Local Study Area consisted of the Project Footprint as well as a 150 m buffer around it (Map 3-1). A 150 m wide buffer of the Project Footprint was thought to capture all potential indirect changes to plants and their habitats in a worst case scenario for the following reasons. Project effects on habitat and plants were generally expected to diminish below measurable levels within 50 m of the Project Footprint (see Appendix 2A for details). Exceptions could occur in wetlands with high water tables or surficial groundwater flows, physically disturbed areas and/or areas with certain types of indirect effects (*e.g.*, resource harvesting or human caused fires) but these effects were expected to alter only a small portion of the outer 100 m of the 150 m buffer. The Local Study Area was also expected to capture most Project impacts that cannot be defined with reasonable confidence prior to construction (*e.g.*, trails to borrow areas, accidental disturbance).

The 14,200 km^2 Regional Study Area was thought to be large enough to maintain the long-term viability of plant populations under current environmental conditions since the Regional Study Area was large enough to represent a region level ecosystem in the Keeyask area (see Section 1.3.5). That is, a relatively homogenous area in terms of ecological context (*e.g.*, climate, surface materials) that was large enough to capture the key ecological processes operating at the regional ecosystem level (such as the fire regime) and populations of most of the resident wildlife species. In practical terms, the Regional Study Area size was determined such that it was large enough to maintain a relatively stable habitat composition in response to the natural fire regime. In other words, one large fire was unlikely to substantially change the proportion of any habitat type, thereby providing alternative habitat for species to move to when large fires occur.

Proxy areas were other northern areas that provided examples of how the Project could affect terrestrial plants because they have been affected by similar types of development. The four **proxy area**s used to indicate the likely effects of **flooding** and water regulation on terrestrial plants were Stephens Lake (*i.e.*, the **reservoir** for the Kettle **Generating Station**), Notigi reservoir, Wuskwatim Lake and Long Spruce reservoir (Map 3-2). The terrestrial plants assessment relied most heavily on Stephens Lake information because it was immediately downstream of the proposed Keeyask reservoir, was the most ecologically comparable proxy area and had the best time series of large-scale historical aerial photography.

Proxy areas for plant recovery in cleared and excavated areas were selected from **borrow area**s developed for the Kettle, Limestone and Long Spruce Generating Stations and for PR 280.

Benchmark areas, which were areas relatively unaffected by human development, were used to characterize plant community patterns and dynamics in natural ecosystems. Benchmark areas for shoreline wetlands were **off-system** lakes and large rivers in the Regional Study Area (Map 3-2). Benchmark areas were not required for upland and **inland peatland** plant communities since most of the Regional Study Area has been relatively unaffected by large-scale human activities other than **global change**.

3.2.3 Information Sources

The sources of information for the terrestrial plants assessment were:

- Aboriginal traditional knowledge;
- existing published information; and
- EIS studies designed and conducted to address identified data gaps.

The environmental setting was described using available local **Aboriginal traditional knowledge**, existing information, environmental impact assessment studies conducted to fill information gaps and the Physical Environment Supporting Volume (PE SV). Information from the Project Description Supporting Volume (PD SV) was used to determine which Project impacts are relevant to the terrestrial plants assessment while the PE SV provided information on the status of and trends in physical factors with and without the Project. Descriptions of historical conditions relied heavily on habitat mapping completed for the EIS (Section 2.3) and existing reports regarding the effects of Lake Winnipeg Regulation (LWR) and the Churchill River Diversion (CRD) on the Nelson River aquatic system and the communities located along it. Descriptions of current conditions relied heavily on habitat mapping and habitat field data collected for the EIS (Section 2.3) since very little information suitable for assessment purposes existed when studies commenced.

Additional and/or specific information sources are listed below.

3.2.3.1 Aboriginal Traditional Knowledge

Aboriginal traditional knowledge (ATK) played an important role in both technical data collection and describing the existing environment. The KCNs Partners provided ATK through their Environmental Evaluation Reports and community-based studies. The KCNs were involved in reviewing annual fieldwork plans through the Environmental Studies Working Groups and individual KCNs Members participated in field data collection. In addition, ATK of historic and current conditions as gathered through community-based research and workshops was incorporated into the detailed VEC and supporting topic descriptions that are presented below and in the TE SV (e.g., CNP Keeyask Environmental Evaluation Report; YFFN Evaluation Report (*Kipekiskwaywinan*); FLCN Traditional Knowledge Report 2010 Draft). FLCN's TK Report, as well as each of the KCNs Environmental Evaluation Reports, also document how the terrestrial ecosystem was impacted by past hydro development.

3.2.3.2 Existing Information

A limited amount of existing published information regarding terrestrial plants was available for the Regional Study Area prior to the commencement of EIS studies, consisting primarily of reports in floras, Manitoba Conservation Data Centre (MBCDC) data, herbarium records and a few articles from the scientific literature. Reviews of the effects of hydroelectric development on the Nelson River **aquatic environment** (*e.g.*, Split Lake PPER) provided some information on historical shoreline conditions. Although some vegetation and soil mapping was available, its usefulness for EIS purposes was limited

because the mapping scale was too small and/or coarse, the information was outdated and/or only a small portion of the study areas was captured (Section 2.2.4). **Landscape**s and waterscapes of the **Split Lake RMA** are characterized in CNP Keeyask Environmental Evaluation Report Appendix 1. Existing plant and habitat studies were not available except with regard to peatland responses to past climate change (see Section 2.3.3.2).

Key information sources used for current conditions were:

- Flora of North America (Flora of North America Editorial Committee (FNA) 1993+), Flora of Canada (Scoggan 1978) and A Synonymised Checklist of the Vascular Flora of the United States, Canada, and Greenland (Kartesz 1994);
- Manitoba Museum, University of Manitoba and University of Winnipeg herbarium records for occurrence information;
- Flora of Manitoba (Scoggan 1957), Flora of Canada (Scoggan 1978), Manitoba Museum herbarium records, MBCDC information and Porsild and Cody 1980, Burns and Honkala 1990, Ringius and Sims 1997, Argus 2007,Reaume 2009 for species ranges;
- The Federal Species At Risk Act (SARA) and The Manitoba Endangered Species Act (MESA) for the list of endangered and threatened species; and
- MBCDC for provincial conservation concern rankings.

Specific information regarding current trends for the Regional Study Area were not found for particular plant species. General trends in plant community composition were inferred from scientific publications regarding vegetation and peatland responses to past climate warming in northern Manitoba.

3.2.3.3 Environmental Impact Assessment Studies

The terrestrial habitat and ecosystems section of the TE SV (Section 2) provided the foundation for the plants assessment by characterizing vegetation, habitat and ecosystems in the study areas, including current trends and predicting residual Project effects. Predictions regarding current trends in the existing environment, also referred to as the future without the Project, were essentially generated by integrating habitat and plant trends extrapolated from the current condition with projections reported in the scientific literature, where available.

The majority of the information used for the terrestrial plants assessment came from a wide range of EIS studies that included a large number of sample locations. Studies were initiated in 2001 and continued to 2011, with most field data collected from 2003 to 2009. Data collection efforts were highest in Local Study Area (Map 3-3) and decreased with distance from it. Stephens Lake (*i.e.*, the Kettle Generating Station reservoir) was the proxy area most commonly included in field studies.

Much of the data used for the terrestrial plants assessment was collected as a component of the terrestrial habitat mapping and terrestrial habitat relationships studies (Section 2.2.4.3). Additional locatons sampled for invasive and priority plants included 79 rare and invasive plant transects in the Local Study Area and along portions of the Nelson River shoreline and along PR 280 in the Regional Study Area. Invasive

and/or priority plant transects were sampled by foot in most areas, by boat along the Nelson River and by vehicle stops along PR 280. Details on study design and field methods are provided in Appendix 3A. Additionally, potential priority plants were recorded as incidental observations while moving from one sample location to another during fieldwork. In all cases, habitat data was recorded at each location and a photo was taken of rare species, except where local population numbers were sufficient to support the removal of an individual for collection.

Data from non-Project studies conducted northeast of the Regional Study Area were also used to determine species distributions and habitat associations. The combined Regional Study Area and northeastern area is referred to as the lower Nelson River (LNR) region.

3.2.4 Methods

3.2.4.1 Data Analysis and Indicator Measurement

Plant nomenclature followed Flora of North America where volumes currently exist for the genus and the Manitoba Conservation Data Centre elsewhere. White birch (*Betula papyrifera*) and Alaskan birch (*Betula neoalaskana*) were grouped into one taxon (white birch) since these species could not be reliably distinguished in the field.

Plant species potentially occurring in the Regional Study Area were identified from field data, MBCDC information (pers. comm. 2011) and other sources. Although the sample sizes from the EIS studies were relatively large, some rare species would not be detected because a very large sample size is required to detect all rare species, some terrestrial habitat types absent in the Local Study Area were not sampled and sample sizes for a few terrestrial habitat types were low. Additional potentially occurring globally, provincially and regionally rare species were identified from MBCDC conservation concern rankings, herbarium records, and relevant literature.

The distribution and abundance of each plant species recorded during field studies was classified. Distribution classes were very widespread, widespread, scattered, localized or absent (Table 3-1) based on frequency of occurrence across the sample locations using the ranges shown in Table 3-2. Species abundance was classified as being very abundant, abundant, sporadic, scarce or absent (Table 3-1) based on mean percentage of presences in the sub-samples (*e.g.*, percentage of quadrats in plots) across the locations using the ranges shown in Table 3-2. Abundance measures for shoreline wetland transects were not reported since their calculation is not straightforward (the number of quadrats along a transect until the maximum water depth is reached varies with substrate slope).

At a minimum, indicator measures included mean distribution values for each species that had sufficient occurrences in the field data. The amounts of habitat were also used, to the extent that local habitat associations could be determined for a species.

Potential influences on plant species were examined under the categories of habitat change, disturbance and access effects. Associations between different plant species and between particular plant species and habitat attributes were developed using univariate and multivariate techniques. The primary multivariate

techniques were Ward's clustering, principal coordinates analysis, non-metric multi-dimensional scaling and logistic regression.

Invasive plants for the Regional Study Area were identified from Scoggan, 1978, FNA 1993+, White *et al.* 1993, Royer and Dickinson 1999, Riley 2003, ISCM 2012).

Regarding priority plants, endangered or threatened species were those listed by The *Manitoba Endangered Species Act* (MESA), *Schedule 1* of the *Species at Risk Act* (SARA) and/or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Globally, nationally and provincially rare plant species were identified from the MBCDC global and provincial conservation concern ranks, referred to as G-Ranks and S-Ranks, respectively. The provincial rankings are as follows: S1 is a provincially very rare species; S2 is a provincially rare species and S3 is a provincially uncommon species. Global rankings follow the same convention but using G1, G2 and G3 for the rank labels. Since the MBCDC does not provide national conservation concern ranks, it was assumed that nationally rare species would be captured by a combination of the global rank, provincial rank and the endangered and threatened species lists.

Regionally rare species were identified in several steps. The first step was to determine the frequency of occurrence in the field data for all vascular plant species. Habitat mapping was the primary "field data" source for canopy tree species. Data collected from the sampling protocols designed to be representative samples of the study area were the data source for the remaining native species. One hundred and fourty-two species occurred in less than 1% of the 950 sample locations. Some species were very infrequent in the sample data because the sample size for their preferred habitat type was low. For example, sampling for submergent aquatic species (*e.g.,* flatstem pondweed; *Potamogeton zosteriformis*) was only undertaken in a small number of off-system ponds for the purpose of characterizing muskrat habitat. Other species were very infrequent in the field data because it difficult to reliably distinguish them from other species in the field so they were usually field classified to a broader taxonomic group (*e.g.*, *Carex tenuiflora* typically identified as *Carex* spp.). The species record appearing in the dataset is often the lab identification of a flowering specimen collected in the field.

To account for low sample size and taxon level field identifications, species with S-5 conservation ranks were not considered to be regionally rare unless they were identified as a range limit species (see below). Finally, invasive species were not included in the regionally rare species list.

Range limit plant species were identified based on the literature (Burns and Honkala 1990), floras (*e.g.*, FNA 1993+), herbarium records (MBCDC pers. comm.; Manitoba Museum pers. comm.), habitat mapping and analysis of the field data gathered from Project and non-Project studies in the LNR region. Although tree species near range limits were included as priority plants based on this criterion, assessments for these species was completed in the priority habitat component of the ecosystem diversity assessment because the habitat mapping (see Section 2.2) provided better distribution and abundance data for these species.

Ecologically sensitive plant species were determined from Project studies and relevant literature.

A list of plant species of particular interest to the KCNs was developed from the KCNs ATK library (Split Lake Cree 1996a, Split Lake Cree 1996d, WLFN 2002, FLCN 2008, FLCN Traditional Knowledge

Report 2010 Draft, YFFN 2011, CNP Keeyask Environmental Evaluation Report, FLCN Environment Evaluation Report (Draft)), which included documents produced by the KCNs and notes from working group meetings. Species mentioned more than three times were included as KCN priority plant species. In order to gather additional information on traditional plants prior to construction, a KCNs traditional plants workshop is planned for the summer of 2012 to share information regarding plants in the Keeyask area.

The assessment approach for each priority plant was based on the degree of concern regarding potential Project effects. Each of the globally rare, nationally rare and provincially very rare plant species were assessed individually, with particularly high emphasis on those that are endangered, threatened, globally rare (*i.e.*, ranked G1 to G2 by MBCDC) or provincially rare (*i.e.*, ranked S1 to S2 by MBCDC). Too many plant species met the remaining priority plant criteria to assess each of them individually. These remaining species were indirectly assessed in two ways. The percentage of known locations affected was used for species that were observed during field studies. Species that were essentially as common as their habitats were indirectly assessed through the priority habitat component of the ecosystem diversity VEC assessment and the terrestrial habitat supporting topic assessment. For rare species, it is generally not practicable to collect sufficient data to develop statistically-based habitat associations relevant for local conditions. Many of the provincially very rare to uncommon species were thought to be scarce and/or localized (Table 3-1) in the Regional Study Area because they were at a range limit and/or their habitats were rare to uncommon there (see Section 2.3.2 for regionally rare habitat types). In other words, if a species was regionally rare because it was confined to a habitat type that is regionally rare then an assessment of Project effects on the regionally rare habitat types was an indirect assessment of Project effects on plants that were as common as their habitat.

Evaluations for potentially occurring but undetected provincially very rare to uncommon species were indirectly determined based on their habitat associations, to the extent these could be defined for local conditions. The risk of taking this approach for these species was considered to be low given that a relatively large amount of fieldwork occurred in the Local Study Area and further rare plant surveys could be conducted prior to construction if locations with high potential to harbor such species are identified.

Most of these regionally rare species were thought to be very infrequent in the Regional Study Area because their habitats were rare to uncommon there. Evaluations for regionally rare species were indirectly determined based on their habitat associations, to the extent these could be defined for local conditions.

To make use of the percentages of known locations for a species, the raw data must be interpreted in the context of differences in sampling density across the nested study areas. The probability of detecting a species increases with the proportion of the study area sampled. The sample density in the Project Footprint and terrestrial plants zone of influence was approximately 32 times higher than in the rest of the Regional Study Area as a whole because sampling was more intensive in areas with potential Project effects. The sample density in the Project Footprint and terrestrial plants zone of influence was 2.62 sample locations per km^2 while in the rest of the Regional Study Area it was 0.05 sample locations per km^2 (2.62/0.05=38 times higher density).

To provide a crude correction so that the number of known locations in the Project Footprint and terrestrial plants zone of influence of influence could be related to each other for the benchmark comparison, the number of known locations in the Regional Study Area outside of the Project Footprint and zone of influence was corrected by multiplying the number of locations in this area by 32 to account for differences in sampling intensity. In other words, if the spatial distribution throughout the Regional Study Area was identical to that of the Project Footprint and if the same number of locations had been sampled in the same distribution, then it is expected that 32 times more locations of species X would have been recorded. Since this is a crude method to adjust for differences in sampling intensity, the resulting number of Regional Study Area locations will be treated as being location with a wide range around the true value (which is adequate where the number of locations in the Project Footprint and terrestrial plants zone of influence is clearly a small proportion of the estimated number of known locations).

Table 3-1: Distribution, Abundance and Regional Rarity Classes Used in the Terrestrial Plants Assessment

Distribution (D)	Abundance (A)	Rarity (R)
Very Widespread	Very Abundant	Very Common
Widespread	Abundant	Common
Scattered	Sporadic	Uncommon
Localized	Scarce	Regionally rare
Absent	Absent	n/a

Table 3-2: Distribution and Abundance Class Names and Ranges

Distribution (D)		Generalized Distribution	Abundance (A)	
Very Widespread	90% ≤ D ≤ 100%	Widely	Very Abundant	80% ≤ A ≤ 100%
Widespread	75% ≤ D < 90%		Abundant	53% ≤ A < 80%
Scattered	25% ≤ D < 75%	Narrowly	Sporadic	33% ≤ A < 53%
Localized	0% < D < 25%		Scarce	0% < A < 33%
Absent	0%	Absent	Absent	0%

Notes:
1. Distribution measured as percentage of sample locations where the species occurred (*i.e.*, percentage of plots or percentage of paired transect locations).
2. Abundance was measured as the mean subsample frequency across all sample locations. For Inland plots this was mean quadrat frequency out of a maximum 15; for shoreline wetlands this was mean percentage of total transect length.

3.2.4.2 Project Effects Predictions

Predictions of the future levels of the measurable indicators considered current conditions and trends in the key topic indicators, future changes in non-Project driving factors and the combined effects of the Project with past, existing and reasonably foreseeable future projects.

The key Project linkages with the terrestrial plants are the same as those identified for the terrestrial habitats and ecosystems assessment in the TE SV Section 2.1. The primary pathways of direct Project effects are clearing and flooding, followed by indirect effects in surrounding areas arising from edge effects, reservoir expansion and depth to groundwater changes. Anticipated indirect Project effects on plants extend varying distances from the areas of direct physical change (*i.e.*, the Project Footprint) and for varying lengths of time, depending on the plant species, impact type and local conditions (see Section 1.2.3.2 for overview and Appendix 2A for details). The spatial extent of the Project's indirect effects on terrestrial plants is referred to as the terrestrial plants zone of influence.

Potential Project effects on invasive plants include the introduction and/or further spreading of invasive species. Project effects on invasive plants were evaluated in terms of the risk of the Project increasing the rate at which invasive plants are introduced and/or spread.

Potential Project effects on priority plants include the loss or disturbance of individual plants and plant populations and the loss and alteration of plant habitats. Direct Project effects on priority plants will include loss, alteration and disturbance of plants and their habitats in the Project Footprint (*e.g.*, clearing or flooding) as well any undefined Project activities that may ultimately occur outside of the Project Footprint (*e.g.*, machine trails), if any. To predict potential Project effects, the terrestrial plants effects assessment assumed that all of the plants and their habitat inside of the terrestrial plants zone of influence would be lost when construction starts. This assumption was cautious because it was expected that: impacts will be phased in over the construction period; only a portion of the potential borrow area footprint will be used; clearing of the access road ROW will generally be less than the 100 m width; and, a large proportion of the potential disturbance areas are unlikely to be used. Undefined Project footprints are expected to comprise a very small proportion of the terrestrial plants zone of influence.

Residual Project effects on invasive and priority plants were assessed based on nature of the effect, geographic extent, magnitude, duration, frequency and reversibility as defined in Table 1.4-1. Uncertainty and the likelihood of residual effects were evaluated using the approach described in Section 1.2.4.6.

The acceptability of residual Project effects on priority plants was evaluated based on the number of plant locations and/or the available priority plant habitat that could be affected by the Project. For both of these indicators, effects that are small to moderate in magnitude would generally be acceptable regardless of their duration or geographic extent because this degree of change is expected to fall within the range of natural variability. Exceptions could occur for a moderate magnitude residual effect on a species if there was a substantial ongoing adverse trend in either its population level or amount of available habitat.

The magnitude of residual Project effects on the number of plant locations was measured as the predicted percentage of known locations affected. Magnitude for available habitat was measured as the cumulative percentage of habitat affected within the Regional Study Area. For the endangered,

threatened, globally rare, provincially very rare species and provincially rare species, the percentage benchmarks for both indicators were as follows: percentage changes below 1% are small magnitude; percentage changes between 1% and 5% are moderate magnitude; and, percentage changes greater than 5% are high magnitude (Hegmann *et al.* 1999; Wagner 1991). For the remaining priority plants, the percentage benchmarks for both indicators were as follows: percentage changes below 1% are small magnitude; percentage changes between 1% and 10% are moderate magnitude; and, percentage changes greater than 10% are high magnitude (Hegmann *et al.* 1999).

3.3 ENVIRONMENTAL SETTING

This section describes the environmental setting for the terrestrial plant community, invasive plants and priority plants in the Regional Study Area. Plant community descriptions focus on the distribution and abundance of plants in the Regional Study Area since species and habitat associations were provided in Section 2.2.3.3. Detailed species distribution and abundance results are provided in Appendix 3C.

3.3.1 Historical Conditions

The earliest published information on Manitoba plants was a botanical appendix by John Richardson in Franklin's 1823 account of his travels along the Hudson Bay coast (Scoggan 1957). A number of checklists were subsequently published for all or portions of the Province. The first flora of Manitoba was published in 1957 and included over 1,200 native vascular plant species (Scoggan 1957). A recent list provided by MBCDC increased that number to at least 1,500 native plant species (MBCDC 2011, personal communication).

As described in Section 2.2.3.2, human impacts, **global change** and fire regime changes have been the primary factors driving plant community and ecosystem change in the Regional Study Area over the past few hundred years. Airborne deposition and other widespread anthropogenic influences have also contributed to change. The major effects on plants are captured by the vegetation component of habitat change described in Section 2.2.3. In brief, past and existing human features have removed individual plants and their habitat and altered plant populations. Based on historical habitat effects, it is likely that plant species associated with mineral sites, the Nelson River shore zone and Nelson River shoreline wetland plants were more affected than species located in other areas.

Climate change since the last glaciation has shifted the ranges of many plant species. In the Keewatin area of central Canada, studies estimated that the northern treeline has shifted approximately 240 km south since the end of the Mid-Holocene Warm Period (5,000 – 4,000 yr BP; Section 2.3.3.2).

3.3.2 Current Conditions

3.3.2.1 Plant Community

The plant species found in the Regional Study Area are typical of the central Canadian boreal forest, consisting primarily of species that are tolerant of the cold, harsh climate and can grow in peatlands.

MBCDC information, floras and herbarium records indicated that at least 750 vascular plant species could potentially occur in the Regional Study Area. Of this total, 350 taxa consisting of 304 species and 46 broader **taxa** (*e.g.*, species only identified to the genus level in the field) were recorded during field studies in the Regional Study Area. The 377 Inland plots included 221 of these taxa; the 193 shoreline wetland transects included 253 taxa.

All of the 11 **bryophyte**s and lichens that were to be identified to either species or genus during field studies were encountered. An additional 85 moss, lichen and liverwort species were identified to either species or genus in the lab from ground layer samples collected in the Inland plots (Project studies only attempted to identify the most common and abundant ground mosses and lichens in the field. Based on field data and ground layer samples collected at the terrestrial habitat plots, 88 mosses, six lichens and two liverworts were identified to either a species or a broader taxon).

Appendix 3B provides a list of vascular plant species that could potentially occur in the Regional Study Area, along with common names, scientific names, MBCDC conservation concern ranking (*i.e.*, S-Rank) and the number of locations where the species was found during the terrestrial habitat and plant studies. Appendix 3B also includes the list of non-vascular plants identified from ground samples collected at the inland habitat plots and the number of plots where the species was found.

In descending order, the most widespread and abundant plant taxa were black spruce (*Picea mariana*), green alder (*Alnus viridis* ssp. *crispa*), willows (*Salix bebbiana, S. myrtillifolia, S. planifolia, S. pedicellaris*), swamp birch (*Betula pumila*), Labrador tea (*Rhododendron groenlandicum*) and rock cranberry (*Vaccinium vitis-idaea*) in the inland habitat plots (stem density was the abundance measure for trees and tall shrubs; quadrat frequency was the abundance measure for low shrubs, herbs and ground cover). Marsh reed-grass (*Calamagrostis canadensis*), common horsetail (*Equisetum arvense*) and water sedge (*Carex aquatilis*) were the most widespread species in the shoreline wetland transects.

Based on the species distribution and abundance classes (Table 3-2), no species were very widespread and very abundant in the inland plots while 168 species were localized and scarce (Table 3-3). No species were widespread or very widespread in the shoreline wetland transects while 17 species were scattered.

Table 3-3: Number of Plant Species that Occurred in Each of the Distribution and Abundance Classes Based on the Field Data

[DN: ACS added the shoreline wetland numbers, need to finalize the method for determining shoreline wetland species abundance – these are the understorey species]

Abundance Class	Distribution Class			
	Very Widespread	Widespread	Scattered	Localized
Inland Plots				
Very Abundant	0	0	0	0
Abundant	0	1	0	0
Sporadic	1	1	1	0
Scarce	0	1	23	158
Shoreline Wetland Transects				
Total	0	0	17	236

Note: See Table 3-2 for class ranges.

3.3.2.1.1 Inland Habitats

Trees

Black spruce was the most commonly recorded tree species (81% of plots; Appendix 3C, Figure 3-3), followed by tamarack (*Larix laricina*), white birch (*Betula papyrifera*), jack pine (*Pinus banksiana*), trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*) and white spruce (*Picea glauca*). Black spruce also had the highest mean stem density across all plots (6,488 stems per hectare (stems/ha)). White spruce and balsam poplar had the lowest overall mean stem densities (7 stems/ha and 21 stems/ha, respectively). When considering only the plots where the species was present, black spruce still had the highest mean stem density by far.

Tree species distribution and relative abundance patterns were generally the same across all six **vegetation structure type**s (*i.e.*, forest, woodland, sparsely treed, tall shrub, low shrub, bryoid and sparse; Appendix 3C). Prominent exceptions were that black spruce and tamarack were predominant in the tall shrub, low shrub and bryoid plots. As well, tamarack was not recorded in forest plots.

Black spruce had the highest mean stem density in all of the five **site type**s that had adequate replication in the Regional Study Area, except for fen (Appendix 3C). Fen and sphagnum bog had fewer tree species than the other site types. White spruce was only recorded on the deep dry mineral site type and once in the feathermoss bog site type.

Tree species distribution and relative abundance patterns were similar among Regional and Local Study Areas (N= 237 and 98, respectively). White birch was observed in only 18% of Regional Study Area plots compared to 32% of Local Study Area plots and had a lower mean stem density (119 stems/ha compared to 387 stems/ha in Regional Study and Local Area, respectively). Differences in species frequencies in the

study areas were attributed to the higher proportions of mineral soils and rare habitat plots in the Local Study Area portion of the Regional Study Area.

Tall Shrubs

Green alder and willows were the most widely distributed tall shrubs in the Regional Study Area, occurring in 29% and 50% of inland plots, respectively (Appendix 3C, Figure 3-4). The most frequently recorded willows were Bebb's (*S. bebbiana*), myrtle-leaved (*Salix myrtillifolia*), flat-leaved (*S. planifolia*) and bog (*S. pedicellaris*) willow.

Based on mean values, green alder was the most abundant tall shrub across all plots and in the plots where it occurred (Appendix 3C, Figure 3-4). Willows were the second most abundant tall shrub across all of the plots but only the fifth most abundant in the plots where it occurred.

Although willows were more widespread than green alder, swamp birch and speckled alder (*Alnus incana* ssp. *rugosa*), it was less abundant where it was present (Appendix 3C, Figure 3-4). Alder-leaved buckthorn (*Rhamnus alnifolia*), saskatoon (*Amelanchier alnifolia*), Canada buffalo-berry (*Shepherdia canadensis*) and low bush-cranberry (*Viburnum edule*) had low abundances in the Regional Study Area. Red-osier dogwood was rarely recorded.

Green alder and willow were the most abundant tall shrubs in the three treed vegetation structure types. Swamp birch and willows were most abundant in the untreed types (see Appendix 3C). Red-osier dogwood was only recorded in tall shrub plots while Canada buffalo-berry was only recorded in the three treed structure types and the sparse type. Although speckled alder, low bush-cranberry and alder-leaved buckthorn were not widespread, they had relatively high densities in the sparsely treed and tall shrub types.

Green alder was the most abundant tall shrub on the deep dry and deep moist site types. Willow and swamp birch were the most abundant tall shrubs on the feathermoss bog, Sphagnum bog and fen site types (see Appendix 3C). Red-osier dogwood was only found on the deep dry mineral site type. Canada buffalo-berry was only found on the mineral site types. Overall, plots in the feathermoss bog and Sphagnum bog site types had lower mean tall shrub densities than the other site types.

Shrub species distribution and relative abundance patterns were similar in the Local and Regional Study Areas, with a few exceptions. Green alder was slightly more widespread than Swamp birch in the local study area, while in the Regional study area, Swamp birch was more abundant. Willow (3,330 stems/ha compared to 5,316 stems/ha) and green alder (3,480 stems/ha compared to 6,424 stems/ha) had lower mean densities overall in Regional Study Area plots.

Understorey

Labrador tea, rock cranberry, moss species and black spruce seedlings were the only widespread to very widespread understorey taxa in the inland plots (Appendix 3C, Figure 3-5). The 27 scattered taxa included 16 vascular plants, six bryophytes and five lichens.

Labrador tea, and black spruce seedlings were abundant and scarce, respectively, while both other moss species and rock cranberry were sporadic. All scattered species were scarce in the Regional Study Area plots, except for green reindeer lichen (*Cladina mitis*), which was sporadic.

Mosses not identified to a genus or species were very widespread or widespread in all six vegetation structure types (Appendix 3C, Figure 3-6). Two vascular (Labrador tea and rock cranberry) and two bryophyte (stair-step moss (*Hylocomium splendens*) and big red stem moss (*Pleurozium schreberi*)) species were very widespread in one or more of the structure types. Very widespread species ranged from sparse to abundant. Seven vascular and five bryophyte species were widespread in one or more of the structure types. Of these taxa, four were sporadic in more than one type, but none was abundant in more than one type, except for peat mosses (*Sphagnum* spp.) which were abundant in the low shrub and bryoid types. Bunchberry (*Cornus canadensis*) and Labrador tea were abundant in the forest and woodland type, respectively. Rock cranberry, Labrador tea and green reindeer lichen were abundant in the sparsely treed type. Among the untreed structure types, four vascular and one bryophyte species were widespread in one or more type. Small bog cranberry (*Vaccinium oxycoccos*) and peat mosses were sporadic and abundant, respectively, in both the low shrub and bryoid types. Three of the species were widespread in only one of the structure types. There were no species that occurred in only one vegetation structure type.

Thirteen taxa were widespread to very widespread on one or more of the site types (Appendix 3C, Figure 3-7). Mosses not identified to a genus or species and Labrador tea were very widespread and either sporadic or abundant in all site types, with the exception of Labrador tea which was widespread in the sphagnum bog type and neither very widespread or widespread in the fen type. Three vascular and one bryophyte species were very widespread on one or more site type. Additionally, two vascular and four bryophyte species were widespread in one or more of site types. Of these species, four were abundant in more than one of the site types, including Labrador tea which was also very abundant in the sphagnum bog sites. Three species were sporadic in more than one of the site types. None of the species were abundant on deep dry mineral sites, but Labrador tea and rock cranberry were abundant in the deep moist mineral type. Labrador tea, rock cranberry and other moss species were abundant in the feathermoss bog type. In addition to Labrador tea, rock cranberry, sphagnum mosses and green reindeer lichen were abundant in the sphagnum bog site type. Sphagnum moss was also abundant in the fen type, where it was the only widespread species aside from other moss species and three-leaved Solomon's-seal (*Maianthemum trifolium*). Four Understorey species were widespread in only one of the site types. Four species occurred exclusively in one site type in the Regional Study Area. Trembling aspen seedlings, pink corydalis (*Corydalis sempervirens*) and jack pine seedlings were only recorded on deep dry mineral sites.

Understorey species distribution and relative abundance patterns were similar between the Local and Regional Study Areas, with a few exceptions. Green reindeer lichen was widespread in the Regional Study Area, while it was scattered in the Local Study area (in 82% in Regional plots compared to 63% in Local Study Area plots). The Local Study Area had fewer species with a scattered distribution than the Regional Study Area.

3.3.2.1.2 Shoreline Wetlands

No taxa were widespread or very widespread in the shoreline wetland transects. Marsh reed-grass, Labrador tea, common horsetail (*Equisetum arvense*), moss species, water sedge (*Carex aquatilis*) and rock

cranberry were the only species that were scattered (Appendix 3C, Table 3-22). The 169 localized taxa included 160 vascular plants, four bryophytes and five lichens. Black spruce, flat-leaved willow and fireweed (*Chamerion angustifolium*) were the most common localized species.

No taxa were widespread or very widespread in the off-system transects, or the on-system transects. Marsh reed-grass and Labrador tea were scattered in both the on- and off-system transects (Appendix 3C, Table 3-23). Water sedge, speckled alder and leather-leaf (*Chamaedaphne calyculata*) were also scattered in the off-system transects. Common horsetail, black spruce tree, flat-leaved willow and rock cranberry were scattered in on-system transects.

Labrador tea, moss species and black spruce were widespread in wetland transects sampled in the Long Spruce forebay (Appendix 3C, Table 3-24). Bog bilberry was widespread in transects sampled on Stephens lake. Labrador tea was also scattered in all other regions. Twenty-nine species were scattered in at least one of the four study regions (Keeyask, Stephens, Long Spruce and Limestone). Flat-leaved willow, marsh reed-grass and water sedge were scattered in all but the Limestone area. Rock cranberry was scattered in all but the Keeyask area and common horsetail was scattered in all but the Long Spruce Study Area. Fifteen species were scattered in the Long Spruce transects, while only seven were scattered in the Keeyask transects.

No taxa were widespread or very widespread on any of the substrate classes. Seventeen taxa were scattered in one or more of the substrate classes (Appendix 3C, Table 3-25). Labrador tea, marsh reed-grass, water sedge and flat-leaved willow were the most common species found on organic substrates. Labrador tea, common horsetail and moss species were the most common on organic-mineral substrates, whereas marsh reed-grass, common horsetail and moss species were the most common on fine-coarse mineral substrates. Labrador tea, common horsetail, moss species and rock cranberry were common on fine mineral substrates. Thirteen of the seventeen taxa were scattered on organic plots, more species than any other substrate type.

Table 3-4: Composition of Vegetation Bands in Water Duration Zones (*i.e.*, vegetation sequences) on Mineral or Organic Substrates.

Water Duration Zone	**Core Vegetation Sequence** (Species most commonly observed in all conditions)	**Species More Common and/ or Abundant In Shore Zone Habitat Type Relative to the Core Vegetation Sequence** (*i.e.*, each vegetation sequence includes the species from the core vegetation sequence plus species modifications listed)			
		Nelson River	**Keeyask**	**Stephen's Lake**	**Off-System**
Lower Beach	water horsetail *(Equisetum fluviatile)*	Mineral Substrates: water horsetail *(Equisetum fluviatile),* bottle sedge *(Carex utriculata*), water smartweed *(Persicaria amphibia)*	Mineral Substrates: water horsetail *(Equisetum fluviatile)*, bottle sedge *(Carex utriculata)*, Water smartweed *(Persicaria amphibia)*	N/A	Mineral Substrates: various-leaved pondweed *(Potamogeton gramineus)*, viscid great-bulrush *(Schoenoplectus tabernaemontani*), creeping spike-rush *(Eleocharis palustris)*, water horsetail *(Equisetum fluviatile)* Organic Substrates: spiked water-milfoil *(Myriophyllum sibiricum),* Richardson's pondweed *(Potamogeton richardsonii),* narrow-leaved bur-reed *(Sparganium angustifolium*), needle spike-rush *(Eleocharis acicularis*), small yellow pond-lily *(Nuphar variegata*)

Table 3-4: Composition of Vegetation Bands in Water Duration Zones (*i.e.*, vegetation sequences) on Mineral or Organic Substrates.

Water Duration Zone	Core Vegetation Sequence (Species most commonly observed in all conditions)	Species More Common and/ or Abundant In Shore Zone Habitat Type Relative to the Core Vegetation Sequence (*i.e.*, each vegetation sequence includes the species from the core vegetation sequence plus species modifications listed)			
		Nelson River	**Keeyask**	**Stephen's Lake**	**Off-System**
Upper Beach	water sedge *(Carex aquatilis*), reed-grass *(Calamagrostis spp)*	Mineral Substrates: sweet gale *(Myrica gale)*, bog bilberry *(Vaccinium uliginosum)* Organic Substrates: water sedge *(Carex aquatilis)*	Organic Substrates: small bedstraw *(Galium trifidum*), smartweed *(Persicaria spp),* creeping spike-rush *(Eleocharis palustris)*	Mineral Substrates: sweet gale *(Myrica gale*), bog bilberry (*Vaccinium uliginosum)* Organic Substrates: flat-leaved willow *(Salix planifolia*), water sedge *(Carex aquatilis)*	Organic Substrates: bog sedge *(Carex magellanica),* water sedge *(Carex aquatilis),* leather-leaf *(Chamaedaphne calyculata),* marsh reed-grass *(Calamagrostis canadensis)*
Inland Edge	black spruce *(Picea mariana),* willows *(Salix spp.),* Labrador tea *(Rhododendron groenlandicum*), marsh reed-grass (*Calamagrostis* canadensis)	Mineral Substrates: black spruce (*Picea mariana*), green alder *(Alnus viridis ssp. crispa*), fireweed (*Chamerion angustifolium*) Organic Substrates: flat-leaved willow (*Salix planifolia*),myrtle-leaved willow *(Salix myrtillifolia),* bog bilberry *(Vaccinium uliginosum)*	Mineral Substrates: black spruce (*Picea mariana*), green alder *(Alnus viridis ssp. crispa),* prickly rose *(Rosa acicularis),* rock cranberry *(Vaccinium vitis-idaea*) Organic Substrates: flat-leaved willow *(Salix planifolia)*, bog bilberry *(Vaccinium uliginosum),* marsh reed-grass *(Calamagrostis canadensis)*	Mineral Substrates: black spruce *(Picea mariana),* green alder *(Alnus viridis ssp. crispa*), prickly rose *(Rosa acicularis*), rock cranberry *(Vaccinium vitis-idaea)* Organic Substrates: leather-leaf *(Chamaedaphne calyculata)*, Labrador tea *(Rhododendron groenlandicum*), water sedge (Carex aquatilis)	Mineral Substrates: fireweed *(Chamerion angustifolium)* Organic Substrates: Bebb's willow *(Salix bebbiana*), leather-leaf *(Chamaedaphne calyculata),* peat mosses (*Sphagnum spp.)*

Table 3-4: Composition of Vegetation Bands in Water Duration Zones (*i.e.*, vegetation sequences) on Mineral or Organic Substrates.

Water Duration Zone	Core Vegetation Sequence (Species most commonly observed in all conditions)	Species More Common and/ or Abundant In Shore Zone Habitat Type Relative to the Core Vegetation Sequence (*i.e.*, each vegetation sequence includes the species from the core vegetation sequence plus species modifications listed)			
		Nelson River	**Keeyask**	**Stephen's Lake**	**Off-System**

Note: N/A = Either no specific association found, or insufficient data available for the area/zone.

3.3.2.2 Invasive Plants

Invasive non-native species are widely considered to be a threat to species and ecosystems (Stein and Flack 1996; Environment Canada 2010a; ISCM 2012). Highly invasive plants can crowd out other plant species and, in extreme cases, alter vegetation composition, ecosystem diversity and other ecosystem attributes. Purple loosestrife (*Lythrum salicaria*) and leafy spurge (*Euphorbia esula*) provide localized examples of this phenomenon in southern and central Manitoba (Ball *pers. comm.* 2010).

As noted in the introduction, invasive plants are introduced and spread by human activities and natural dispersal mechanisms.

3.3.2.2.1 Historical Conditions

Invasive plants have been introduced and are spreading in southern Manitoba. White *et al.* (1993) show a general northward and westward trend for invasive species in Canada. Species such as purple loosestrife and leafy spurge were introduced south and east of Manitoba, but have been moving north. Invasive species in Canada are generally expected to move north, particularly with increasing temperatures (Huang *et al.* 2011, Smith *et al.* 2012).

3.3.2.2.2 Current Conditions

Field studies detected all of the 19 invasive plants known to occur in the Regional Study Area (Appendix 3D, Table 3-26). Their locations are shown in Map 3-4. The majority of these species were generally found in disturbed areas, such as along PR 280 or in borrow areas, or along Nelson River shorelines having substrates similar to those in human disturbed inland areas.

Invasive species found in ditches and borrow pits along PR 280 included narrow-leaved hawks-beard (*Crepis tectorum*), smooth brown grass (*Bromus inermis*), Canada thistle (*Cirsium arvense*), quack grass (*Elymus repens*), wild barley (*Hordeum jubatum*), pineappleweed (*Matricaria discoidea*), white sweet clover (*Melilotus albus*), yellow sweet clover (*Melilotus officinalis*) smooth catchfly (*Silene csereii*), perennial sow thistle (*Sonchus arvensis*), Alsike clover (*Trifolium hybridum*) and common dandelion (*Taraxacum officinale*). Common dandelion was also recorded once on the shore of a pond, in three locations south of the Nelson River and four times just north of Gull Rapids.

Invasive species recorded along the Nelson River between Birthday and Gull Rapids included wild barley, lamb's quarters (*Chenopodium album*), oakleaf goosefoot (*Chenopodium glaucum* var. *salinum*), reed-canary grass (*Phalaris arundinacea*), common plantain (*Plantago major*), common knotweed (*Polygonum aviculare* spp. *depressum*) and curled dock (*Rumex crispus*). One record of ox-eye daisy (*Leucanthemum vulgare*) was made on the north shore of the Nelson River just downstream of Gull Rapids. One record of common plantain was made on the south side of an island in Stephens Lake, just downstream of Gull Rapids, within the Local Study Area.

Of the invasive species known to occur in the Regional Study Area, White *et al.* (1993) consider reed-canary grass to be highly invasive and among the plant species that "appear to constitute the most significant threat to wetland natural areas". The ISCM (2012) lists reed-canary grass as an invasive species of some concern, where it is described as being capable of dominating wetlands and preventing the establishment of native species.

Moderately invasive species (White *et al.* 1993) known to occur in the Regional Study Area include smooth brome grass, Canada thistle. yellow and white sweet-clover. Smooth brome grass is considered a moderately invasive non-native plant of the native grasslands of the prairies and the southern boreal forest and aspen parkland (White *et al.* 1993). Canada thistle is considered a moderately invasive species of disturbed and grassy areas (White *et al.* 1993). Yellow and white sweet-clover are considered moderately invasive species, primarily of native prairies and meadows (White *et al.* 1993). Of these four species, only Canada thistle is listed on the ISCM invasive species list as a species of some concern (ISCM 2012).

In addition to ox-eye daisy, which was recorded in the study area, tufted vetch (*Vicia cracca*) is a species listed by the ISCM that could occur in the Regional Study Area based on recorded locations to the west and east. Scentless chamomile (*Tripleurospermum inodorum*) is a common species in Manitoba that has been recorded southwest of Thompson.

Some moderately to highly invasive plants not presently known to occur in or adjacent to the Regional Study Area could be introduced or immigrate from outside of the Region (White *et al.* 2003, ISCM 2012). The species, organized by habitat association, are:

- Wetlands:
  - Eurasian watermilfoil (*Myriophyllum spicatum*);
  - European frog-bit (*Hydrocharis morsus-ranae*);
  - Flowering-rush (*Butomus umbellatus*); and
  - Purple loosestrife/ swamp loosestrife.
- Uplands:
  - Common buckthorn (*Rhamnus cathartica*);
  - Garlic mustard/ hedge garlic (*Allaria petiolata*);
  - Leafy spurge/ wolf's milk/ Faitours grass;
  - Scentless chamomile; and
  - Tufted vetch.
- Wetlands and uplands:
  - Glossy buckthorn/ black buckthorn (*Rhamnus frangula*).

Eurasian watermilfoil, European frog-bit and garlic mustard are not considered a risk for the Regional Study Area, as they have not previously been recorded in Manitoba. All three species are generally restricted to the southern portions of Ontario and Quebec, with Eurasian watermilfoil occurring in southern British Colombia as well.

Glossy buckthorn, common buckthorn and flowering rush have been found in southern Manitoba (herbaria records). They are not expected to be a substantial concern for the Regional Study Area because their range in Manitoba has been restricted to the southern quarter of the Province for many years.

Purple loosestrife is a highly invasive species that has been extending its range northward in Manitoba. According to White *et al.* (1993), purple loosestrife presents a serious threat to natural wetland plant communities. Efforts elsewhere to control it have met with little success because it is so effective at expanding its range. The northward expansion of this species may be limited by the length of growing season it requires to produce its seed (Lahring 2003). Purple loosestrife is most often spread in wetlands and marshes by water flowing into unaffected areas, independent of disturbance or development (White *et al.* 1993). The Pas and Snow Lake are northern-most recorded observations for purple loosestrife (Lee 1991 in White *et al.* 1993) and the Lake Dauphin area is the northern-most location where it has become a problem (Ball *pers. comm.* 2010).

Leafy spurge is a highly invasive species and is considered a serious threat in Manitoba (see White *et al.* 1993). Herbarium records indicate that this species has only been recorded in southern Manitoba (Manitoba Museum herbarium). Leafy spurge is most likely to spread in the disturbed soils of agricultural and prairie grasslands, which are not found in the Regional Study Area.

3.3.2.2.3 Current Trends (no climate change)

Invasive plants are introduced and spread by human activities and natural dispersal mechanisms. It is anticipated that these vectors will continue to increase the occurrence of invasive plants in the Regional Study Area.

3.3.2.3 Priority Plants

This section describes existing environment conditions for the priority plants. See Appendix 3E for detailed results.

3.3.2.3.1 Historical Conditions

Historical trends for priority plant species are expected to be similar to those reported for terrestrial plants in Section 3.3.1. Past human developments and activities may have affected priority plants to a greater degree than other terrestrial plants because many of these species are associated with mineral sites, which have likely been disproportionately affected by past development and activities.

3.3.2.3.2 Current Conditions

Appendix 3E, Table 3-28 lists the 101 priority plant species considered in this assessment, their MBCDC conservation concern ranking (S-Rank), their reasons for inclusion as a priority plant species, the number of sample locations where the species was found at in the Local and Regional Study Areas and very general habitat associations from MBCDC and the literature (Soper and Heimburger 1982, FNA 1993+, Johnson *et al.* 1995, Lahring 2003). None of the plant species was considered to be a keystone species for the Regional Study Area.

Endangered and Threatened Plant Species

None of the endangered, threatened or globally rare plant species listed in Appendix 3E, Table 3-28 were either found during field studies or are known to occur in the Regional Study Area based on herbarium records, literature and Project field studies. It is also unlikely that the Local Study Area contains any of

the endangered or threatened plant species that are known to occur elsewhere in Manitoba. Except for flooded jellyskin lichen (*Leptogium rivulare*), all of these species are prairie species.

Flooded jellyskin lichen is a small foliose lichen that has been found at several locations in Ontario and at one location near Flin Flon, Manitoba (COSEWIC 2004). Its known habitat is primarily at the margins of seasonal pools, where it grows on rocks or at the base of living broadleaf trees (typically ash) between seasonal high and low water marks, and always below the high-water mark (COSEWIC 2004). It is highly vulnerable to changes in normal annual flooding patterns (COSEWIC 2004).

Flooded jellyskin lichen is not expected to occur in the areas that would be affected by the Project because the Project is not near an existing known flooded jellyskin location, water levels on the Nelson River are highly variable, shorelines along the Nelson River are subject to water currents and ice scouring, its required microhabitat is rare in waterbodies off the Nelson River (*i.e.*, rock outcrop or broadleaf tree trunks located in the water fluctuation zone) and lichens were generally not observed along the waterline of the waterbodies that could be affected by the Project. A representative from the Canadian Wildlife Service confirmed that flooded jellyskin is not likely to occur in the Project area for these reasons (R. Bazin pers. comm. 2012).

Provincially Very Rare to Uncommon Plant Species

The 10 plant species ranked as provincially very rare by MBCDC and could potentially occur in the Regional Study Area were not found during extensive field studies. Based on general information, these species are understood to be associated with specific habitat types (see FNA 1993+, Johnson *et al.* 1995), including in some cases rocky outcrops, shaded rocky slopes, acidic sandy soils, meadows, calcareous soils and emergent shorelines, meadows, calcareous soils (FNA 1993+, Johnson *et al.* 1995), which are absent or uncommon in the Local Study Area. One or two of these species are less specifically associated with habitats such as wet bogs and fens, which are a bit more common in the Local Study Area, as well as in the Regional Study Area. Some species have no known habitat associations.

Table 3-5 provides the number of locations where provincially rare to uncommon species were found at locations within the Regional Study Area and locations northeast of the Regional Study Area during field studies.

Elegant hawk's-beard (*Crepis elegans*) was the only provincially rare or very rare species (uncertain rank of S1S2) found in the Regional Study Area during field studies. Elegant hawk's-beard grows primarily in western Canada, with a few single occurrences in Ontario and Manitoba (FNA 1993+). Herbarium specimens of elegant hawk's-beard originate from three locations along the Lower Nelson River (Manitoba Museum), north east of the Keeyask Study Area. Elegant hawk's-beard was identified at nine locations in the ditch along the highway between Gillam and the north arm of Stephens Lake.

Small pondweed (*Potamogeton pusillus* spp. *tenuissimus*) and Robbin's pondweed (*Potamogeton robbinsii*) were the only provincially rare species found in the Regional Study Area during field studies. Map 3-5 shows the locations where Project field studies recorded these species.

Small pondweed grows along the east and west coast of North America, its distribution reaches through the Great Lakes to southeastern Manitoba, and it has been collected in scattered areas in Saskatchewan

and Alberta (FNA 1993+). Herbarium specimens of small pondweed were collected primarily in southern Manitoba, with two scattered occurrences between the Keeyask Study Area and the Ontario border (Manitoba Museum).

Small pondweed could be widespread in the Regional Study Area given its habitat associations and the small sample size for ponds. Small pondweed was found in six, or 50%, of the 12 ponds sampled. Based on its presence in the proportion of ponds sampled, small pondweed would be considered a common pond species in the Regional Study Area.

Robbin's pondweed grows primarily in eastern Canada, around the great lakes and in parts of BC, with a few scattered occurrences in the prairie provinces (FNA 1993+). In Manitoba, herbarium specimens were collected primarily in the south east corner (MBCDC), with two occurrences between the Keeyask Study Area and the Ontario border (Manitoba Museum). Robbin's pondweed was recorded at three of the 12 ponds sampled, all south of the Nelson River.

Provincially uncommon plant species (S3) recorded during field studies included shrubby willow (*Salix arbusculoides*), rock willow (*Salix vestita*), horned pondweed (*Zannichellia palustris*), oblong-leaved sundew (*Drosera anglica*) and American milk-vetch (*Astragalus americanus*). Map 3-6 shows the locations where Project field studies recorded these species.

Shrubby willow is a medium-sized slender shrub that grows up to 4 m tall, with narrow pointed and serrated leaves. It grows primarily on littoral habitats, in swamps, muskegs, coniferous forest, gravel ridges and calcareous clays and silts (Soper and Heimburger 1982, FNA 1993+). Shrubby willow was more common in the Regional Study Area and surrounding areas than suggested by its provincial S-Rank. Shrubby willow was observed at 11 locations in the Local Study Area, 38 locations in the Regional Study Area and an additional 706 locations in the LNR region.

Rock willow is a stout dwarf shrub, that grows to 60 cm tall, its leaves are round and hairy with conspicuous veins. It grows primarily on dry, well drained ridges, riverbank crests, cliffs and occasionally open muskeg (Soper and Heimburger 1982, FNA 1993+). Rock willow was also more common than suggested by its S-Rank. It was observed at 26 locations in the Regional Study Area and an additional 399 locations in the LNR region, where sampling was further into its range.

Horned pondweed is a slender, fragile branching submerged aquatic herb, with sparse narrow, threadlike leaves. It grows in ponds, lakes, ditches and streams and prefers hard or saline water (Lahring 2003, FNA 1993+). Horned pondweed was observed at three locations in the Regional Study Area, with no observations in the Local Study Area. There were no observations for this species the LNR downstream region because pond sampling that could detect this species was not conducted in that region.

American milk-vetch is a stout perennial herb, that grows to 1 m tall, with pinnately compound, nearly hairless leaves. It grows on streambanks and in moist open woods (Johnson *et al.* 1995). American milk-vetch was observed at nine locations in the Regional Study Area, none of which were in the Local Study Area, and 48 additional times in the LNR region.

Oblong-leaved sundew is a small, stemless, insectivorous herb that grows to 17 cm tall, its leaves are long and narrow, covered in sticky hairs and grow in a rosette. It grows in rich fens and pond edges (Johnson *et al.* 1995). Oblong-leaved sundew was probably more common than suggested by field

records. Oblong-leaved sundew is hard to detect, being a miniscule plant that blends in well with its background. Oblong-leaved sundew was observed at four locations in the Regional Study Area, two of which were in the Local Study Area and. All of the recorded field locations were in collapse scars or horizontal fens, which were common in the Regional Study Area. Oblong-leaved sundew was observed at an additional 23 locations in the LNR region.

Based on herbarium records, floras and the literature, there are 50 other provincially very rare to uncommon species that could potentially occur in the Regional Study Area (Appendix 3E, Table 3-28). Of these species, 12 are ranked as provincially very rare (S1-S1S2), 35 as provincially rare (S2-S2S3) and the rest as provincially uncommon (S3). The five potentially occurring species that were found northeast of the Regional Study Area during sampling were Herriot's sage (*Artemisia tilesii*), fewflower sedge (*Carex pauciflora*), Lapland lousewort (*Pedicularis lapponica*), muskeg lousewort (*Pedicularis macrodonta*) and northern spike-moss (*Selaginella selaginoides*).

Table 3-5: Number of Locations - Provincially Rare to Uncommon Plant Species Found During Field Studies in the Regional Study Area and Other Areas

	Species[2]		Number of Field Records	
MBCDC S-Rank[1]	Scientific Name	Common Name	Regional Study Area	Areas Northeast of the Regional Study Area
Found in the Regional Study Area				
S1S2	*Crepis elegans*	Elegant hawk's-beard	9	2
S2	*Potamogeton pusillus ssp. tenuissimus*	Small pondweed	27	0*
S2	*Potamogeton robbinsii*	Robbin's pondweed	20	0*
S3	*Astragalus americanus*	American milk-vetch	9	48
S3	*Drosera anglica*	Oblong-leaved sundew	4	23
S3	*Salix arbusculoides*	Shrubby willow	38	745
S3	*Salix vestita*	Rock willow	26	399
S3?	*Zannichellia palustris*	Horned pondweed	3	2
Found northeast of the Regional Study Area				
S1	*Ranunculus hyperboreus*	Boreal buttercup	0	3
S2	*Argentina egedii*	Egede's cinquefoil	0	1
S2	*Artemisia tilesii (P)*	Mountain sagewort	0	105
S2	*Listera borealis*	Northern twayblade	0	3
S2	*Pedicularis macrodonta (P)*	Swamp lousewort	0	12
S2	*Selaginella selaginoides (P)*	Club spikemoss	0	19

Table 3-5: Number of Locations - Provincially Rare to Uncommon Plant Species Found During Field Studies in the Regional Study Area and Other Areas

MBCDC S-Rank[1]	Species[2]		Number of Field Records	
	Scientific Name	Common Name	Regional Study Area	Areas Northeast of the Regional Study Area
S2	*Drosera linearis*	Slender-leaved sundew	0	2
S2?	*Danthonia intermedia*	Poverty oat-grass	0	1
S2S3	*Pedicularis lapponica (P)*	Lapland lousewort	0	1
S3	*Anemone richardsonii*	Yellow anemone	0	2
S3	*Carex pauciflora (P)*	Few-flowered sedge	0	1
S3	*Chamerion latifolium*	Broad-leaved willowherb	0	8
S3	*Primula stricta*	Erect primrose	0	1
S3	*Puccinellia phryganodes*	Salt-meadow grass	0	3
S3	*Salix reticulata*	Net-veined willow	0	1
S3	*Tanacetum bipinnatum*	Lake Huron tansy	0	27
S3	*Utricularia cornuta*	Horned bladderwort	0	1
S3?	*Juncus castaneus*	Chestnut rush	0	2
S3?	*Rhynchospora alba*	White beak-rush	0	6

Note: Species with a (P) were not recorded in Regional Study Area, but had the potential to occur there.
[1] MBCDC Ranking Codes: S1= Very rare throughout its range or in the Province. May be especially vulnerable to extirpation., S2= Rare throughout its range or in the Province. May be vulnerable to extirpation., S3=Uncommon, S3S4 and S3?= Uncommon to apparently secure, S4= Widespread, abundant, and apparently secure throughout its range or in the Province, with many occurrences, but the element is of long-term concern, S5= Demonstrably widespread, abundant, and secure throughout its range or in the Province, and essentially irradicable under present conditions, SNA= A conservation status rank is not applicable to the element; ?= Inexact; S#S#= A range between two of the numeric ranks. Denotes range of uncertainty about the exact rarity of the species. [2] Nomenclature follows Flora of North America (FNA) where volumes currently exist for the genus and the Manitoba Conservation Data Centre elsewhere.
* Pond sampling that could detect this species was not conducted in the downstream study area.

Regionally Rare Plant Species

Appendix 3E, Table 3-28 identifies the 29 regionally rare plant species, which includes one tree, two shrubs, 21 herbs and five grasses and sedges. Map 3-7 shows the locations where Project field studies recorded these species.

Regarding very general habitat associations for these species, 14 were upland species, 15 were wetland/peatland species, five were shoreline wetland species and two did not have identified habitat associations. Six of the regionally rare species occurred in shoreline wetlands but were more commonly found in uplands or other types of wetlands. Of the upland species, six also occurred on disturbed sites, such as roadsides or borrow pits.

Plant Species at a Range Limit

The literature reports that jack pine and white birch approach their northeastern range limit in Manitoba slightly downstream of Stephen's Lake (Burns and Honkala 1990, FNA 1993+, Reaume 2009). White birch was not included as a range limit species because white birch and Alaskan birch (*Betula neoalaskana*) were treated as one taxon during field studies. These two species are similar in appearance, are difficult to distinguish in the field and their ranges overlap in the Regional Study Area. Alaskan birch is not near a range limit in the Regional Study Area.

Nine other vascular plant species may be near a range limit in the Regional Study Area (Appendix 3E, Table 3-28). Map 3-8 shows the locations where Project field studies recorded these species with one exception. Jack pine is not shown on this map because the habitat mapping provides a more reliable representation of its distribution and abundance.

Rock willow, shrubby willow, northern Labrador tea (*Rhododendron tomentosum*) and arctic wintergreen (*Pyrola grandiflora*) are all growing at the southern edge of their distributions in the Regional Study Area. Elegant hawk's-beard, goldthread (*Coptis trifolia*), hairy goldenrod (*Solidago hispida*), wolf-willow (*Elaeagnus commutata*) and small yellow pond-lily (*Nuphar variegata*) are all growing at the northern edge of their distributions in the Regional Study Area

Plant Species of Particular Interest to the KCNs

Plants identified as being of particular interest to the KCNs (Table 3-6) were sweet flag (*Acorus americanus*; locally known as ginger root in English and *wekes*, *wekas* or *wihkis* in Cree), white birch (*Betula papyrifera/neoalaskana*; *asatee*), strawberries (*Fragaria virginiana*; *odahihminah*), northern Labrador tea, currants and gooseberries (*Ribes lacustre or Ribes triste*; e*komina* or a*nikimina*), cloudberries (*Rubus chamaemorus*; *oostigonihminah* or *ostikonihminah*), red raspberry (*Rubus ideaus*; *anouskanuk*), dewberry (Rubus pubescens; *ooskeesihikoominh*), bog bilberry (blueberries) (*Vaccinium uliginosum*; *niskeminah*) and rock cranberry (cranberries) (*Vaccinium vitis-idaea*; *wesahkeminah*). In order to gather additional information on traditional plants prior to construction, a KCNs traditional plants workshop is planned for the summer of 2012 to share information regarding plants in the Keeyask area.

Table 3-6: Number of Locations – Species of Particular Interest to the KCNs Found During Field Studies in the Regional Study Area and Other Areas

Species		Number of Field Records		
Common Name (Scientific Name)	**Cree Name**	**Local Study Area**	**Regional Study Area**	**Areas Northeast of the Regional Study Area**
Sweet flag *(Acorus americanus)*	*wekes, wekas, wihkis*	0	0	0

Table 3-6: Number of Locations – Species of Particular Interest to the KCNs Found During Field Studies in the Regional Study Area and Other Areas

Species		Number of Field Records		
Common Name (Scientific Name)	**Cree Name**	**Local Study Area**	**Regional Study Area**	**Areas Northeast of the Regional Study Area**
White birch *(Betula papyrifera/neoalaskana)*	*Asatee*	82	197	181
Strawberry *(Fragaria virginiana)*	*odahihminah*	21	34	344
Labrador tea *(Rhododendron tomentosum)*		1	7	221
Currant *(Ribes lacustre)*	*ekomina, anikimina*	0	3	70
Gooseberry *(Ribes triste)*	*ekomina, anikimina*	18	66	285
Cloudberry *(Rubus chamaemorus)*	*oostigonihminah, ostikonihminah*	55	178	304
Red raspberry *(Rubus ideaus)*	*anouskanuk*	10	30	123
Dewberry *(Rubus pubescens)*	*ooskeesihikoominh*	17	55	356
Blueberry *(Vaccinium uliginosum)*	*niskeminah*	92	309	986
Rock cranberry *(Vaccinium vitis-idaea)*	*wesahkeminah*	144	392	844

[2] Nomenclature follows Flora of North America (FNA) where volumes currently exist for the genus and the Manitoba Conservation Data Centre elsewhere for latin names and Split Lake Cree 1996a,d, WLFN 2002, FLCN 2008, FLCN Traditional Knowledge Report 2010 Draft, YFFN 2011, CNP Keeyask Environmental Evaluation Report, FLCN Environment Evaluation Report (Draft) for Cree names

3.3.3 Current Trends (no future climate change)

Past and existing human impacts and climate change are expected to continue to drive future habitat change in the Regional Study Area even if the Project does not proceed, which would affect priority plants directly and indirectly through habitat effects. Ongoing shoreline erosion will continue to remove terrestrial plants and their habitat. For example, it is estimated that approximately 91 ha of inland habitat would be lost to ongoing mineral bank erosion in the Keeyask reach of the Nelson River between 2006–2047 (equivalent to 30 years post-Project; see Section 2.2.4). Due to the higher proportion of mineral ecosites along the Nelson River banks, and the disproportionate effects of shoreline erosion on mineral banks, it is predicted that a higher proportion of priority plant species associated with mineral ecosites would be lost to ongoing erosion. Plant species associated with the black spruce dominant on mineral and tall shrub on riparian peatland habitat types could be among the most highly affected species based on projections of shoreline erosion losses for these priority habitat types (see Section 2.7.3.3).

It was estimated that the ongoing effects of past climate change will convert at least one-quarter of the remaining peat plateau bog to open water and other peatland types by 2047. Priority plant species associated with these habitat types could also be disproportionately affected by past climate change.

3.4 PROJECT EFFECTS, MITIGATION AND MONITORING

3.4.1 Introduction

Section 1.6 of the TE SV provided an overview of the Project impacts during construction and operation that were relevant for the terrestrial assessment. Sections 2.2 and 2.3 translated those impacts into direct and indirect residual Project effects on habitat and ecosystems. This section outlines the potential direct and indirect Project effects on the plant key topics.

Direct Project effects on terrestrial plants will include loss and disturbance of plants and plant populations as well as loss, alteration and disturbance of their habitats in the Project Footprint and any Project activities that may ultimately occur outside of the Project Footprint, if any (for Project Footprint details see Section 1.6). These direct effects will lead to indirect effects on terrestrial plants, both within the Project Footprint and in some adjacent areas surrounding the physical footprint, through pathways such as edge effects and altered groundwater levels. That is, a Project impact creates indirect effects on plants, which are referred to as the terrestrial plants zone of influence.

A particular indirect effect can be several stages removed from the direct Project effect (see Section 1 Figure 1.3-1). For example, clearing trees on permafrost soils often leads to higher soil temperatures within and adjacent to the cleared area. Many of the potential pathways for Project effects on plants are demonstrated in Figure 3-2.

The size and nature of an impact's zone of influence will be a function of how the impact interacts with the plant species of interest and local conditions. For example, vegetation clearing in dense, mature forest on permafrost soils will have a much larger zone of influence than vegetation clearing on a bedrock

outcrop. The nature and spatial extent of indirect effects on plants and their habitat will range from not measurable to conversion to aquatic vegetation. In general, Project effects on plants were expected to decline with distance from the Project Footprint and be confined to the habitat zone of influence that is described in Section 2.2.5. The spatial extent of the Project zone of influence on terrestrial plants (*i.e.*, the terrestrial plants zone of influence) was expected to be the same as the terrestrial habitat zone of influence.

Improved access is another potentially important pathway for indirect Project effects on terrestrial plants since this will bring more equipment, material and/or people into an area, which could lead to increased resource harvesting, invasive plant spreading and/or human-caused fires, among other things.

The remainder of this section summarizes potential Project effects on invasive and priority plants during construction and operation. It should be noted that Section 3 uses the term zone of influence to refer either to the concept of indirect effects on terrestrial plants or the expected (*i.e.*, most likely) spatial extent of indirect on terrestrial plants. The Local Study Area encompasses the predicted maximum potential (*i.e.*, worst case scenario) spatial extent of indirect effects.

3.4.2 Invasive Plants

3.4.2.1 Construction Period

3.4.2.1.1 Potential Project Effects

Invasive species could become a problem if the Project directly and/or indirectly: (i) introduces or spreads large numbers of seeds or other types of propagules; and/or (ii) creates a large area with ideal conditions for the colonization of invasive species. Invasive plants could be introduced and/or further spread through various types of activities such as seeding cleared areas to control erosion, workers transporting seeds or other types of propagules on their footwear or vehicles and/or propagules being transported on construction equipment moved from distant areas. A severe accidental Project-related fire could create ideal conditions for some invasive species by killing off a high proportion of the plant propagules and/or burning off the surface organic layer to expose the mineral soil. Invasive plant colonization centres could also be created in temporarily cleared areas.

As described in Section 3.3.2.2, five of the plant species that are moderately to highly invasive in some parts of Canada are present in Manitoba. The risk that any of these species will become a problem in the Local Study Area is probably low over the short-term at least. Field studies conducted near existing developments in northern Manitoba, which included several generating stations, indicated invasive plants have been largely confined to human disturbed areas and have not been crowding out native plant species in adjacent native habitat.

Invasive plants could potentially establish in temporarily cleared areas and EMPAs where site conditions are favorable and other vegetation does not become established. Such areas can serve as centres that support colonization of surrounding areas.

To address invasive species threats, the *Invasive Alien Species Strategy For Canada* (Anonymous 2004) recommends "a hierarchical approach that prioritizes:

1. prevention of new invasions;
2. early detection of new invaders;
3. rapid response to new invaders; and
4. management of established and spreading invaders (containment, eradication, and control)."

3.4.2.1.2 Mitigation

Mitigation will include the following measures specifically targeted towards minimizing the risk of introducing, spreading or promoting invasive plants:

- Temporarily cleared areas will be revegetated or treated with a non-invasive ground cover as soon as practicable during construction;
- Contractors utilizing equipment and machinery that was recently used more than 150 km from the Project area will wash that equipment and machinery prior to transport to the Project area;
- Where seeding is used as a rehabilitation or erosion control measure, the seed mixture will only contain native species and/or non-invasive introduced plant species;
- Containment, eradication, and/or control programs will be implemented if monitoring identifies problems with invasive plants;
- Contractors will be educated about the importance of cleaning their vehicles, equipment and footwear before travelling to the area; and,
- Except for existing resource-use trails (see Construction Access Management Plan), Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project Footprint will be revegetated to minimize the risk of invasive plant, accidental fire and other access-related effects.

A severe fire can create favorable conditions for invasive plant spread by burning off most or all of the surface organic layer. The risk that such a fire may occur, or that the proposed Project will affect fire intensity and/or severity will be minimized through the EnvPP measures that are described under the fire regime supporting topic (Section 2.5.4).

3.4.2.1.3 Residual Effects

Past and current projects and activities, as well as natural dispersal processes, have introduced and will continue to introduce and spread invasive plants into the Local Study Area. With mitigation, Project construction is not expected to substantially increase the rate at which invasive plants are introduced and/or spread in the Local Study Area.

3.4.2.2 Operation Period

3.4.2.2.1 Potential Project Effects

Potential Project effects during operation include introducing and/or spreading invasive plants and/or creating favorable conditions for invasive plant establishment. Although the potential for the Project to

promote invasive plants will decline dramatically during operation because Project-related activities will decline, better access to the Local Study Area would increase the potential for people passing through or using the area to introduce and/or further spread invasive plants. Better access also increases the risk of fire-related effects.

3.4.2.2.2 Mitigation

Mitigation during operation will include the following measures specifically targeted towards minimizing the risk of introducing, spreading or promoting invasive plants:

- Where seeding is used as a rehabilitation or erosion control measure, the seed mixture will only contain native species and/or non-invasive introduced plant species;
- Containment, eradication, and/or control programs will be implemented if monitoring identifies problems with invasive plants within the areas that remain as permanent infrastructure and along reservoir shorelines; and,
- Except for existing resource-use trails (see Construction Access Management Plan), Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project Footprint will be revegetated to minimize the risk of invasive plant, accidental fire and other access-related effects.

3.4.2.2.3 Residual Effects

With mitigation, Project operation is not expected to substantially increase the rate at which invasive plants are introduced and/or spread in the Local Study Area.

3.4.2.3 Residual Effects Conclusion

Past and current projects and activities, as well as natural dispersal processes, have introduced and spread invasive plants into the Local Study Area. The Project could further spread invasive plants already in the Local Study Area and/or introduce new invasive plant species. It is anticipated that mitigation measures will minimize the risk that this will occur and provide a means to control the spread of invasive plants, should they become a problem. With mitigation, the Project is not expected to substantially increase the rate at which invasive plants are introduced and/or spread in the Local Study Area.

3.4.2.4 Uncertainty

Overall, the uncertainty related to the invasive plant assessment is moderately low. Past experience has shown that invasive plants are typically confined to disturbed areas in the Regional Study Area. Although future changes to environmental conditions could enhance the competitive abilities of some species, eradication and control measures are expected to be effective for some situations at least.

3.4.2.5 Environmental Monitoring and Follow-up

Invasive plant monitoring will include periodic surveys to determine if the Project is further introducing and/or spreading invasive plants. Monitoring details are provided in the Terrestrial Environment Monitoring Plan (Manitoba Hydro.2012b).

3.4.3 Priority Plants

3.4.3.1 Construction Period

3.4.3.1.1 Potential Project Effects

Potential Project effects on priority plants during construction include removing and disturbing individual plants and plant populations as well as removing, altering or disturbing their habitats through the direct and indirect effects described in Section 3.4.1.

Endangered and Threatened Plant Species

Project effects on endangered or threatened plant species during construction are not expected since none of these species are either known to occur or expected to occur within the terrestrial plants zone of influence (see Section 3.3.2.3).

Provincially Very Rare to Uncommon Plant Species

Project effects on provincially very rare plant species are not expected since none were found during extensive field studies in the Regional Study Area and Project effects on their anticipated habitats are expected to be nil or low, depending on the species (see Section 3.3.2.3).

Elegant hawk's-beard was the only species found during field studies with an uncertain rank of provincially very rare or rare. The likelihood that it occurs in the Local Study Area is considered to be low because it was not found there during extensive field studies in the Local Study Area and its recorded local habitat is roadsides.

The following four of the seven provincially rare to uncommon plant species that could potentially occur in the Regional Study Area (Section 3.3.2.3) were recorded in the Project Footprint and terrestrial plants zone of influence during field studies: small pondweed, oblong-leaved sundew, rock willow and shrubby willow (Table 3-7; Map 3-5; Map 3-6).

Project effects on small pondweed are expected to be low. Four of the recorded locations within the Project Footprint and terrestrial plants zone of influence were in one pond on the west side of Gull Lake. Small pondweed was observed at 23 locations in five more ponds in the Regional Study Area (Section 3.3.2.3). After correcting for differences in sampling intensity (see Section 3.2.4.2), approximately 0.5% of the recorded locations in the Regional Study Area locations were within the Project Footprint and terrestrial plants zone of influence (Table 3-7). Small pondweed is probably a regionally common pond species (it was found in 50% of the ponds sampled) and there are more than 3,000 ponds in the Regional Study Area.

Project effects on oblong-leaved sundew are expected to be low. After correcting for differences in sampling intensity, approximately 3% of the recorded locations in the Regional Study Area locations were within the Project Footprint and terrestrial plants zone of influence (Table 3-7). Oblong-leaved sundew was probably more common in the Regional Study Area than suggested by its provincial S-Rank (Section 3.3.2.3). This species is difficult to detect, being small and inconspicuous. In addition, all of the recorded

field locations were in collapse scars and horizontal fens, which were more common in the Regional Study Area than the Local Study Area.

Project effects on rock willow are expected to be low. After correcting for differences in sampling intensity, the estimated percentage of locations in the Regional Study Area falling within the Project Footprint and zone of influence is approximately 2% (Table 3-7).

Project effects on shrubby willow are expected to be low. Approximately 1% of the estimated number of shrubby willow locations in the Regional Study Area were within the Project Footprint and terrestrial plants zone of influence Table 3-7. Shrubby willow was found at an additional 745 locations further downstream. Shrubby willow was often recorded on veneer bogs on slopes, which is a common habitat in the habitat Regional Study Area.

Section 3.3.2.4 identified an additional 50 species ranked as being of provincial conservation concern that were not found but could potentially occur in the Project Footprint or terrestrial plants zone of influence. Of these, the 42 species ranked S1 to S2 (Appendix 3B, Table 3-9) are of highest concern. None of these species were found in the Project Footprint or terrestrial plants zone of influence despite extensive surveys in these areas. To the extent that the distributions of the provincially very rare to uncommon plant species are related to terrestrial habitat type, Project-related effects on all of the native broad habitat types are expected to be nil to moderate in magnitude (Sections 2.3.6, 2.6.4, 2.7.4 and 2.8.4).

Regionally Rare and Range Limit Plant Species

Eleven regionally rare species were recorded in the Project Footprint and terrestrial plants zone of influence (Appendix 3E, Table 3-30). Seven range limit plant species were observed at 47 locations within the terrestrial plants zone of influence (Appendix 3E, Table 3-30). Of these, hairy goldenrod, small yellow pond-lily, wolf-willow and northern Labrador-tea were the species not already discussed in the previous section. After correcting for differences in sampling intensity, the estimated percentage of known locations in the Regional Study Area falling within the Project Footprint and terrestrial plants zone of influence is less than approximately 4% for all seven species.

An additional 18 regionally rare species were not encountered but could potentially occur in the Project Footprint or terrestrial plants zone of influence. To the extent that the distributions of these species are related to terrestrial habitat type, Project-related effects on priority plant habitats are expected to be small to moderate in magnitude. As described above, the Project construction is predicted to affect less than 10% of each of the broad habitat types.

Table 3-7: Number of Observations of Provincially Rare Plant Species in the Project Footprint and Other Study Areas

S-Rank	Species		Number of Locations Recorded During Field Studies[1]					Percentage of Estimated Regional Study Area locations in Project Footprint and Zone of Influence[3]
	Scientific Name	Common Name	Project Footprint	Construction Zone of Influence	Operation Zone of Influence	Regional Study Area	Areas Northeast of the Regional Study Area	
S3	*Drosera anglica*	oblong-leaved sundew	2	0	0	4	23	3.0
S2	*Potamogeton pusillus* spp. *tenuissimus*	small pondweed	4	0	0	27	02	0.5
S3	*Salix arbusculoides*	shrubby willow	9	1	0	38	745	1.0
S3	*Salix vestita*	rock willow	7	1	0	26	399	1.2

[1] Number of locations is the total within the area only except for Regional Study Area which includes all of the nested areas within it.
[2] Pond sampling that could detect this species was not conducted in the downstream study area.
[3] Estimated percentage of Regional Study Area locations is after correcting for the much lower sampling density in the Regional Study Area compared with the Project Footprint and terrestrial plants zone of influence using the method described in Section 3.2.4.2.

Plant Species of Particular Interest to the KCNs

Nine of the eleven species identified as being of particular interest to the KCNs were recorded in the terrestrial plants zone of influence. White birch (71 locations), smooth wild strawberry (11 locations), northern Labrador-tea (discussed above), red currant (13 locations), cloudberry (37 locations), red raspberry (10 locations), dewberry (15 locations), bog bilberry (74 locations) and rock cranberry (111 locations) were recorded in the terrestrial plants zone of influence. Substantial Project effects on the KCN species are not expected. Most of the KCNs species are either generally widespread or widespread in their preferred habitat. A small to moderate number of the known locations of each of the remaining species occurs within the terrestrial plants zone of influence. After correcting for differences in sampling intensity, the percentage of affected locations is less than 5% for all species. In addition, to the extent that the distributions of these species are related to terrestrial habitat type, the Project is predicted to affect less than 10% of each of the broad terrestrial habitat types during operation.

3.4.3.1.2 Proposed Mitigation

Mitigation during construction is not proposed for endangered or threatened plant species since none of these species are expected to occur in the Local Study Area.

Because it is possible that existing locations of provincially very rare to rare species were not found, mitigation for these species will include:

- Pre-construction rare plant surveys will be conducted in the Project Footprint and nearby areas that were not previously surveyed and have the highest potential for supporting provincially very rare to rare species; and
- In the unlikely event that a provincially very rare to rare species is discovered in the terrestrial plants zone of influence and there are not at least 20 known healthy patches outside of the terrestrial plants zone of influence, then the discovered locations will be avoided where practicable and where avoidance is not practicable the plants will be transplanted outside of the terrestrial plants zone of influence.

Mitigation for priority plant effects already incorporated into the Project design includes avoiding some priority plant habitats by modifying the south access road route, refining the boundaries of the potential borrow areas and locating the excavated material placement areas away from areas of concern.

Additional mitigation for priority plants during construction will include the following:

- Clearing and disturbance within the Project Footprint will be minimized to the extent practicable;
- Disturbance of areas adjacent to the Project Footprint will be avoided to the extent practicable; and
- Except for existing resource-use trails (see Construction Access Management Plan), Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project Footprint will be revegetated to minimize the risk of invasive plant, accidental fire and other access-related effects.

Ecosystem diversity and wetland function mitigation (see Sections 2.7.4 and 2.8.4) could also benefit priority plants to the extent that a priority plant species is associated with these habitat types.

In extreme cases, a single accidental fire could either extirpate a rare plant species or substantially reduce its abundance, depending on the nature of the fire. Some of the potential effects of accidental fires, such as degrading high-quality priority plant habitat, could persist over the long term. The risk that a Project-related fire may occur or that the proposed Project will alter fire behaviour will be minimized through the EnvPP measures that are described under the Fire Regime key supporting topic (Section 2.5.4).

Invasive plants have the potential to crowd out priority plant species or, in extreme cases, extirpate a species. As explained in (Section 3.4.2), invasive plants are not expected to become a problem within the Local Study Area.

3.4.3.1.3 Residual Effects

After considering mitigation and the effects of other past and existing human features, substantial residual Project effects on priority plants during construction are not expected. None of the species of highest conservation concern are either known or expected to occur in the Local Study Area. For the remaining species, the Project is expected to affect low percentages of their known locations and/or available habitat.

Using the criteria established to determine the significance of Project effects for regulatory purposes (Section 1.4.4), the likely residual effects of Project construction on priority plants are expected to be adverse, medium in geographic extent, long-term in duration and, depending on the species, nil to moderate in magnitude. The moderate magnitude residual effects are expected to be irreversible, continuous in frequency and low in ecological context.

3.4.3.2 Operation Period

3.4.3.2.1 Potential Project Effects

Potential Project effects on priority plants during operation include additional habitat loss, habitat alteration, population reductions, disturbance and access effects. Reservoir expansion, additional edge effects and groundwater-related habitat effects will be the primary pathways for Project effects on priority plants during operation. Habitat recovery in the temporarily cleared areas, disturbed areas and the habitat zone of influence could reduce Project effects on priority plants and their habitats. Better access may increase plant harvesting and/or disturbance.

Endangered and Threatened Plant Species

Project effects on endangered or threatened plant species are not expected during operation since none of these species are either known to occur or expected to occur in the Local Study Area (see Section 2.3.1.4.2).

Provincially Very Rare to Uncommon Plant Species

As described above, Project operation is not anticipated to affect provincially very rare plant species since none are expected to occur within the terrestrial plants zone of influence for Project operation.

Project operation is not expected to affect any provincially rare to uncommon species beyond those already affected during construction nor increase the number of known locations in the Project Footprint and the terrestrial plants zone of influence (Table 3-7; Map 3-5). As described above, Project effects on species known to occur in the Project Footprint and terrestrial plants zone of influence are expected to be low because these species are more common in the Regional Study Area than indicated by their provincial conservation concern ranks.

Although reservoir expansion during the first 30 years of operation could affect additional habitat, Project operation is still predicted to affect less than 10% of each of the broad habitat types that will not eventually disappear due to the lagged effects of past climate change on ground ice.

Regionally Rare and Range Limit Plant Species

Reservoir expansion during the first 30 years of operation is not expected to affect additional known locations of regionally rare and/or range limit species (Appendix 3E, Table 3-30). To the extent the distributions and abundances of these species are related to habitat, the Project is predicted to affect less than 10% of each of the broad terrestrial habitat types during operation.

Plant Species of Particular Interest to the KCNs

One additional location for each of the cloudberry, bog bilberry and rock cranberry are known to occur within the Project Footprint and terrestrial plants zone of influence during operation. Substantial Project effects on these species are not expected since they are generally widespread in their habitats. After correcting for differences in sampling intensity, the percentage of affected locations is less than 5% for all species.

3.4.3.2.2 Proposed Mitigation

Because it is possible that existing locations of provincially very rare to rare species were not found, mitigation for these species will include:

- Pre-construction rare plant surveys will be conducted in the reservoir expansion areas that were not previously surveyed and have high potential for supporting provincially very rare to rare species; and
- In the unlikely event that a provincially very rare to rare species is discovered in the reservoir expansion area, the plants will be transplanted outside of the terrestrial plants zone of influence.

Improved access when the north and south access roads become part of PR 280 could increase harvesting and/or habitat alteration for some priority plant species. The effects of improved access on priority plants due to potential Project effects on invasive plants and the fire regime are expected to be small assuming that the EnvPP measures are effective (Sections 2.4.6 and 3.4.2 in the TE SV).

Mitigation for habitat effects provided by the mitigation for priority habitats and wetland function could benefit priority plants to the extent that a species is associated with these habitat types.

As described above, the risks that there would be adverse Project effects on priority plants due to invasive plants and fire regime changes should be low assuming that the EnvPP measures are effective.

3.4.3.2.3 Residual Effects

After considering mitigation and the effects of other Past and current projects and activities, substantial residual Project effects on priority plants during operation are not expected. None of the species of highest conservation concern are either known or expected to occur in the Local Study Area. For the remaining species, the Project is expected to affect low percentages of their known locations and/or available habitat.

Using the criteria established to determine the significance of Project effects for regulatory purposes (Section 1.4.4), the likely residual effects of Project construction on priority plants are expected to be adverse, medium in geographic extent, long-term in duration and, depending on the species, nil to moderate in magnitude. The moderate magnitude residual effects are expected to be irreversible, continuous in frequency and low in ecological context.

3.4.3.3 Residual Effects Conclusion

Overall, the likely Project residual effects on priority plants are expected to be adverse but regionally acceptable. Project effects on endangered or threatened plant species are not expected since none of these species are either known to occur or are expected to occur in areas affected by the Project. Effects on the species of particular interest to the KCNs are expected to be low because most of these species are widespread in appropriate habitats and the percentages of known locations and available habitat affected by the Project are low. While the Project would affect the locations and/or habitat for some of the remaining priority plant species, the magnitude of these effects is anticipated to range from small to moderate, depending on the species, based on the percentage of known locations affected and/or the cumulative percentage area losses for the native habitat types. Regarding ecological context for species with moderate magnitude effects, although population trend information for these species in the Regional Study Area is not available, there are no substantial ongoing adverse trends in the amounts of native habitat types. Additional pre-construction mitigation has been included for the species of highest conservation concern to address the unlikely event that patches of these species exist but have not been discovered to date due to the rarity of the species.

3.4.3.4 Uncertainty

Overall, the uncertainty related to the priority plant assessment is expected to be moderately low. Endangered or threatened species, the species of highest concern, are not expected to occur in the Local Study Area. The extensive field surveys conducted in the Regional Study Area indicate that it is unlikely that provincially very rare or rare species that are not regionally common occur in the Project Footprint and terrestrial plants zone of influence. Practicable mitigation is available in the unlikely event that any such species are discovered within the terrestrial plants zone of influence during subsequent fieldwork.

For the remaining priority plants, uncertainty is expected to range from moderately low to moderate. While the estimated proportions of affected locations in the Regional Study Area is low for each species, there is a limited understanding of the factors that substantially influence the abundance and distribution for many of these species due to their rarity. To the extent these species are as common as their habitat, uncertainty related to effects on priority plant habitats is moderately low to moderate (Sections 2.6.4.4 and 2.7.4.4).

3.4.3.5 Environmental Monitoring and Follow-up

Priority plant monitoring will include confirming that any rare plant patches marked for avoidance are not disturbed and documenting the actual direct and indirect effects on selected priority plant species and/or their habitats. Monitoring details are provided in the Terrestrial Environment Monitoring Plan (Manitoba Hydro. 2012b).

3.5 CUMULATIVE EFFECTS WITH FUTURE PROJECTS

3.5.1 Introduction

As described in the Response to the EIS Guidelines Section 7.2, VECs with adverse residual effects were evaluated for cumulative effects with reasonably foreseeable future projects or human activities. This section provides the assessment of cumulative effects of the Project with future projects or human activities. The effects of past and current projects and activities was described in the preceding sections as a component of the residual effects assessment for the priority plants VEC.

By focusing on individual environmental components, the VEC approach does not capture the broader concept of the Cree worldview, which emphasizes that all things are interconnected and should be viewed as a whole. An understanding of this worldview, as expressed by the KCN is provided in Response to the EIS Guidelines Chapter 2, Partners' Context, Worldviews and Evaluation Process (Response to the EIS Guidelines Section 2.2), and in the KCNs' community reports. However, where ATK of specific environmental components was incorporated into the assessment, this is reflected in the CEA results.

See Response to the EIS Guidelines Section 7.2 for a description of the approach used for the assessment of cumulative effects of the Project with future projects and activities. The reasonably foreseeable future projects and activities considered for the cumulative effects with future projects were Bipole III Transmission Project, Keeyask Transmission Project, Gillam Redevelopment and Conawapa Generation Project

3.5.2 Priority Plants

Effects from all of the future projects would overlap spatially and temporally with residual Project effects on priority plants. All of these future projects, except for the Conawapa Generation Project, are expected to remove individual plants and their habitat and alter plant populations. Transportation and increased

activity along PR 280 for the Conawapa Generation Project could spread invasive plants and increase the risk of access-related effects.

Field studies have been conducted within and near the anticipated locations of the Keeyask Transmission Project ROWs. Additional locations of provincially very rare or rare were not discovered in these areas during these field studies. A few additional locations for four of the provincially uncommon species could be affected (*i.e.*, American milk-vetch, oblong-leaved sundew, shrubby willow and rock willow), depending on the final ROW location. As described above, all of these species except American milk-vetch appear to be regionally common so the small number of additional affected locations are not expected to alter the residual effects conclusions for these species. The records for American milk-vetch were at two general locations. Substantially higher residual Project effects are not expected for American milk-vetch since this species is expected to have nil residual Project effects (no known locations in the Project Footprint and terrestrial plants zone of influence).

Field studies were not conducted within the anticipated locations of the Bipole Transmission Project ROW or the Gillam Redevelopment area.

Based on the potential for species of high conservation concern to occur in the Regional Study Area and the known locations of the remaining priority plant species and their habitats, cumulative losses for all priority plants are predicted to remain in the nil to moderate magnitude range, depending on the species.

3.5.3 Sensitivity of Predictions to Future Climate Change

As described in the TE SV Section 2.3.2, climate change scenarios, on average, project increasing temperatures and precipitation in the Project area. Winter is projected to experience the greatest change with annual temperature and precipitation changes increasing between the 2020s and the 2080s. A smaller subset of climate change scenarios also project increasing evapotranspiration for the same time periods, although climate modeling uncertainty is not well captured in the limited subset of scenarios.

Potential effects of future climate change on predicted residual Project effects for the physical environment that are relevant for the terrestrial plants assessment are a possible increase in reservoir area and the rate at which the reservoir expands after the fifth year of operation (PE SV Section 11.4). These changes would create relatively small increases in the amounts of peatland loss. A longer reservoir shoreline could increase the amount of Nelson River shoreline wetland.

Potential effects of future climate change on the terrestrial habitat residual Project effects predictions that are relevant for the terrestrial plants assessment are a relatively small increase to total terrestrial habitat loss, which could slightly alter the proportions of the common and uncommon habitat types and increase effects on some of the regionally rare habitat types. For many of these types, the increases would need to be quite large to increase effects from moderate to high magnitude, especially considering that the most highly affected types will be given preference in the rehabilitation plan. Higher reservoir expansion would predominantly affect the very wet peatland types, which to some extent would be offset by development of Nelson River shoreline wetland area. These beneficial offsets relative to the very wet peatland types were not considered in the calculation of net effects on priority habitats.

The predicted future changes to climate could also alter the invasive plants and priority plants residual effects predictions through the following anticipated changes to drivers:

- Longer growing season;
- Higher evapotranspiration;
- Droughts, especially in the fall, may be more frequent and more severe;
- Extreme weather events may be more frequent and more severe;
- Heat waves may be more frequent and more severe;
- Large fires could become more frequent and possibly more severe; and
- Accelerated permafrost melting.

3.5.3.1 Invasive Plants

Over the longer-term, climate change could alter conditions to the extent that some invasive species spread more rapidly and/or become more highly invasive in the Regional Study Area. To the extent this occurs, control and eradication may become more difficult. Should this occur, a potential response is to implement control and eradication measures more aggressively and/or to test alternative control and eradication measures.

3.5.3.2 Priority Plants

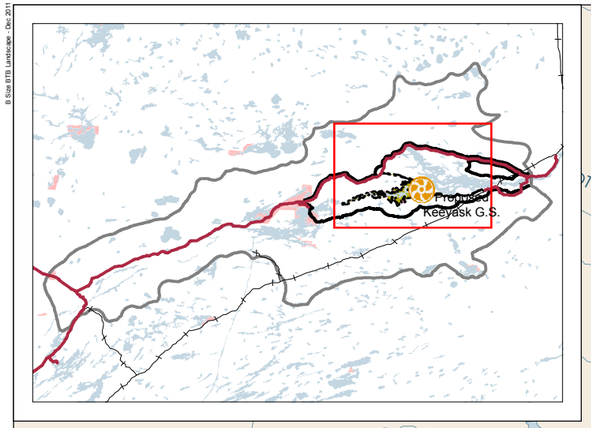
Potential effects of future climate change on the priority plants residual effects predictions are as follows. Since terrestrial habitat predictions are the key component for effects on all of the priority plants, it is unlikely that potential climate-induced increases to Project-related priority plant habitat effects would be sufficiently large to substantially alter the Project effects predictions.

3.6 ENVIRONMENTAL MONITORING AND FOLLOW-UP

Monitoring will be required to verify the short and long-term effects of the Project on plants. The recommended monitoring and follow-up includes both VECs and some supporting topics during construction and operation phases (Table 3-8). While this table provides a summary of the topics and species requiring monitoring, information on the methods and procedures are outlined in the Terrestrial Effects Monitoring Program and will be provided in further detail as the Monitoring and Follow-up Plans are developed during the review process. Monitoring is planned for situations where the ATK and technical assessments differ, where a prediction has substantial uncertainty or a difference between predicted and actual residual effects could substantially alter the effects assessment.

Table 3-8: Monitoring and Follow-Up Program for Terrestrial Plants

Supporting Topic / VEC	Issue / Rationale	Monitoring	Timelines
Priority Plants (VEC)	• To verify that the priority plant patches that are to be avoided are not disturbed. • To verify predicted effects on priority plant species.	• Monitor to confirm avoidance of priority plant patches. • Monitor effects on priority plants and their habitat using terrestrial habitat monitoring data.	Regularly during clearing activities. See Terrestrial Habitat Monitoring Section.
Invasive Plants (Supporting Topic)	• To verify that mitigation measures limit the further introduction and spreading of invasive non-native plants.	• Conduct invasive plant surveys within and near to the Project Footprint.	Periodically during construction and first five years of operation.



KEEYASK
Hydropower Limited Partnership

DATA SOURCE: Study areas and Nelson River shoreline - ECOSTEM Ltd.; Water - NTS; Roads and rail - Manitoba Conservation.		
CREATED BY: ECOSTEM Ltd.		
COORDINATE SYSTEM: UTM NAD 1983 Z15N	**DATE CREATED:** 14-MAY-12	**REVISION DATE:** 14-MAY-12
0 4 8 Kilometres / 0 2 4 Miles	**VERSION NO:** 1.0	**QA/QC:** JWE/YYY/ZZZ

Legend

Study Areas

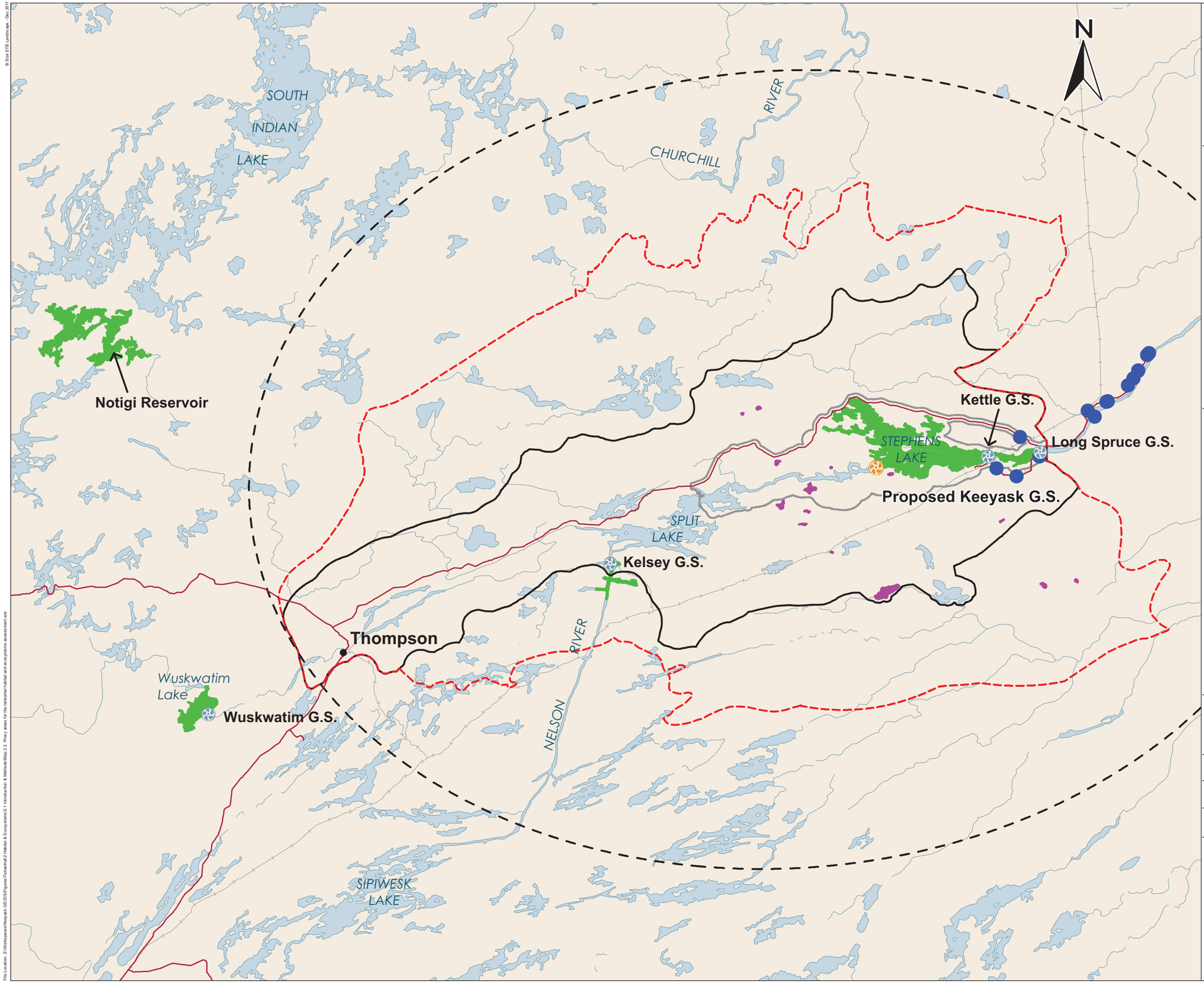
- Expected Zone of Influence on Terrestrial Plants During Construction
- Expected Additional Zone of Influence on Terrestrial Plants During Operation
- Terrestrial Plants Local Study Area
- Study Zone 4
- Terrestrial Plants Regional Study Area

Terrestrial Plants Study Areas

Map 3-1

File Location: Z:\Workspaces\Keeyask GIS\ESF\gures\Terrestrial\3 Plants\Terrestrial Plant Study Areas.wor

B Size ETB Landscape - Dec 2011



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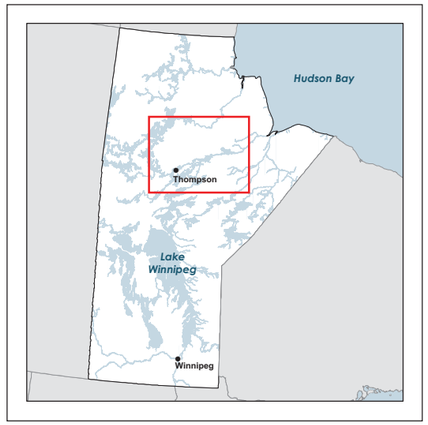
Legend

Proxy and Benchmark Areas

- Benchmark Area - Shoreline Wetland
- Proxy Area - Shoreline Wetland
- Proxy Area - Habitat Regeneration

Study Areas

- Study Zone 4
- Study Zone 5
- Study Zone 6
- Keeyask Generation Project Area



DATA SOURCE:
Study areas, Nelson River, proxy and benchmark areas - ECOSTEM Ltd.; Water- NTS; Roads and rail - Manitoba Conservation.

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ECOSTEM Ltd.

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	17-APR-12	31-MAY-12
0 20 40 Kilometres 0 10 20 Miles	VERSION NO: 1.0	QA/QC: APPROVED

Proxy and Benchmark Areas

Map 3-2

LIMESTONE LAKE

NORTH MOSWAKOT RIVER

SOUTH MOSWAKOT RIVER

PR 280

LIMESTONE RIVER

N

Ferris Bay

STEPHENS LAKE

Proposed Keeyask G.S.

NELSON RIVER

GULL LAKE

CLARK LAKE

SPLIT LAKE

RIVER

BUTNAU RIVER

KETTLE RIVER

KEEYASK
Hydropower Limited Partnership

DATA SOURCE:
Sample locations, study areas and Nelson River shoreline - ECOSTEM Ltd.; Water and rail - NTS; Roads - Manitoba Conservation

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COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	16-MAY-12	16-MAY-12
0 3 6 Kilometres / 0 1.5 3 Miles	VERSION NO: 1.0	QA/QC: JWE/YYY/ZZZ

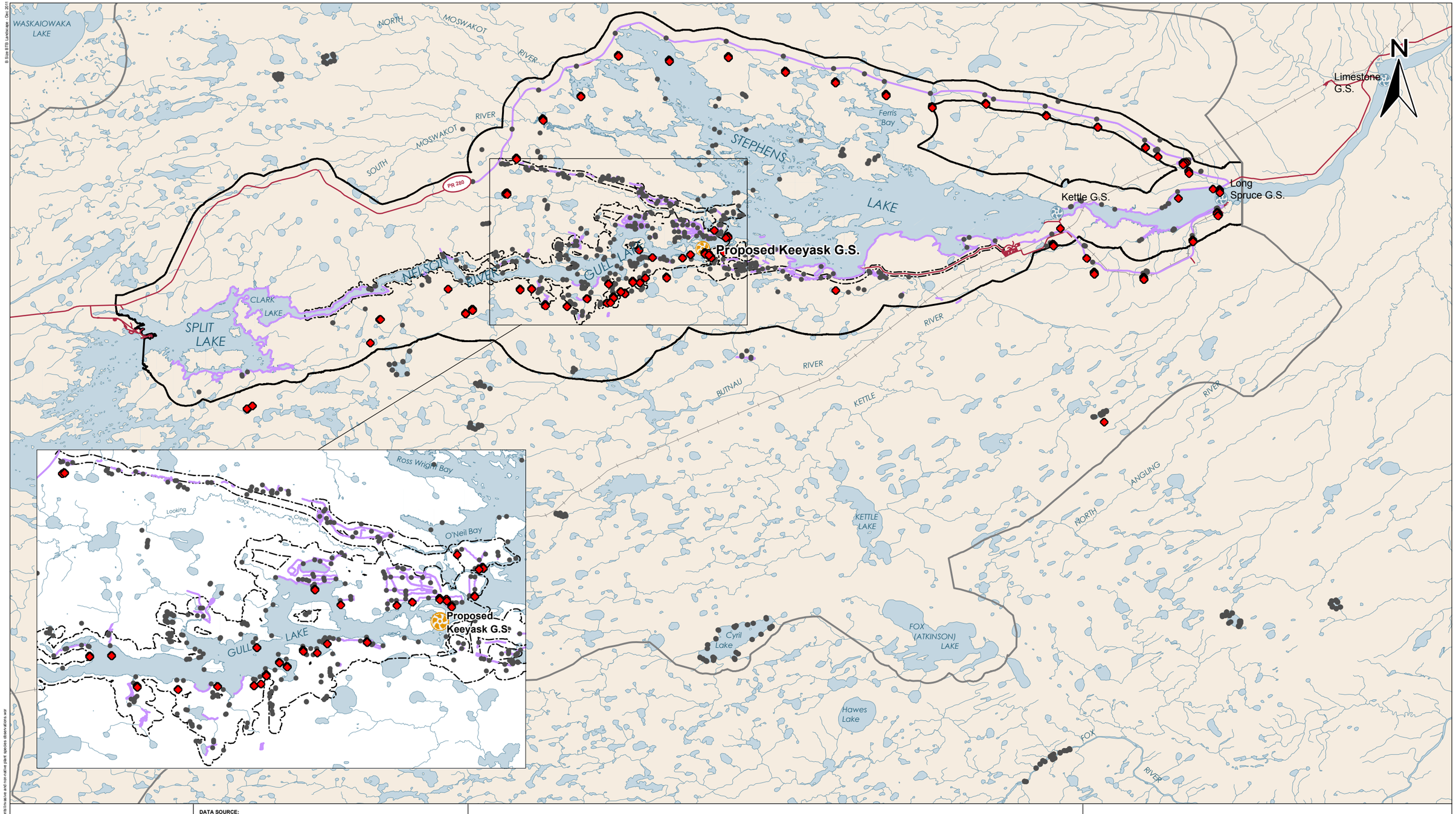
Legend

Sample Transect Survey Method
- Boat
- Helicopter
- On Foot

Study Areas
- Terrestrial Plants Local Study Area
- Study Zone 4

Additional Invasive and Priority Plant Sample Locations

Map 3-3



DATA SOURCE:
Study areas, observed and sample locations and Nelson River shoreline - ECOSTEM Ltd.; Water - NTS; Roads and rail - Manitoba Conservation.

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UTM NAD 1983 Z15N	15-MAY-12	31-MAY-12
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Legend

Sample Locations
- Invasive Species

Sample locations
- Sample Plot
- Sample Transect

Study Areas
- Terrestrial Plants Local Study Area
- Study Zone 4
- Terrestrial Plants Regional Study Area

Locations of Invasive Plant Species Observed During Project Field Studies

Map 3-4

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WASKAIOWAKA LAKE
NORTH MOSWAKOT RIVER
SOUTH MOSWAKOT RIVER
PR 280
STEPHENS LAKE
Ferris Bay
Limestone G.S.
Long Spruce G.S.
Kettle G.S.
Proposed Keeyask G.S.
NELSON RIVER
GULL LAKE
CLARK LAKE
SPLIT LAKE
BUTNAU RIVER
KETTLE RIVER
ANGLING RIVER
KETTLE LAKE
NORTH
Cyril Lake
FOX (ATKINSON) LAKE
Hawes Lake
FOX RIVER
Ross Wright Bay
Looking Back Creek
O'Neil Bay
GULL LAKE
Proposed Keeyask G.S.

N

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DATA SOURCE:
Study areas, observed and sample locations and Nelson River shoreline - ECOSTEM Ltd.; Water - NTS; Roads and rail - Manitoba Conservation.

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0 4 8 Kilometres / 0 2 4 Miles	VERSION NO: 1.0	QA/QC: JWE/YYY/ZZZ

Legend

Sample Locations
- S-2 Ranked Species

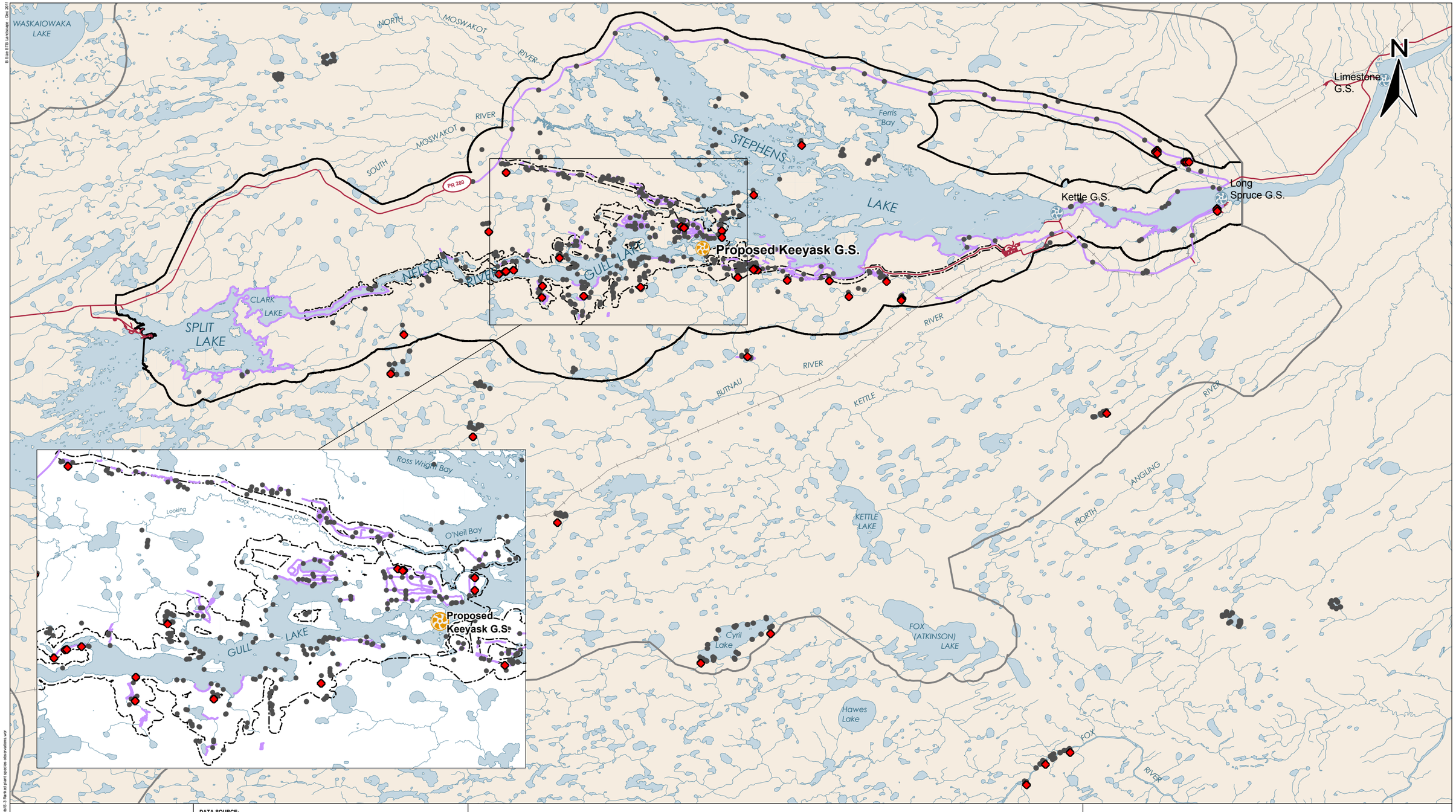
Sample locations
- Sample Plot
- Sample Transect

Study Areas
- Terrestrial Plants Local Study Area
- Study Zone 4
- Terrestrial Plants Regional Study Area

Locations of S-2 Ranked Species Found During Project Field Studies

Map 3-5

File Location: Z:\Workspace\Keeyask GIS\ESIS\Figures\Terrestrial\3 Plants\S-2 Ranked plant species observations.mxr



DATA SOURCE:
Study areas, observed and sample locations and Nelson River shoreline - ECOSTEM Ltd.; Water - NTS; Roads and rail - Manitoba Conservation.

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UTM NAD 1983 Z15N	01-JUN-12	01-JUN-12
0 4 8 Kilometres / 0 2 4 Miles	VERSION NO: 1.0	QA/QC: JWE/YYY/ZZZ

KEEYASK Hydropower Limited Partnership

Legend

Sample Locations
- S-3 Ranked Species

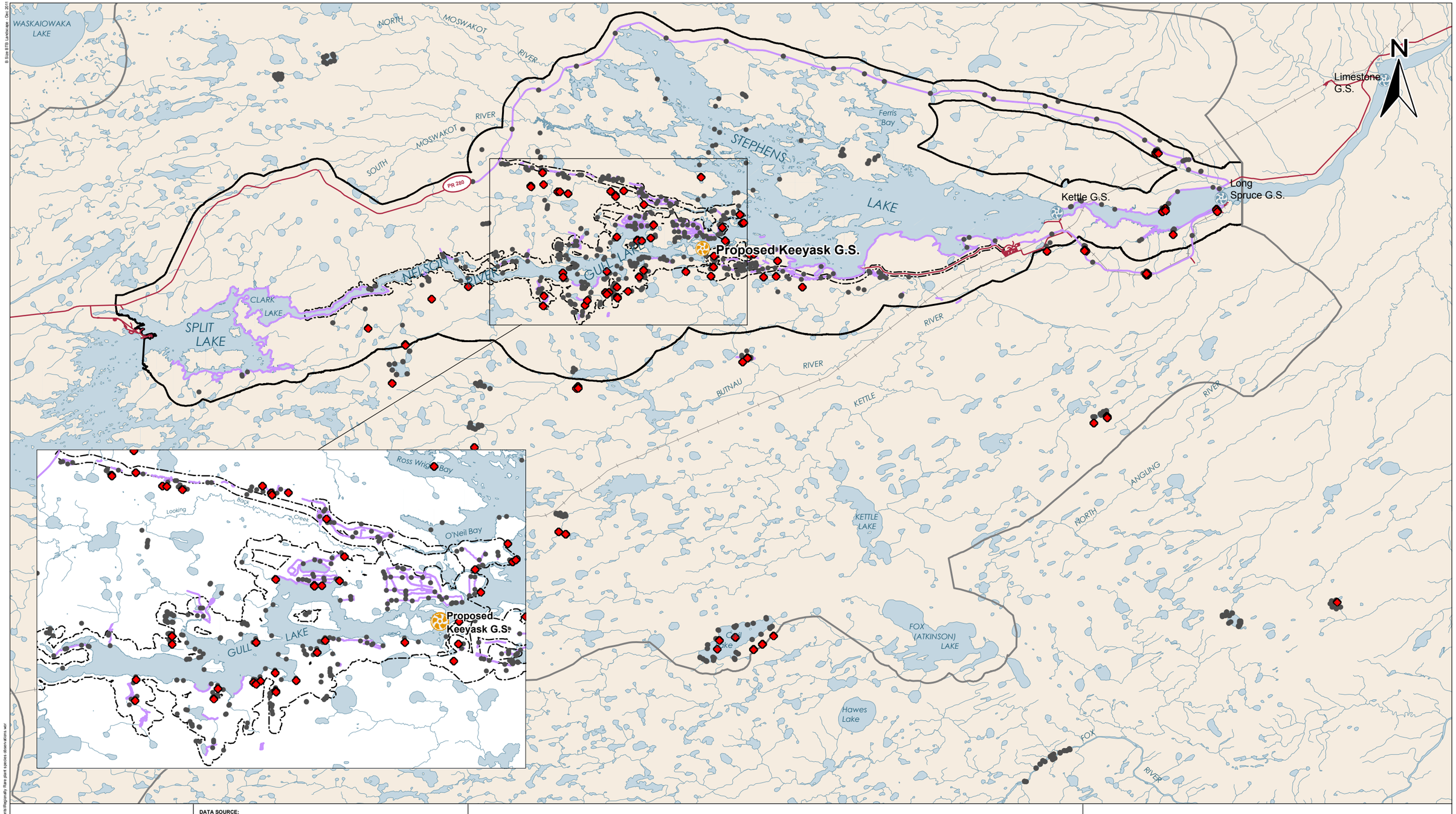
Sample locations
- Sample Plot
- Sample Transect

Study Areas
- Terrestrial Plants Local Study Area
- Study Zone 4
- Terrestrial Plants Regional Study Area

Locations of S-3 Ranked Species Found During Project Field Studies

Map 3-6

File Location: Z:\Workspace\Keeyask GIS\ESIS\Figures\Terrestrial\3 Plants\S-3 Ranked plant species observations.mxr



DATA SOURCE:
Study areas, observed and sample locations and Nelson River shoreline - ECOSTEM Ltd.; Water - NTS; Roads and rail - Manitoba Conservation.

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ECOSTEM Ltd.

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	01-JUN-12	01-JUN-12
0 4 8 Kilometres / 0 2 4 Miles	VERSION NO: 1.0	QA/QC: JWE/YYY/ZZZ

Legend

Sample Locations
- Regionally Rare Species

Sample locations
- Sample Plot
- Sample Transect

Study Areas
- Terrestrial Plants Local Study Area
- Study Zone 4
- Terrestrial Plants Regional Study Area

Locations of Regionally Rare Species Found During Project Field Studies

Map 3-7

WASKAIOWAKA LAKE
NORTH MOSWAKOT RIVER
SOUTH MOSWAKOT RIVER
PR 280
STEPHENS LAKE
Ferris Bay
Limestone G.S.
Kettle G.S.
Long Spruce G.S.
Proposed Keeyask G.S.
NELSON RIVER
GULL LAKE
CLARK LAKE
SPLIT LAKE
BUTNAU RIVER
KETTLE RIVER
ANGLING RIVER
KETTLE LAKE
NORTH FOX (ATKINSON) LAKE
Hawes Lake
FOX RIVER
Ross Wright Bay
Looking Back Creek
O'Neil Bay
Proposed Keeyask G.S.
GULL LAKE

DATA SOURCE:
Study areas, observed and sample locations and Nelson River shoreline - ECOSTEM Ltd.; Water - NTS; Roads and rail - Manitoba Conservation.

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0 4 8 Kilometres / 0 2 4 Miles	VERSION NO: 1.0	QA/QC: JWE/YYY/ZZZ

KEEYASK
Hydropower Limited Partnership

Legend

Sample Locations
- Range Limit Species

Sample locations
- Sample Plot
- Sample Transect

Study Areas
- Terrestrial Plants Local Study Area
- Study Zone 4
- Terrestrial Plants Regional Study Area

Locations of Range Limit Species Found During Project Field Studies

Map 3-8

APPENDIX 3A
PLANT METHODS

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3.7 APPENDIX 3A – PLANT METHODS

Figure 3A-1 provides a network linkage diagram for potential Project effects on terrestrial plants due to vegetation clearing.

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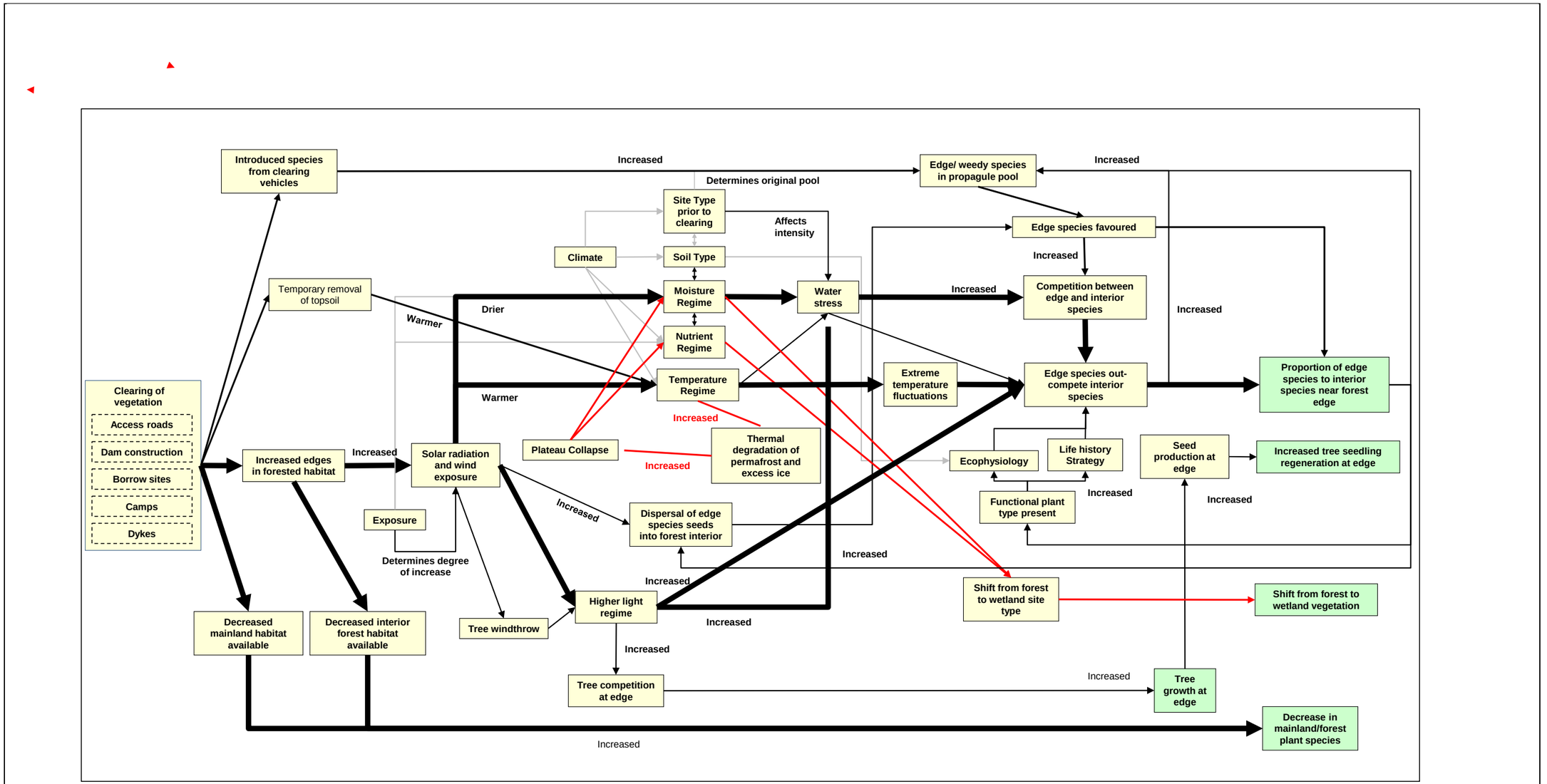

Figure 3A-1: Web of Linkages Between Vegetation Clearing and Terrestrial Plants

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APPENDIX 3B
PLANT SPECIES LISTS

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3.8 APPENDIX 3B – PLANT SPECIES LISTS

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Achillea millefolium L. var. *borealis* (Bong.) Farw.	Common yarrow	S5	11.6	B	8	26	
Actaea rubra (Ait.) Willd.	Baneberry	S5	12.5	B	3	5	
Agrostis scabra Willd.	Rough hair-grass	S5	59.1	B	42	55	
Agrostis stolonifera L.	Redtop	SNA	33.3	B	0	1	
Alnus incana (L.) Moench. ssp. *rugosa*	Speckled alder	S5	27.9	B	38	203	
Alnus viridis (Vill.) de Candolle ssp. *crispa*	Green or mountain alder	S5	15.0	B	83	208	
Alopecurus aequalis Sobol.	Short-awned foxtail	S5	88.9	B	8	8	
Amerorchis rotundifolia (Banks ex Pursh) Hulten	Small round-leaved orchis	S5	50.0	B	1	5	
Andromeda polifolia L.	Bog Rosemary	S5	37.8	B	18	62	
Anemone canadensis L.	Canada anemone	S5	4.4	B	8	8	
Anemone multifida Poir.	Cut-leaved anemone	S5	23.1	B	0	6	
Anemone parviflora Michx.	Northern anemone	S4	6.7	B	1	2	Near range limit
Anemone richardsonii Hook.	Yellow anemone	S3	0.0	C	0	0	
Antennaria pulcherrima (Hook.) Greene	Showy pussytoes	S4	3.7	B	0	1	
Antennaria rosea Greene ssp. *rosea*	Rosy pussytoes	SU	0.0	C	0	0	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Anthoxanthum hirtum (Schrank) Schouten & Veldkamp	Common sweet grass	S5	0.0	C	0	0	
Aquilegia brevistyla Hook.	Blue columbine	S4	7.7	B	0	3	
Aralia nudicaulis L.	Wild sarsaparilla	S5	60.0	B	3	3	Near range limit
Arctuous alpina (L.) Niedenzu	Alpine Bearberry	S5	11.2	B	22	69	
Arctuous rubra (Rehd. & Wilson) Nakaj	Bearberry	S5	0.0	C	0	0	Difficult to ID without mature berries
Arctostaphylos uva-ursi (L.) Spreng.	Common bearberry	S5	17.1	B	9	49	
Argentina anserina (L.) Rydb.	Silverweed	S5	29.3	B	62	66	
Argentina egedii (Wormsk.) Rydb.	Egede's cinquefoil	S2	0.0	C	0	0	
Arnica angustifolia Vahl	Narrowleaf arnica	S4	0.0	C	0	0	
Artemisia biennis Willd.	Biennial wormwood	S5	80.0	B	4	4	
Artemisia tilesii Ledeb.	Mountain sagewort	S2	0.0	C	0	0	
Astragalus agrestis Dougl. ex G. Don	Milkvetch	S5	0.0	C	0	0	
Astragalus alpinus L.	Alpine milk-vetch	S5	0.0	C	0	0	
Astragalus americanus (Hook.) M. E. Jones	American milk-vetch	S3	15.8	B	0	9	
Astragalus eucosmus B. L. Robins.	Pretty milk-vetch	S4	0.0	C	0	0	
Beckmannia syzigachne (Steud.) Fern	Slough grass	S5	73.7	B	14	14	
Betula glandulosa Michx.	Dwarf birch	S5	0.0	C	0	0	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Betula neoalaskana Sarg.	Alaskan birch	S5	50.0	B	0	1	Included with *Betula papyrifera*, not differentiated in field due to difficulty in doing so
Betula occidentalis Hook.	Water birch	S4S5	0.0	C	0	0	
Betula papyrifera Marsh.	White birch	S5	52.1	B	82	197	
Betula pumila L.	Swamp Birch	S5	31.8	B	53	236	
Bidens cernua L.	Smooth beggar-ticks	S5	100.0	K	14	17	
Bistorta vivipara (L.) S. F. Gray	Alpine bistort	S4	0.0	C	0	0	
Botrychium lunaria (L.) Sw.	Moonwort	S4	0.0	C	0	0	
Bromus inermis Leyss.	Smooth brome grass	SNA	85.7	B	0	6	Introduced species
Calamagrostis canadensis (Michx.) Nutt.	Marsh reed-grass	S5	33.0	B	83	342	
Calamagrostis stricta ssp. *inexpansa* (Gray) C. W. Greene	Northern reed-grass	S5	20.0	B	0	2	
Calamagrostis stricta (Timm) Koeler ssp. *stricta*	Narrow reed-grass	S5	86.5	B	35	45	
Calla palustris L.	Wild calla	S5	86.2	B	4	25	
Callitriche hermaphroditica L.	Northern water-starwort	S5	100.0	K	0	2	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Callitriche palustris L.	Vernal water-starwort	S5	75.0	B	2	3	
Caltha palustris L.	Marsh-marigold	S5	62.1	B	3	18	
Calypso bulbosa (L.) Oakes	Venus'-slipper	S4	50.0	B	1	3	Near range limit
Campanula rotundifolia L.	Harebell	S5	5.6	B	0	2	
Cardamine pensylvanica Muhl. ex Willd.	Bitter-cress	S5	100.0	K	0	8	
Carex aquatilis Wahl.	Water sedge	S5	44.1	B	78	331	
Carex atherodes Spreng.	Awned sedge	S5	11.8	B	2	2	
Carex aurea Nutt.	Golden sedge	S5	10.0	B	0	1	
Carex bebbii Olney ex Fern.	Bebb's sedge	S5	80.0	B	3	4	
Carex brunnescens (Pers.) Poir.	Brownish sedge	S5	100.0	K	1	3	
Carex buxbaumii Wahlenb.	Brown sedge	S4S5	100.0	K	0	5	
Carex canescens L.	Hoary sedge	S5	78.7	B	6	37	
Carex capillaris L.	Hair-like sedge	S5	25.6	B	1	10	
Carex chordorrhiza Ehrh. ex L.	Prostrate sedge	S5	46.5	B	8	53	
Carex concinna R. Br.	Beautiful sedge	S4S5	14.0	B	16	42	
Carex deflexa Hornem.	Bent sedge	S5	66.7	B	2	2	
Carex diandra Schrank	Two-stamened sedge	S5	80.6	B	0	25	
Carex disperma Dewey	Two-seeded sedge	S5	40.6	B	2	13	
Carex eburnea Boott	Bristleleaf sedge	S4S5	0.0	C	0	0	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Carex foenea Willd.	Silvery-flowered sedge	S5	50.0	B	4	4	
Carex gynocrates Wormsk. ex Drej.	Northern bog sedge	S5	34.2	B	7	27	
Carex houghtoniana Torr.	Sand sedge	S5	100.0	K	1	1	
Carex interior Bailey	Inland sedge	S4?	0.0	C	0	0	
Carex lacustris Willd.	Lakeshore sedge	S5	100.0	K	2	2	
Carex lenticularis Michx.	Lens-fruited sedge	S5	100.0	K	3	3	
Carex leptalea Wahlenb.	Bristle-stalked sedge	S5	45.5	B	1	10	
Carex limosa L.	Mudge sedge	S5	0.0	C	0	0	
Carex magellanica Lam.	Bog Sedge	S5	51.9	B	26	94	
Carex media R. BR.	Closedhead sedge	S5	0.0	C	0	0	
Carex pauciflora Lightf.	Few-flowered sedge	S3	0.0	C	0	0	
Carex pellita Muhl. ex Willd.	Wooly sedge	S5	82.4	B	0	14	
Carex sartwellii Dewey	Sartwell's sedge	S4	100.0	K	2	6	
Carex saxatilis L.	Rock sedge	S4	0.0	C	0	0	
Carex scirpoidea Michx.	Rush-like sedge	S5	21.0	B	3	13	
Carex sychnocephala Carey	Long-beaked sedge	S4?	100.0	K	4	4	
Carex tenuiflora Wahlenb.	Thin-flowered sedge	S5	20.0	B	0	1	
Carex trisperma Dew.	Three-seeded sedge	S5	50.0	B	1	1	
Carex utriculata Boott	Bottle sedge	S5	84.9	B	18	101	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Carex vaginata Tausch	Sheathed sedge	S5	23.0	B	13	65	
Castilleja raupii Pennell	Purple paintbrush	S4	0.0	C	0	0	
Ceratophyllum demersum L.	Coontail	S5	100.0	K	1	3	
Chamaedaphne calyculata (L.) Moench	Leather-leaf	S5	51.0	B	51	268	
Chamerion angustifolium (L.) Holub	Fireweed	S5	19.6	B	64	223	
Chamerion latifolium (L.) Holub	Broad-leaved willowherb	S3	0.0	C	0	0	
Chenopodium album L.	Lamb's-quarters	SNA	40.0	B	2	2	Introduced species
Chenopodium capitatum (L.) Ambrosi var. *capitatum*	Strawberry-blite	S5	50.0	B	2	2	
Chenopodium glaucum L. var. *salinum* (Standl.) Boivin	Oakleaf goosefoot	SNA	100.0	K	11	11	Introduced species
Cicuta bulbifera L.	Bulb-bearing water-hemlock	S5	89.2	B	4	33	
Cicuta maculata L.	Spotted cowbane	S5	58.3	B	3	7	
Cicuta virosa L.	Mackenzie's water-hemlock	S4	100.0	K	0	1	
Cirsium arvense (L.) Scop.	Canada thistle	SNA	100.0	K	0	1	Introduced species
Coeloglossum viride (L.) Hartman	Bracted bog-orchid	S5	0.0	C	0	0	
Comarum palustre L.	Marsh-five-finger	S5	73.0	B	41	146	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Coptis trifolia (L.) Salisb.	Goldthread	S5	40.0	B	2	2	
Corallorhiza trifida Chat.	Early coral-root	S5	37.5	B	3	6	
Cornus canadensis L.	Bunchberry	S5	43.7	B	75	216	
Cornus sericea L.	Red osier dogwood	S5	7.6	B	14	46	
Corydalis aurea Willd.	Golden corydalis	S5	0.0	C	0	0	
Corydalis sempervirens (L.) Pers.	Pink corydalis	S5	80.0	B	4	4	
Crepis elegans Hook.	Elegant hawk's-beard	S1S2	81.8	B	0	9	Near range limit
Crepis tectorum L.	Narrow-leaved hawk's-beard	SNA	100.0	K	1	6	Introduced species
Cypripedium parviflorum Salisb. var. *pubescesns* (Willd.) Knight	Yellow lady's-slipper	S5?	100.0	K	0	1	
Cypripedium passerinum Richards.	Sparrow's-egg lady's-slipper	S4	0.0	C	0	0	
Danthonia intermedia Vasey	Poverty oat-grass	S2?	0.0	C	0	0	
Danthonia spicata (L.) Beauv. Ex Roemer & J. A. Schultes	Poverty oat-grass	S5	42.9	B	0	3	
Dasiphora fruticosa (L.) Rydb. ssp. *floribunda* (Pursh) Kartesz	Shrubby cinquefoil	S5	1.5	B	0	5	
Delphinium elatum L.	Candle larkspur	SNA	0.0	C	0	0	
Deschampsia cespitosa (L.) Beauv.	Tufted hair grass	S5	0.0	C	0	0	
Descurainia sophia (L.) Webb ex Prantl	Flixweed	SNA	0.0	C	0	0	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Diphasiastrum complanatum (L.) Holub	Ground-cedar	S5	50.0	B	9	24	
Dracocephalum parviflorum Nutt.	American dragonhead	S5	100.0	K	0	1	
Drosera anglica Huds.	Oblong-leaved sundew	S3	18.5	B	2	5	
Drosera linearis Goldie	Slender-leaved sundew	S2	0.0	C	0	0	
Drosera rotundifolia L.	Round-leaved sundew	S5	46.8	B	33	89	
Elaeagnus commutata Bernh. ex Rydb.	Wolf-willow	S4	8.8	B	4	10	
Eleocharis acicularis (L.) Roemer & J. A. Schultes	Needle spike-rush	S5	88.8	B	32	87	
Eleocharis palustris (L.) Roemer & J. A. Schultes	Creeping spike-rush	S5	85.9	B	34	79	
Eleocharis quinqueflora (F.X. Hartmann) Schwarz	Few-flowered spike-rush	S4	25.0	B	1	1	
Elodea canadensis Michx.	Canada waterweed	S5	100.0	K	1	2	
Elymus repens (L.) Gould	Quack grass	SNA	66.7	B	0	2	Introduced species
Elymus trachycaulus (Link) Gould ex Shinners ssp. *trachycaulus*	Slender wheat-grass	S5	11.2	B	1	12	
Empetrum nigrum L.	Black crowberry	S5	29.0	B	27	65	
Epilobium ciliatum Raf.	Northern willowherb	S5	88.9	B	0	8	
Epilobium ciliatum ssp. *glandulosum* (Lehm.) Hoch & Raven	Northern willowherb	S5	98.0	B	39	48	
Epilobiuim ciliatum ssp. *watsonii* (Barbey) Hoch & Raven	Northern willowherb	SU	0.0	C	0	0	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Epilobium leptophyllum Raf.	Marsh willow-herb	S5	50.0	B	1	1	
Epilobium palustre L.	Marsh willow-herb	S5	69.8	B	16	30	
Equisetum arvense L.	Common or Field horsetail	S5	16.5	B	89	260	
Equisetum fluviatile L.	Water horsetail	S5	59.1	B	29	166	
Equisetum palustre L.	Marsh horsetail	S4S5	100.0	K	0	1	
Equisetum pratense Ehrh.	Meadow horsetail	S4S5	60.0	B	3	3	
Equisetum scirpoides Michx.	Dwarf scouring rush	S5	24.9	B	55	154	
Equisetum sylvaticum L.	Wood horsetail	S5	56.6	B	64	175	
Equisetum variegatum Schleich. ex F. Weber & D. M. H. Mohr	Variegated scouring-rush	S5	47.4	B	0	9	
Erigeron elatus (Hook.) Greene	Tall fleabane	S4	100.0	K	0	1	
Erigeron hyssopifolius Michx.	Wild daisy	S4	8.7	B	0	2	
Erigeron philadelphicus L.	Philadelphia fleabane	S5	0.0	C	0	0	
Eriophorum angustifolium Honckeny	Tall cotton-grass	S5	33.3	B	0	1	
Eriophorum chamissonis C. A. Mey.	Russet cotton-grass	S5	66.7	B	0	2	
Eriophorum gracile W.D.J Koch	Slender cotton-grass	S5	50.0	B	0	2	
Eriophorum vaginatum L.	Sheathed cotton-grass	S5	31.1	B	3	14	
Eriophorum viridicarinatum (Engelm.) Fern	Thin-leaved cotton-grass	S4	33.3	B	1	1	
Erysimum cheiranthoides L.	Wormseed-mustard	SNA	0.0	C	0	0	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Eschscholzia californica Cham.	California poppy	(blank)	0.0	C	0	0	
Euphrasia arctica Lange ex Rostrup	Northern eyebright	SU	12.5	B	0	1	
Eutrochium maculatum (L.) Lamont var. bruneri	Spotted joe-pye weed	S5	0.0	C	0	0	
Festuca rubra L.	Red-fescue	S5	7.7	B	0	2	
Festuca saximontana Rydb.	Rocky mountain fescue	S5	100.0	K	0	2	
Fragaria vesca L.	Woodland strawberry	S4S5	50.0	B	0	1	
Fragaria virginiana Dcne.	Smooth wild strawberry	S5	11.3	B	14	44	
Galium boreale L.	Northern bedstraw	S5	1.5	B	1	3	
Galium labradoricum (Wieg.) Wieg.	Ladies' bedstraw	S5	84.6	B	0	22	
Galium palustre L.	Common marsh bedstraw	SU	100.0	K	1	1	
Galium trifidum L.	Small bedstraw	S5	73.8	B	54	96	
Galium triflorum Michx.	Sweet-scented bedstraw	S5	33.3	B	1	1	
Gentianella amarella (L.) Boerner	Northern gentian	S5	17.9	B	2	5	
Geocaulon lividum (Richards.) Fern.	Northern comandra	S5	17.5	B	42	111	
Geranium bicknellii Britt.	Bicknell's geranium	S5	50.0	B	1	1	
Glaux maritima L.	Sea-milkwort	S4S5	100.0	K	2	2	
Glyceria borealis (Nash) Batchelder	Small floating manna-grass	S5	96.3	B	23	26	
Glyceria grandis S. Wats.	Tall manna-grass	S5	100.0	K	0	3	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Glyceria striata (Lam.) A. S. Hitchc.	Fowl manna grass	S5	60.0	B	2	3	
Goodyera repens (L.) R. Br. ex Ait.	Lesser rattlesnake-plantain	S5	20.0	B	0	1	
Halenia deflexa (Sm.) Griseb.	Spurred gentian	S5	0.0	C	0	0	
Hedysarum boreale Nutt.	Northern hedysarum	S4	0.0	C	0	0	
Heracleum maximum Bartr.	Cow-parsnip	S5	0.0	C	0	0	
Hieracium umbellatum L.	Canada hawkweed	S5	0.0	C	0	0	
Hippuris tetraphylla L. f.	Four-leaved mare's-tail	S3S4	0.0	C	0	0	
Hippuris vulgaris L.	Mare's-tail	S5	88.9	B	9	24	
Hordeum jubatum L.	Wild barley	S5	50.0	B	6	28	Invasive species
Isoetes echinospora Durieu	Quillwort	S4?	100.0	K	0	7	
Juncus alpinoarticulatus Chaix	Alpine rush	S5	16.7	B	2	2	
Juncus arcticus Willd. var. *balticus* (Willd.) Traut.	Wire rush	S5	13.0	B	6	13	
Juncus bufonius L.	Toad rush	S5	85.7	B	12	12	
Juncus castaneus Sm.	Chestnut rush	S3?	0.0	C	0	0	
Juncus dudleyi Wieg.	Dudley's rush	S5	100.0	K	14	14	
Juncus filiformis L.	Thread rush	S5?	100.0	K	0	2	
Juncus nodosus L.	Knotted rush	S5	70.0	B	14	14	
Juniperus communis L.	Common juniper	S5	12.3	B	8	39	

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Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Juniperus horizontalis Moench	Creeping juniper	S5	50.0	B	0	7	
Kalmia polifolia Wang.	Bog-laurel	S5	53.8	B	45	143	
Larix laricina (Du Roi) Koch	Tamarack	S5	33.4	B	62	220	
Lathyrus ochroleucus Hook.	Cream-coloured vetchling	S4S5	0.0	C	0	0	
Lathyrus palustris L.	Marsh vetchling	S5	9.9	B	14	15	
Lathyrus venosus Muhl. ex Willd.	Wild peavine	S5	60.0	B	3	3	
Lemna minor L.	Duckweed	SNA	100.0	K	0	2	
Lemna trisulca L.	Star-duckweed	S5	100.0	K	0	4	
Leucanthemum vulgare Lam.	Ox-eye Daisy	SNA	25.0	B	1	1	Introduced species
Leymus innovatus (Beal) Pilger	Hairy wild rye	S5	0.0	C	0	0	
Limosella aquatica L.	Mudwort	S4S5	100.0	K	5	5	
Linnaea borealis L.	Twinflower	S5	18.7	B	50	140	
Listera borealis Morong	Northern twayblade	S2	0.0	C	0	0	
Listera cordata (L.) R. Br. var. cordata	Heart-leaved twayblade	S4?	28.6	B	0	2	
Lobelia kalmii L.	Kalm's lobelia	S5	100.0	K	2	2	
Lonicera dioica L.	Twining honeysuckle	S5	7.4	B	0	2	Near range limit
Lonicera dioica L. var. *glaucescens* (Rydb.) Butters	Twining honeysuckle	S5	0.0	C	0	0	
Lonicera involucrata Banks ex Spreng.	Black twinberry	S4	0.0	C	0	0	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Lonicera oblongifolia (Goldie) Hook.	Swamp -fly-honeysuckle	S4	0.0	C	0	0	
Lonicera villosa (Michx.) J. A. Schultes	Fly honeysuckle	S5	85.2	B	8	23	
Luzula parviflora (Ehrh.) Desv.	Small-flowered wood-rush	S5	33.3	B	1	1	
Lycopodium annotinum L.	Stiff club-moss	S5	75.6	B	15	31	
Lycopodium clavatum L.	Running club-moss	S4	92.3	B	4	12	
Lycopodium dendroideum Michx.	Ground-pine	S5	11.1	B	1	1	Near range limit
Lycopus americanus Muhl. ex W. Bart.	Water-hore-hound	S5	100.0	K	6	37	
Lycopus uniflorus Michx.	Water-hore-hound	S5	93.1	B	2	27	
Lysimachia thyrsiflora L.	Tufted loosestrife	S5	72.0	B	1	18	
Maianthemum stellatum (L.) Link	Star-flowered Solomon's-seal	S5	2.2	B	0	1	
Maianthemum trifolium (L.) Sloboda	Three-leaved Solomon's-seal	S5	51.9	B	50	162	
Matricaria discoidea DC.	Pineappleweed	SNA	100.0	K	0	1	Introduced species
Medicago sativa L.	Alfalfa	SNA	0.0	C	0	0	Introduced species
Melampyrum lineare Desr.	Cow-wheat	S5	0.0	C	0	0	
Melilotus albus Medik.	White sweet clover	SNA	83.3	B	0	30	Introduced species

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Melilotus officinalis (L.) Lam.	Yellow sweet clover	SNA	80.0	B	0	4	Introduced species
Mentha arvensis L.	Common mint	S5	76.9	B	27	40	
Menyanthes trifoliata L.	Bogbean	S5	35.8	B	12	49	
Mertensia paniculata (Ait.) Don	Tall lungwort	S5	13.0	B	19	45	
Mitella nuda L.	Bishop's-cap	S5	22.9	B	19	77	
Moehringia lateriflora (L.) Fenzl	Grove-sandwort	S5	17.6	B	3	3	
Moneses uniflora (L.) Gray	One-flowered wintergreen	S5	0.0	C	0	0	
Muhlenbergia glomerata (Willd.) Trin.	Bog muhly	S4	50.0	B	1	1	Near range limit
Muhlenbergia richardsonis (Trin.) Rydb.	Mat muhly	S4	0.0	C	0	0	
Myrica gale L.	Sweet gale	S5	55.3	B	10	78	
Myriophyllum sibiricum Komarov	Spiked water-milfoil	S5	100.0	K	16	92	
Najas flexilis (Willd.) Rostk. & Schmidt	Slender naiad	S4	100.0	K	0	2	
Nuphar variegata Dur.	small yellow pond-lily	S5	100.0	K	13	67	Near range limit
Orthilia secunda (L.) House	One-sided pyrola	S5	18.7	B	27	74	
Oryzopsis asperifolia Michx.	White-grained mountain-rice grass	S5	28.6	B	1	6	
Oxytropis borealis DC.	Locoweed	SU	0.0	C	0	0	
Oxytropis campestris (L.) DC. var. varians (Rydb.)	Field locoweed	SU	50.0	B	0	5	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Oxytropis splendens Dougl. ex Hook.	Showy locoweed	S4	0.0	C	0	0	
Packera paupercula (Michx.) A. & D. Love	Balsam groundsel	S5	8.8	B	1	3	
Parnassia kotzebuei Cham. ex Spreng.	Small grass-of-parnassus	S4	100.0	K	0	1	
Parnassia palustris L. var. *tenuis* Wahlenb.	Grass-of-Parnassus	S4	32.5	B	9	26	
Pedicularis lapponica L.	Lapland lousewort	S2S3	0.0	C	0	0	
Pedicularis macrodonta Richards.	Swamp lousewort	S2	0.0	C	0	0	
Persicaria amphibia (L.) Gray	Water smartweed	S5	72.6	B	38	69	
Persicaria lapathifolia (L.) S. F. Gray	Pale persicaria	S5	92.3	B	34	36	
Petasites frigidus (L.) Fries var. *palmatus* (Ait.) Cronq.	Palmate-leaved colt's-foot	S5	36.7	B	42	106	
Petasites frigidus (L.) Fries var. *sagittatus* (Banks ex Pursh) Cherniawsky	Arrow-leaved colt's-foot	S5	30.6	B	2	11	
Petasites frigidus (L.) Fries var. x *vitifolius* (Greene) Cherniawsky	Vine-leaved colt's-foot	SNA	0.0	C	0	0	
Phacelia franklinii (R. Br.) Gray	Franklin's scorpionweed	S5	0.0	C	0	0	
Phalaris arundinacea L.	Reed-canary-grass	S5	75.0	B	20	27	Introduced species
Picea glauca (Moench.) Voss	White spruce	S5	3.0	B	12	16	
Picea mariana (Mill.) BSP	Black spruce	S5	28.4	B	181	638	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Pinguicula villosa L.	Hairy butterwort	S3S4	66.1	B	28	41	
Pinguicula vulgaris L.	Common butterwort	S5	11.1	B	0	1	
Pinus banksiana Lamb.	Jack pine	S5	65.0	B	31	104	
Piptatherum pungens (Torr. ex Spreng.) Dorn	Northern rice grass	S5	29.3	B	4	17	
Plantago major L.	Common plantain	SNA	92.3	B	20	24	Introduced species
Platanthera aquilonis Sheviak	Northern green bog-orchid	SNA	22.7	B	1	5	
Platanthera dilatata (Pursh) Lindl. ex Beck	Tall white bog-orchid	S4	0.0	C	0	0	
Platanthera obtusata (Banks ex Pursh) Lindl.	Blunt-leaf orchid	S5	0.0	C	0	0	
Poa glauca Vahl	Glaucous poa.	S5	0.0	C	0	0	
Poa palustris L.	Fowl bluegrass	S5	23.9	B	7	17	
Poa pratensis L.	Kentucky bluegrass	S5	0.0	C	0	0	
Polygonum aviculare L. ssp. *depressum* (Meisner) Arcangeli	Common knotweed	SNA	100.0	K	8	8	Introduced species
Populus balsamifera L.	Balsam-poplar	S5	6.1	B	16	62	
Populus tremuloides Michx.	Trembling aspen	S5	16.1	B	22	58	
Potamogeton gramineus L.	Various-leaved pondweed	S5	98.7	B	20	78	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Potamogeton praelongus Wulfen	White-stemmed pondweed	S5	100.0	K	0	1	
Potamogeton pusillus L. ssp. *tenuissimus* (Mert. & W.D.J. Koch) Haynes & C. B. Hellquist	small pondweed	S2	100.0	K	4	27	
Potamogeton richardsonii (Benn.) Rydb.	Richardson's pondweed	S5	100.0	K	16	81	
Potamogeton robbinsii Oakes	Robbin's pondweed	S2	100.0	K	1	20	
Potamogeton zosteriformis Fernald	Flatstem pondweed	S5	100.0	K	6	24	
Potentilla norvegica L.	Rough cinquefoil	S5	100.0	K	11	26	
Primula egaliksensis Wormsk. ex Hornem.	Greenland primrose	S4	0.0	C	0	0	
Primula incana M. E. Jones	Mealy primrose	S4	0.0	C	0	0	
Primula mistassinica Michx.	Bird's-eye primrose	S5	46.7	B	6	7	
Primula stricta Hornem.	Erect primrose	S3	0.0	C	0	0	
Prunus pensylvanica L.	Pin-cherry	S5	16.7	B	1	4	
Puccinellia nuttalliana (Schultes) Hitchc.	Nuttall's alkali grass	S5	100.0	K	0	1	
Puccinellia phryganodes (Trin.) Scribn. & Merr.	Salt-meadow grass	S3	0.0	C	0	0	
Pyrola asarifolia Michx.	Pink pyrola	S5	15.5	B	15	41	
Pyrola chlorantha Sw.	Greenish-flowered wintergreen	S5	8.1	B	0	6	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Pyrola grandiflora Radius	Arctic wintergreen	S4	12.5	B	1	3	Near range limit
Ranunculus aquatilis L.	Large-leaved white water-crowfoot	S5	100.0	K	20	46	
Ranunculus cymbalaria Pursh	Seaside buttercup	S5	71.4	B	5	5	
Ranunculus flammula L.	Creeping spearwort	S5	95.8	B	23	23	
Ranunculus gmelinii DC.	Yellow water-crowfoot	S5	66.7	B	1	2	
Ranunculus hyperboreus Rottb.	Boreal buttercup	S1	0.0	C	0	0	
Ranunculus lapponicus L.	Lapland buttercup	S5	36.8	B	0	7	
Ranunculus pensylvanicus L.	Bristly crowfoot	S5	100.0	K	5	5	
Ranunculus sceleratus L.	Cursed crowfoot	S5	100.0	K	6	6	
Rhamnus alnifolia L'Her.	Alder-leaved buckthorn	S5	6.4	B	7	20	
Rhinanthus minor L. ssp. *groenlandicus* (Ostenf.) L. Neum.	Arctic rattlebox	S4	0.0	C	0	0	
Rhinanthus minor L. ssp. *minor*	Little yellow rattle	S4	0.0	C	0	0	
Rhododendron groenlandicum (Oeder) Kron & Judd	Labrador-tea	S5	29.2	B	182	627	
Rhododendron tomentosum (Harmaja) G. Wallace	Northern labrador-tea	S4	3.1	B	1	7	Near range limit
Rhynchospora alba (L.) Vahl	White beak-rush	S3?	0.0	C	0	0	
Ribes americanum P. Mill.	Wild black currant	S5	0.0	C	0	0	
Ribes glandulosum Grauer	Skunk currant	S5	71.4	B	6	15	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Ribes hudsonianum Richards.	Northern black currant	S5	29.5	B	11	31	
Ribes lacustre (Pers.) Poir.	Bristly black currant	S4	4.1	B	0	3	
Ribes oxyacanthoides L.	Northern gooseberry	S5	8.9	B	3	11	
Ribes triste Pall.	Red currant	S5	18.8	B	18	66	
Rorippa palustris (L.) Besser	Bog yellowcress	S5	85.2	B	36	46	
Rosa acicularis Lindl.	Prickly rose	S5	17.5	B	75	199	
Rubus arcticus L.	Stemless raspberry	S5	28.1	B	34	121	
Rubus chamaemorus L.	Cloudberry	S5	36.9	B	55	178	
Rubus idaeus L.	Red raspberry	S5	19.6	B	10	30	
Rubus pubescens Raf.	Dewberry	S5	13.4	B	17	55	
Rubus x *paracaulis* Bailey		SNA	0.0	C	0	0	
Rumex crispus L.	Curly-leaf dock	SNA	100.0	K	1	1	Introduced species
Rumex fueginus Phil.	Golden dock	S5	100.0	K	14	14	
Sagina nodosa (L.) Fenzl	Knotted pearlwort	S4	50.0	B	0	1	
Sagittaria cuneata Sheldon	Arum-leaved arrowhead	S5	100.0	K	10	34	
Salix arbusculoides Anderss.	Shrubby willow	S3	5.0	B	11	39	Near range limit
Salix bebbiana Sarg.	Bebb's willow	S5	21.5	B	58	213	
Salix candida Fluegge ex Willd.	Hoary willow	S5	37.8	B	7	14	
Salix discolor Muhl.	Pussy-willow	S5	0.0	C	0	0	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Salix exigua Nutt.	Sandbar willow	S5	0.0	C	0	0	
Salix glauca L.	Grey-leaved willow	S4?	5.3	B	15	34	
Salix lucida Muhl. ssp. *lasiandra* (Benth.) E. Murr.	Shining willow	S5	0.0	C	0	0	
Salix myrtillifolia Anderss.	Myrtle-leaved willow	S5	21.0	B	41	150	
Salix pedicellaris Pursh	Bog willow	S5	59.4	B	17	63	
Salix pellita Anderss.	Satin willow	S4	13.8	B	30	73	
Salix planifolia Pursh.	Flat-leaved willow	S5	51.2	B	62	241	Includes S. discolor and hybrids of S. planifolia and S. discolor
Salix pseudomonticola Ball	False Mountain Willow	S4S5	1.0	B	1	6	
Salix pseudomyrsinites Anderss.	Tall blueberry willow	S5	3.9	B	5	26	
Salix reticulata L.	Net-veined willow	S3	0.0	C	0	0	
Salix serissima (Bailey) Fern.	Autumn willow	S4	66.7	B	0	4	
Salix vestita Pursh.	Rock willow	S3	6.6	B	8	28	Near range limit
Sarracenia purpurea L.	Pitcher-plant	S5	7.7	B	0	1	
Scheuchzeria palustris L.	Podgrass	S4?	57.1	B	3	16	
Schoenoplectus tabernaemontani K. C. Gmel.	Viscid great-bulrush	S5	100.0	K	18	73	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Scirpus atrocinctus Fern.	Wool-grass	S5	0.0	C	0	0	
Scirpus microcarpus J. & K. Presl	Small-fruited bulrush	S5	0.0	C	0	0	
Scutellaria galericulata L.	Common skullcap	S5	95.7	B	9	22	
Selaginella selaginoides (L.) P. Beauv. ex Mart.& Shrank	Club spikemoss	S2	0.0	C	0	0	
Shepherdia canadensis (L.) Nutt.	Canada buffalo-berry	S5	7.4	B	4	48	
Sibbaldiopsis tridentata (Ait.) Rydb.	Three-toothed cinquefoil	S5	15.4	B	1	2	
Silene csereii Baumg.	Smooth catchfly	SNA	100.0	K	0	4	
Sisyrinchium montanum Greene var. *montanum*	Blue-eyed grass	S5	0.0	C	0	0	
Sium suave Walt.	Water-parsnip	S5	96.1	B	48	74	
Solidago canadensis L.	Canada goldenrod	S5	0.0	C	0	0	
Solidago hispida Muhl.	Hairy goldenrod	S5	45.5	B	12	30	Near range limit
Solidago multiradiata Ait.	Northern goldenrod	S5	7.2	B	4	9	
Solidago simplex Kunth	Mt. Albert goldenrod	SU	2.9	B	0	2	
Sonchus arvensis L.	Perennial sow thistle	SNA	42.1	B	0	8	
Sparganium angustifolium Michx.	Narrow-leaved bur-reed	S5	97.3	B	19	71	
Sparganium natans L.	Small bur-reed	S5	100.0	K	0	1	
Spiranthes romanzoffiana Cham.	Hooded ladies'-tresses	S5	80.0	B	2	8	
Stachys palustris L.	Marsh hedge-nettle	S5	83.3	B	10	10	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Stellaria crassifolia Ehrh.	Fleshy stitchwort	S4	95.0	B	17	19	
Stellaria longifolia Muhl. ex Willd.	Long-leaved stitchwort	S5	70.0	B	11	14	
Stellaria longipes Goldie ssp. *longipes*	Long-stalked stitchwort	S5	16.7	B	1	5	
Stuckenia pectinata (L.) Boerner	Sago pondweed	?	100.0	K	0	1	
Stuckenia vaginata (Turcz.) Holub	Sheathed pondweed	?	100.0	K	0	1	
Symphoricarpos albus (L.) Blake	Snowberry	S5	100.0	K	1	1	
Symphyotrichum boreale (Torr. & Gray) A. & D. Love	Rush aster	S5	17.6	B	3	3	
Symphyotrichum ciliatum (Ledeb.) G.L.Nesom	Rayless aster	SU	100.0	K	6	6	
Symphyotrichum ciliolatum (Lindl.) A. & D. Love	Lindley's aster	S5	58.2	B	9	32	
Symphyotrichum lanceolatum (Willd.) G. L. Nesom var. *hesperium* (A. Gray) G. L. Nesom	Willow aster	S4	0.0	C	0	0	
Symphyotrichum lanceolatum (Willd.) G. L. Nesom var. *lanceolatum*	Small blue aster	S5	0.0	C	0	0	
Symphyotrichum puniceum (L.) A. & D. Love var. *puniceum*	Purple-stemmed aster	S5	13.0	B	3	6	
Tanacetum bipinnatum (L.) Sch. Bip.	Lake Huron tansy	S3	0.0	C	0	0	
Taraxacum officinale Weber.	Common dandelion	S5	29.1	B	4	32	Introduced species
Thalictrum venulosum Trel.	Veiny meadow-rue	S5	4.2	B	3	15	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Tofieldia pusilla (Michx.) Pers.	Scotch false asphodel	S4	10.0	B	0	1	
Triantha glutinosa (Michx.) Baker	Sticky asphodel	S5	0.0	C	0	0	
Trichophorum alpinum (L.) Pers.	Alpine cotton-grass	S5	33.7	B	7	30	
Trichophorum cespitosum (L.) Hartman	Tufted bulrush	S4	33.3	B	0	4	
Trifolium hybridum L.	Alsike clover	SNA	100.0	K	0	5	
Trifolium pratense L.	Red clover	SNA	0.0	C	0	0	
Triglochin maritima L.	Sea-side arrow-grass	S5	31.1	B	5	14	
Triglochin palustris L.	Marsh arrow-grass	S5	0.0	C	0	0	
Trisetum spicatum (L.) K. Richt.	Spike trisetum	S4	0.0	C	0	0	
Typha latifolia L.	Common cat-tail	S5	100.0	K	0	9	
Urtica dioica L.	Stinging nettle	S5	0.0	C	0	0	
Utricularia cornuta Michx.	Horned bladderwort	S3	0.0	C	0	0	
Utricularia intermedia Hayne	Flat-leaved bladderwort	S5	69.4	B	4	25	
Utricularia macrorhiza Le Conte	Common bladderwort	S5	97.7	B	16	43	
Vaccinium myrtilloides Michx.	Velvet-leaf blueberry	S5	86.0	B	40	98	
Vaccinium oxycoccos L.	Small bog cranberry	S5	50.5	B	76	202	
Vaccinium uliginosum L.	Bog bilberry	S5	23.9	B	92	309	
Vaccinium vitis-idaea L.	Rock cranberry	S5	31.7	B	144	392	
Veronica peregrina (L.)	Neckweed	S5	100.0	K	19	19	

Table 3B-1: Vascular Plant Species Encountered During Field Studies, Including MBCDC S-Rank, Location Type and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Veronica scutellata L.	Marsh-speedwell	S4S5	0.0	C	0	0	
Viburnum edule (Michx.) Raf.	Low bush-cranberry	S5	15.6	B	26	90	
Vicia americana Muhl. ex Willd.	American vetch	S5	0.0	C	0	0	
Vicia cracca L.	Tufted vetch	SNA	0.0	C	0	0	Introduced species
Viola adunca Sm.	Early blue violet	S5	100.0	K	1	1	
Viola canadensis L.	Western Canada violet	S5	0.0	C	0	0	
Viola palustris L.	Marsh violet	S4S5	100.0	K	0	3	
Viola renifolia Gray	Kidney-shaped white violet	S5	41.0	B	4	16	
Zannichellia palustris L.	Horned pondweed	S3?	100.0	K	0	3	

[1] Nomenclature follows Flora of North America (FNA) where volumes currently exist for the genus and the Manitoba Conservation Data Centre elsewhere.
[2] MBCDC Ranking Codes: S1= Very rare throughout its range or in the Province. May be especially vulnerable to extirpation., S2= Rare throughout its range or in the Province. May be vulnerable to extirpation., S3=Uncommon, S3S4 and S3?= Uncommon to apparently secure, S4= Widespread, abundant, and apparently secure throughout its range or in the Province, with many occurrences, but the element is of long-term concern, S5= Demonstrably widespread, abundant, and secure throughout its range or in the Province, and essentially irradicable under present conditions, SNA= A conservation status rank is not applicable to the element; ?= Inexact; S#S#= A range between two of the numeric ranks. Denotes range of uncertainty about the exact rarity of the species.
Species S-Rank source: MBCDC, personal communication.
[3] Location codes: K = species was found in Keeyask only during field studies, C = species was found in downstream study area only during field studies, B = species was found in both Keeyask and downstream study areas during field studies.

Table 3B-2: Bryophytes and Lichens Recorded to Species or Genus During Field Studies, Including Study Area and Number of Locations in the Regional and Local Study Areas

Scientific Name[1]	Common Name	MBCDC S-Rank[2]	Percent of RSA Sample Locations	Location[3]	Number of Sample Locations in LSA	Number of Sample Locations in RSA	Comments
Cladina mitis (Sandst.) Hustich	green reindeer lichen		37.4	B	124	350	
Cladina rangiferina (L.) Nyl.	grey reindeer lichen		33.3	B	73	189	
Cladina stellaris (Opiz) Brodo	northern reindeer lichen		31.1	B	50	128	
Cladina stygia (Fr.) Ahti	reindeer lichen		0.0	C	0	0	
Hylocomium splendens (Hedw.) Schimp.	stair-step moss		19.7	B	129	347	
Marchantia polymorpha L.	green-tongue liverwort		8.1	B	0	6	
Pleurozium schreberi (Brid.) Mitt.	big red stem		34.0	B	174	494	
Ptilium crista-castrensis (Hedw.) De Not.	Knight's plume		27.8	B	21	47	
Sphagnum spp.	peat mosses		39.9	B	108	379	
Moss spp.	other mosses		29.2	B	178	584	
Cladonia spp.	cup lichens		36.1	B	104	282	
Peltigera spp.	leaf lichens		28.8	B	53	150	

1 Nomenclature follows Flora of North America (FNA) where volumes currently exist for the genus and the Manitoba Conservation Data Centre elsewhere.
2 Species S-Rank source: MBCDC, personal communication.
3 Location codes: K = species was found in Keeyask only during field studies, C = species was found in downstream study area only during field studies, B = species was found in both Keeyask and downstream study area during field studies.

Table 3B-3: Moss Taxa Identified in the Lab From Samples Collected at Inland Plots in the LNR Region, Including Location and Number of Locations in the Regional and Local Study Areas

Scientific Name*	Common Name	Percent of Plots in RSA	Location**	Number of Sample Locations in LSA	Number of Sample Locations in RSA
Abietinella abietina (Hedw.) Fleisch.	wiry fern moss	0.0	C	0	0
Aulacomnium palustre (Hedw.) Schwagr.	tufted moss	32.5	B	14	52
Brachythecium albicans (Hedw.) Schimp.	brachythecium moss	0.0	C	0	0
Brachythecium spp.	brachythecium mosses	8.5	B	4	6
Bryhnia spp.	bryhnia mosses	0.0	C	0	0
Bryum argenteum Hedw.	silvergreen bryum moss	0.0	C	0	0
Bryum pseudotriquetrum (Hedw.) G. Gaertn., B. Mey. & Scherb.	common green gryum moss	100.0	K	0	1
Bryum spp.	bryum mosses	20.0	B	0	1
Callicladium haldanianum (Grev.) H.A. Crum	callicladium moss	100.0	K	0	1
Calliergon giganteum (Schimp.) Kindb.	giant water moss	35.7	B	0	5
Calliergon spp.	calliergon mosses	0.0	C	0	0
Calliergon stramineum (Brid.) Kindb.	straw-coloured water moss	50.0	B	1	2
Calliergon trifarium (F. Weber & D. Mohr) Kindb.	three-ranked feather moss	0.0	C	0	0
Campylium hispidulum (Brid.) Mitt.	hispid campylium moss	0.0	C	0	0
Campylium spp.	campylium mosses	0.0	C	0	0
Campylium stellatum (Hedw.) C.E.O. Jensen	yellow star moss	35.7	B	2	10
Catascopium nigritum (Hedw.) Brid.	catascopium moss	0.0	C	0	0
Ceratodon purpureus (Hedw.) Brid.	purple horn-toothed moss	4.2	B	2	2
Chara spp.		100.0	K	13	44

Table 3B-3: Moss Taxa Identified in the Lab From Samples Collected at Inland Plots in the LNR Region, Including Location and Number of Locations in the Regional and Local Study Areas

Scientific Name*	Common Name	Percent of Plots in RSA	Location**	Number of Sample Locations in LSA	Number of Sample Locations in RSA
Climacium dendroides (Hedw.) F. Weber & D. Mohr	common tree moss	0.0	C	0	0
Dicranella spp.	dicranella mosses	0.0	C	0	0
Dicranum ontariense Peters	Ontario dicranum moss	0.0	C	0	0
Dicranum polysetum Sw.	electric eels	29.6	B	0	8
Dicranum scoparium Hedw.	dicranum moss	100.0	K	0	1
Dicranum spp.	dicranum mosses	40.7	B	27	94
Dicranum undulatum Brid.	wavy dicranum	33.3	B	3	4
Ditrichum flexicaule (Schwagr.) Hampe	ditrichum moss	100.0	K	0	1
Ditrichum spp.	ditrichum mosses	36.4	B	0	4
Drepanocladus aduncus (Hedw.) Warnst.	common hook moss	100.0	K	0	1
Drepanocldus revolvens (Sw.) Warnst.	limprichtia moss	64.3	B	2	9
Drepanocladus spp.	hook mosses	6.7	B	1	2
Eurhynchium pulchellum (Hedw.) Jenn.	eurhynchium moss	0.0	C	0	0
Funaria hygrometrica Hedw.	funaria moss	75.0	B	0	3
Funaria spp.	funaria moss	0.0	C	0	0
Hamatocaulis vernicosus (Mitt.) Hedenas	hamatocaulis moss	60.0	B	2	3
Helodium blandowii (F. Weber & D. Mohr) Warnst.	Blandow's feather moss	33.3	B	0	2
Hypnum lindbergii Mitt.	Lindberg's hypnum moss	33.3	B	0	1
Hypnum pratense (Rabenh.) Koch ex Spruce	hypnum moss	0.0	C	0	0
Hypnum spp.	hypnum mosses	5.0	B	0	1
Isopterygium spp.	isopterygium mosses	0.0	C	0	0
Leskea spp.	leskea mosses	100.0	K	0	1
Liverwort spp.	liverworts	22.2	B	0	2

Table 3B-3: Moss Taxa Identified in the Lab From Samples Collected at Inland Plots in the LNR Region, Including Location and Number of Locations in the Regional and Local Study Areas

Scientific Name*	Common Name	Percent of Plots in RSA	Location**	Number of Sample Locations in LSA	Number of Sample Locations in RSA
Mniaceae spp.	mniaceae	0.0	C	0	0
Paludella squarrosa (Hedw.) Brid.	angled paludella moss	40.0	B	1	4
Peltigera spp.	peltigera lichens	28.8	B	0	150
Plagiomnium cuspidatum (Hedw.) T. Kop.	toothed plagiomnium moss	12.5	B	0	1
Pohlia nutans (Hedw.) Lindb.	copper wire moss	21.4	B	1	3
Pohlia spp.	pohlia mosses	33.3	B	3	5
Polytrichum juniperinum Hedw.	juniper hair-cap	48.0	B	4	12
Polytrichum spp.	polytrichum mosses	23.7	B	3	9
Polytrichum strictum Brid.	slender hair-cap	47.8	B	6	11
Pseudobryum cinclidioides (Hub.) T. Kop.	pseudobryum moss	100.0	K	0	1
Pylaisiella polyantha (Hedw.) Grout	stocking moss	0.0	C	0	0
Rhytidium rugosum (Hedw.) Kindb.	rhytidium moss	0.0	C	0	0
Sanionia uncinata (Hedw.) Loeske	sanionia moss	24.5	B	4	12
Sarmentypnum exannulatum (Schimp.) Hedenas	ringless hook-moss	50.0	B	0	1
Scorpidium scorpioides (Hedw.) Limpr.	sausage moss	25.0	B	0	3
Sphagnum angustifolium (C.E.O. Jensen ex Russow) C.E.O. Jensen	poor fen peat moss	44.6	B	13	33
Sphagnum capillifolium (Ehrh.) Hedw.	acute-leaved peat moss	36.4	B	36	82
Sphagnum cuspidatum Ehrh. ex Hoffm.	toothed peat moss	28.6	B	0	2
Sphagnum fallax (Klinggr.) Klinggr.	peat moss	100.0	K	1	1
Sphagnum fimbriatum Wilson	peat moss	100.0	K	0	1

Table 3B-3: Moss Taxa Identified in the Lab From Samples Collected at Inland Plots in the LNR Region, Including Location and Number of Locations in the Regional and Local Study Areas

Scientific Name*	Common Name	Percent of Plots in RSA	Location**	Number of Sample Locations in LSA	Number of Sample Locations in RSA
Sphagnum flexuosum Dozy & Molk.	peat moss	0.0	C	0	0
Sphagnum fuscum (Schimp.) Klinggr.	rusty peat moss	53.6	B	49	111
Sphagnum lindbergii Schimp.	Lindberg's peat moss	14.3	B	0	1
Sphagnum magellanicum Brid.	midway peat moss	37.5	B	2	6
Sphagnum majus (Russow) C.E.O. Jensen	greater peat moss	33.3	B	0	1
Sphagnum pulchrum (Lindb. ex Braithw.) Warnst.	peat moss	0.0	C	0	0
Sphagnum riparium Angstr.	shore-growing peat moss	50.0	B	4	8
Sphagnum rubellum Wilson	peat moss	15.4	B	1	2
Sphagnum russowii Warnst.	wide-tongued peat moss	54.5	B	5	6
Sphagnum subsecundum Nees	peat moss	25.0	B	1	2
Sphagnum subtile (Russow) Warnst.	peat moss	0.0	C	0	0
Sphagnum tenellum (Brid.) Bory	peat moss	0.0	C	0	0
Sphagnum teres (Schimp.) Angstr.	thin-leafed peat moss	0.0	C	0	0
Sphagnum warnstorfii Russow	Warnstorf's peat moss	40.3	B	3	25
Thuidium delicatulum (Hedw.) Schimp.	thuidium moss	0.0	C	0	0
Thuidium recognitum (Hedw.) Lindb.	thuidium moss	0.0	C	0	0
Tomenthypnum falcifolium (Renauld ex Nicols) Tuom.	sickleleaf tomentypnum moss	0.0	C	0	0
Tomenthypnum nitens (Hedw.) Loeske	golden fuzzy fen moss	32.2	B	8	38
Tortella fragilis (Hook. & Wilson) Limpr.	fragile tortella moss	100.0	K	0	1

Table 3B-3: Moss Taxa Identified in the Lab From Samples Collected at Inland Plots in the LNR Region, Including Location and Number of Locations in the Regional and Local Study Areas

Scientific Name*	Common Name	Percent of Plots in RSA	Location**	Number of Sample Locations in LSA	Number of Sample Locations in RSA
Torella spp.	tortella moss	0.0	C	0	0
Tortella tortuosa (Hedw.) Limpr.	twisted moss	0.0	C	0	0
Tortula ruralis (Hedw.) G. Gaertn., B. Mey & Scherb.	tortula moss	0.0	C	0	0
Ulota spp.	ulota moss	0.0	C	0	0
Warnstorfia fluitans (Hedw.) Loeske	warnstorfia moss	100.0	K	1	1

* Nomenclature follows XX.
** Location codes: K = species was found in Keeyask only during field studies, C = species was found in downstream study area only during field studies, B = species was found in both Keeyask and downstream study area during field studies.

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APPENDIX 3C
PLANT COMMUNITY RESULTS

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3.9 APPENDIX 3C – PLANT COMMUNITY RESULTS

This appendix provides detailed results for the plant community.

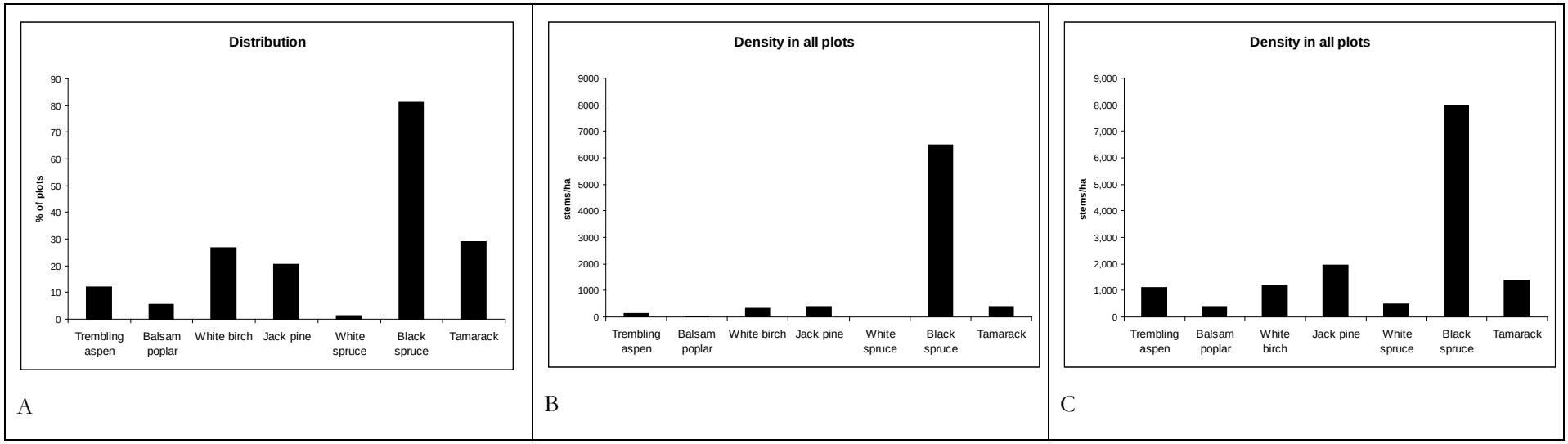


Figure 3C-1: (A) Tree Species Distribution (Percentage of Plots Present), (B) Abundance (Stems/ha) in All Plots and (C) Abundance in the Plots Where Present

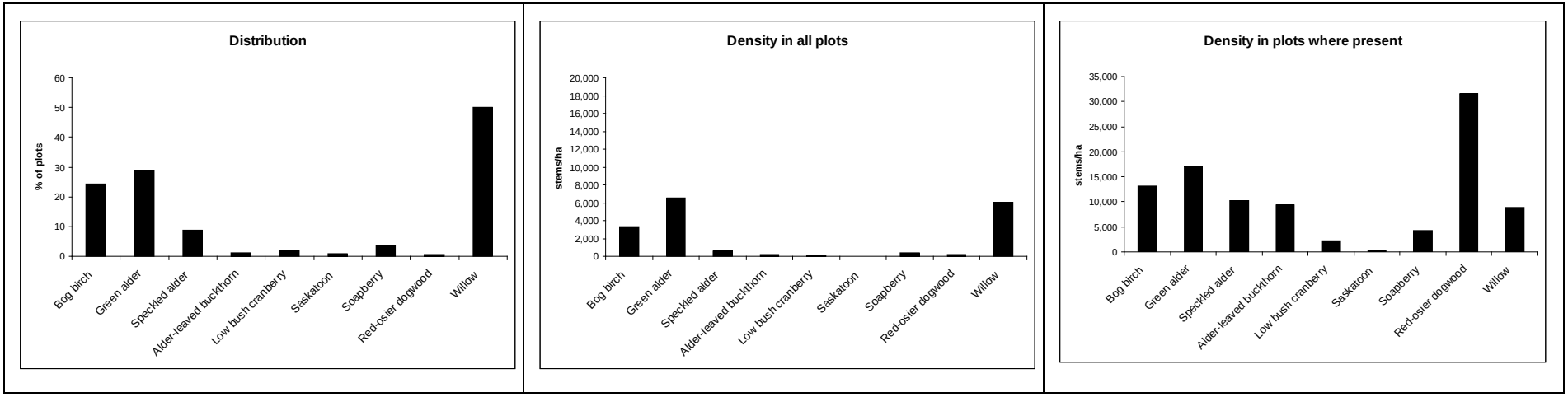


Figure 3C-2: Most Common Tall Shrub Species- Distribution (Percentage of Plots Present) and Abundance (Stems/ha in All Plots and in the Plots Where Present)

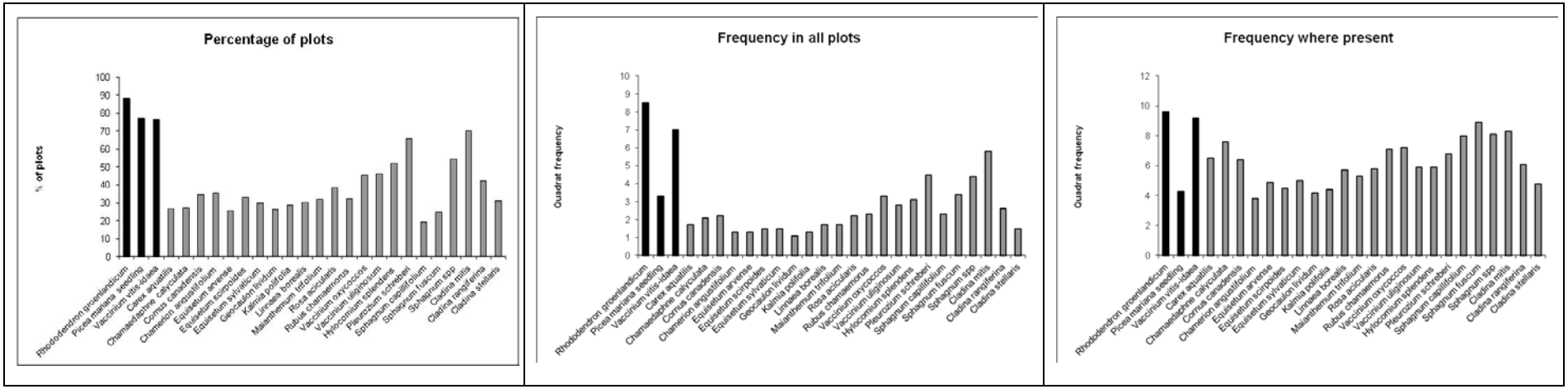
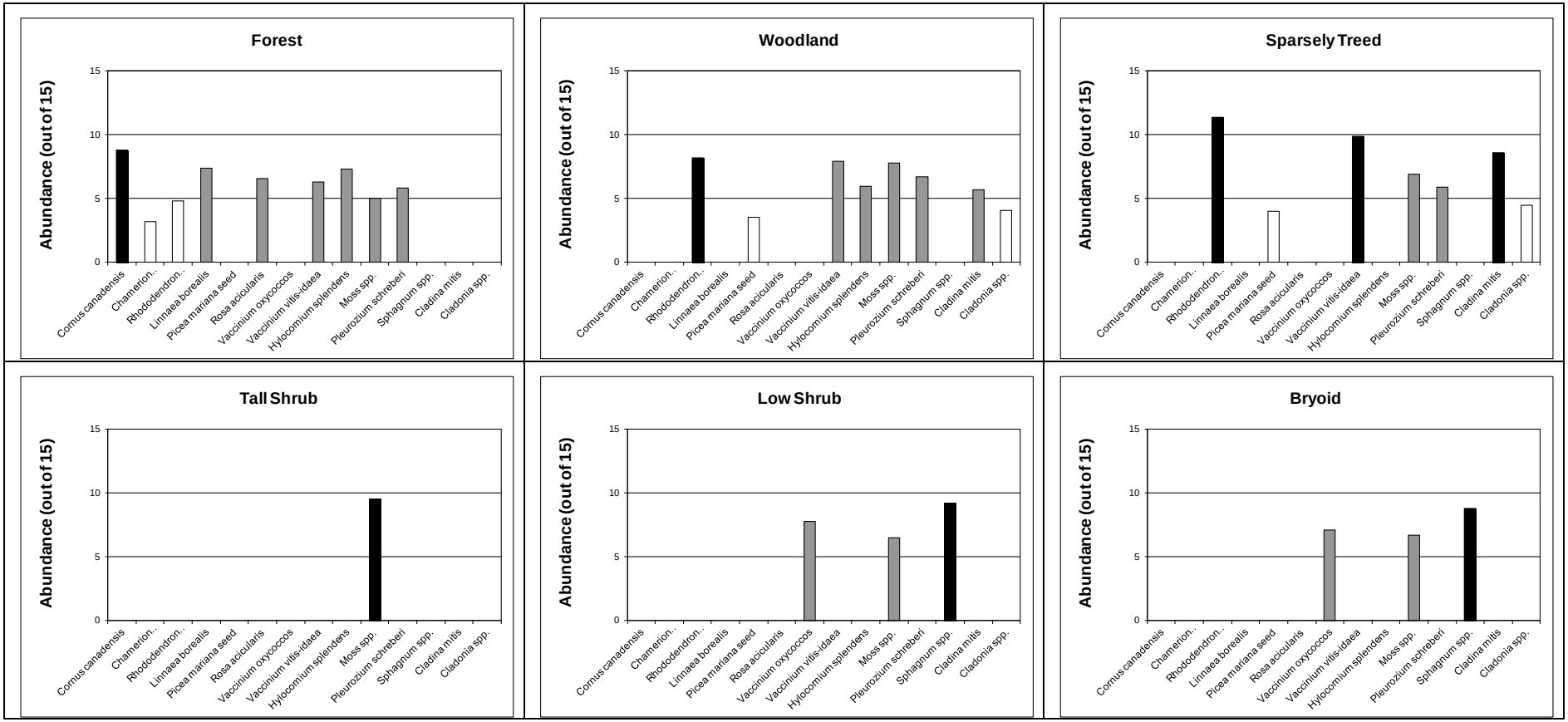


Figure 3C-3: Widespread Understorey Species (Black) and Scattered Understorey Species (Grey) Showing Distribution (Percentage of Plots Present) and Abundance (Quadrat Frequency {Maximum=15} in all Plots and in Plots Where Present)


Forest
Woodland
Sparsely Treed
Tall Shrub
Low Shrub
Bryoid
Abundance (out of 15)
0
5
10
15
Cornus canadensis
Chamerion..
Rhododendron..
Linnaea borealis
Picea mariana seed
Rosa acicularis
Vaccinium oxycoccos
Vaccinium vitis-idaea
Hylocomium splendens
Moss spp.
Pleurozium schreberi
Sphagnum spp.
Cladina mitis
Cladonia spp.

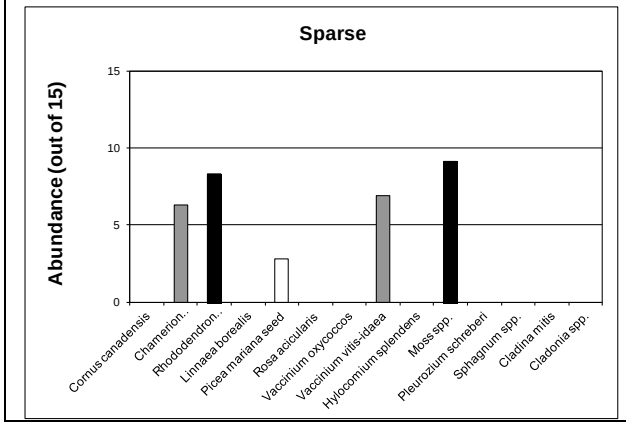


Figure 3C-4: Widespread Understorey Species Abundance (Quadrat Frequency) and their Abundance Class (Black Bar = Abundant, Grey Bar = Sporadic, White Bar = Wparse) by Vegetation Structure Type

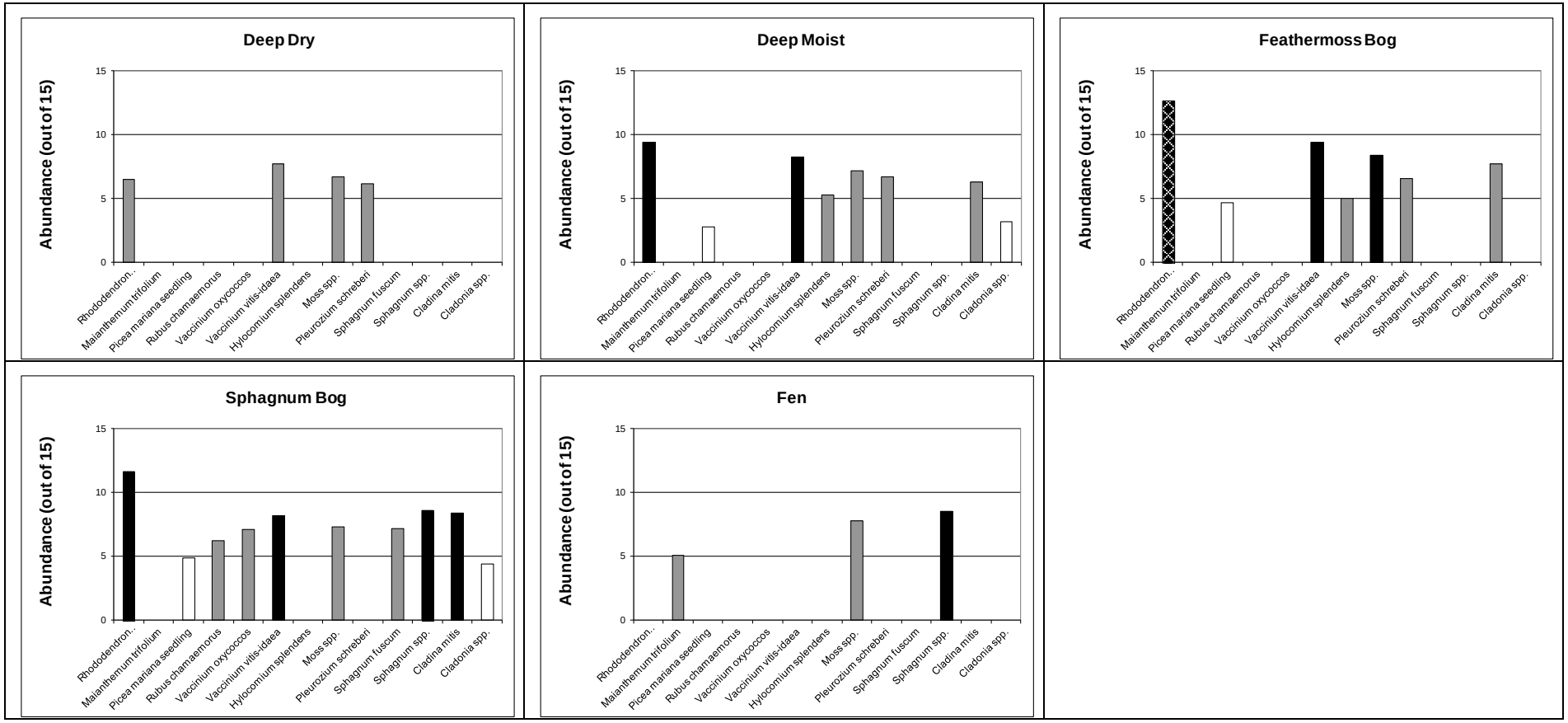


Figure 3C-5: Widespread Understorey Species Abundance (Quadrat Frequency) and their Abundance Class (Black Diamond Bar = Very Abundant, Black Bar = Abundant, Grey Bar = Sporadic, White Bar = Sparse) by Site Type

Table 3C-1: Tree Density Statistics by Diameter Class for the Regional Study Area Inland Plots

Tree Species and Diameter Class	Number of Plots	Stems per hectare				
		All Plots				Plots Where Present
		Mean	SD	Min	Max	Mean
All Size Classes						
trembling aspen	46	135	647	0	6,800	1,104
balsam poplar	21	21	118	0	1,200	382
white birch	101	312	1,118	0	10,200	1,165
jack pine	77	399	2,322	0	27,600	1,953
white spruce	5	7	71	0	900	500
black spruce	306	6,488	7,198	0	47,800	7,994
tamarack	109	392	1,002	0	7,400	1,356
By Diameter Class						
trembling aspen sapling	8	28	260	0	3,400	1,325
trembling aspen DBH 0-8 cm	27	65	434	0	6,800	904
trembling aspen DBH 9-15 cm	24	25	166	0	2,075	395
trembling aspen DBH 16-20 cm	22	11	69	0	800	197
trembling aspen DBH > 20 cm	15	5	35	0	500	133
balsam poplar sapling	3	2	25	0	400	267
balsam poplar DBH 0-8 cm	12	12	90	0	1,200	383
balsam poplar DBH 9-15 cm	9	6	55	0	700	269
balsam poplar DBH 16-20 cm	5	1	6	0	100	40
balsam poplar DBH > 20 cm	0	0	0	0	0	0
white birch sapling	24	50	263	0	2,600	783
white birch DBH 0-8 cm	60	220	916	0	9,000	1,380
white birch DBH 9-15 cm	56	34	129	0	1,200	232
white birch DBH 16-20 cm	28	7	36	0	350	94
white birch DBH > 20 cm	6	1	15	0	275	79
jack pine sapling	3	6	76	0	1,200	800

Table 3C-1: Tree Density Statistics by Diameter Class for the Regional Study Area Inland Plots

Tree Species and Diameter Class	Number of Plots	Stems per hectare				
		All Plots				Plots Where Present
		Mean	SD	Min	Max	Mean
jack pine DBH 0-8 cm	29	325	2,306	0	27,600	4,221
jack pine DBH 9-15 cm	57	41	152	0	1,500	273
jack pine DBH 16-20 cm	43	17	64	0	500	152
jack pine DBH > 20 cm	33	9	41	0	400	105
white spruce sapling	1	2	31	0	600	600
white spruce DBH 0-8 cm	1	1	21	0	400	400
white spruce DBH 9-15 cm	4	2	27	0	400	231
white spruce DBH 16-20 cm	4	1	16	0	300	100
white spruce DBH > 20 cm	4	0	6	0	100	44
black spruce sapling	267	2,715	3,414	0	18,800	3,834
black spruce DBH 0-8 cm	259	3,556	4,734	0	31,800	5,176
black spruce DBH 9-15 cm	188	193	370	0	2,100	387
black spruce DBH 16-20 cm	65	20	62	0	475	116
black spruce DBH > 20 cm	28	4	17	0	150	54
tamarack sapling	64	109	351	0	3,000	641
tamarack DBH 0-8 cm	77	268	793	0	7,000	1,312
tamarack DBH 9-15 cm	35	13	62	0	700	138
tamarack DBH 16-20 cm	12	3	21	0	300	83
tamarack DBH > 20 cm	0	0	0	0	0	0

Note: DBH = diameter at breast height; SD= standard deviation; Min= minimum; Max= maximum

Table 3C-2: Tree Density Statistics by Vegetation Structure Type for the Regional Study Area Inland Plots

Vegetation Structure Type	Forest			Woodland			Sparsely Treed			Tall Shrub			Low Shrub			Bryoid			Sparse		
Number of Plots	18			100			137			25			30			58			9		
Tree Species	Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare	
		All Plots Mean	Plots where Present Mean		All Plots Mean	Plots where Present Mean		All Plots Mean	Plots where Present Mean		All Plots Mean	Plots where Present Mean		All Plots Mean	Plots where Present Mean		All Plots Mean	Plots where Present Mean		All Plots Mean	Plots where Present Mean
trembling aspen	11	803	1,314	25	210	838	6	57	1,300	0	0	0	0	0	0	2	76	2,200	2	356	1,600
balsam poplar	2	26	238	11	53	484	7	13	261	1	16	400	0	0	0	0	0	0	0	0	0
white birch	9	586	1,172	49	492	1,003	31	280	1,235	5	224	1,120	4	367	2,750	3	53	1,025	0	0	0
jack pine	10	401	723	26	1,073	4,125	35	224	875	0	0	0	1	93	2,800	4	38	550	1	33	300
white spruce	1	6	100	3	15	500	1	7	900	0	0	0	0	0	0	0	0	0	0	0	0
black spruce	14	3,454	4,441	97	9,204	9,489	133	8,682	8,943	7	524	1,871	13	1,567	3,615	38	3,589	5,478	4	636	1,431
tamarack	0	0	0	25	399	1,596	46	392	1,167	8	440	1,375	7	453	1,943	22	504	1,330	1	44	400
trembling aspen sapling	1	33	600	3	22	733	1	23	3,200	0	0	0	0	0	0	2	66	1,900	1	89	800
trembling aspen DBH 0-8 cm	7	300	771	14	126	900	2	25	1,700	0	0	0	0	0	0	2	10	300	2	267	1,200
trembling aspen DBH 9-15 cm	8	363	816	12	25	204	4	4	125	0	0	0	0	0	0	0	0	0	0	0	0
trembling aspen DBH 16-20 cm	7	93	239	13	22	169	2	3	225	0	0	0	0	0	0	0	0	0	0	0	0
trembling aspen DBH > 20 cm	2	14	125	10	15	150	3	2	83	0	0	0	0	0	0	0	0	0	0	0	0
balsam poplar sapling	0	0	0	1	4	400	1	1	200	1	8	200	0	0	0	0	0	0	0	0	0
balsam poplar DBH 0-8 cm	1	22	400	6	30	500	4	7	250	1	8	200	0	0	0	0	0	0	0	0	0
balsam poplar DBH 9-15 cm	1	4	75	5	18	360	3	4	183	0	0	0	0	0	0	0	0	0	0	0	0

Table 3C-2: Tree Density Statistics by Vegetation Structure Type for the Regional Study Area Inland Plots

Vegetation Structure Type	Forest			Woodland			Sparsely Treed			Tall Shrub			Low Shrub			Bryoid			Sparse		
Number of Plots	18			100			137			25			30			58			9		
Tree Species	Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare	
		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present
		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean
balsam poplar DBH 16-20 cm	0	0	0	2	1	63	3	1	25	0	0	0	0	0	0	0	0	0	0	0	0
balsam poplar DBH > 20 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
white birch sapling	1	11	200	9	58	644	7	48	943	3	120	1,000	2	47	700	2	31	900	0	0	0
white birch DBH 0-8 cm	7	433	1,114	25	328	1,312	18	210	1,600	4	104	650	4	320	2,400	2	21	600	0	0	0
white birch DBH 9-15 cm	7	118	304	33	84	254	16	18	155	0	0	0	0	0	0	0	0	0	0	0	0
white birch DBH 16-20 cm	4	24	106	16	17	108	7	3	57	0	0	0	0	0	0	1	1	75	0	0	0
white birch DBH > 20 cm	0	0	0	5	5	90	1	0	25	0	0	0	0	0	0	0	0	0	0	0	0
jack pine sapling	0	0	0	1	6	600	0	0	0	0	0	0	1	40	1,200	1	10	600	0	0	0
jack pine DBH 0-8 cm	4	89	400	10	988	9,880	10	137	1,880	0	0	0	1	53	1,600	3	24	467	1	22	200
jack pine DBH 9-15 cm	9	140	281	19	51	268	27	58	293	0	0	0	0	0	0	2	1	25	0	0	0
jack pine DBH 16-20 cm	8	115	259	12	18	150	21	18	117	0	0	0	0	0	0	1	2	125	1	11	100
jack pine DBH > 20 cm	8	57	128	12	10	79	12	11	123	0	0	0	0	0	0	1	0	25	0	0	0
white spruce sapling	0	0	0	0	0	0	1	4	600	0	0	0	0	0	0	0	0	0	0	0	0

Table 3C-2: Tree Density Statistics by Vegetation Structure Type for the Regional Study Area Inland Plots

Vegetation Structure Type	Forest			Woodland			Sparsely Treed			Tall Shrub			Low Shrub			Bryoid			Sparse		
Number of Plots	18			100			137			25			30			58			9		
Tree Species	Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare	
		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present
		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean
white spruce DBH 0-8 cm	0	0	0	1	4	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
white spruce DBH 9-15 cm	1	3	50	2	6	300	1	2	275	0	0	0	0	0	0	0	0	0	0	0	0
white spruce DBH 16-20 cm	1	1	25	2	4	175	1	0	25	0	0	0	0	0	0	0	0	0	0	0	0
white spruce DBH > 20 cm	1	1	25	3	2	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
black spruce sapling	12	1,556	2,333	79	2,924	3,701	118	3,780	4,388	6	400	1,667	13	1,273	2,938	36	2,310	3,722	3	356	1,067
black spruce DBH 0-8 cm	10	1,800	3,240	84	5,900	7,024	121	4,626	5,238	3	120	1,000	8	287	1,075	31	1,214	2,271	2	267	1,200
black spruce DBH 9-15 cm	6	67	200	71	326	460	94	257	374	2	4	50	2	7	100	12	59	288	1	8	75
black spruce DBH 16-20 cm	5	31	110	31	44	141	26	16	86	0	0	0	0	0	0	2	6	163	1	6	50
black spruce DBH > 20 cm	1	1	25	19	10	54	8	3	59	0	0	0	0	0	0	0	0	0	0	0	0
tamarack sapling	0	0	0	7	58	829	27	109	556	6	152	633	7	120	514	17	221	753	0	0	0
tamarack DBH 0-8 cm	0	0	0	17	302	1,776	32	269	1,150	7	288	1,029	5	333	2,000	15	283	1,093	1	44	400
tamarack DBH 9-15 cm	0	0	0	15	34	223	18	10	79	0	0	0	0	0	0	2	1	25	0	0	0
tamarack DBH 16-20 cm	0	0	0	6	6	92	6	3	75	0	0	0	0	0	0	0	0	0	0	0	0

Table 3C-2: Tree Density Statistics by Vegetation Structure Type for the Regional Study Area Inland Plots

Vegetation Structure Type	Forest			Woodland			Sparsely Treed			Tall Shrub			Low Shrub			Bryoid			Sparse		
Number of Plots	18			100			137			25			30			58			9		
Tree Species	Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare		Number of Plots Present	Stems per hectare	
		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present		All Plots	Plots where Present
		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean
tamarack DBH > 20 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: DBH= diameter at breast height

Table 3C-3: Tree Density Statistics by Site Type for Regional Study Area Inland Plots

Site Type	Deep Dry			Deep Moist			Feathermoss Bog			Sphagnum Bog			Fen		
Number of Plots Total	**135**			**32**			**38**			**115**			**53**		
Tree Species	**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**	
		All Plots	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**
		Mean	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**
trembling aspen	37	330	1,203	7	161	736	1	14	525	1	5	600	0	0	0
balsam poplar	14	37	357	5	66	420	2	24	463	0	0	0	0	0	0
white birch	68	650	1,290	11	175	509	7	97	525	9	163	2,083	5	28	300
jack pine	56	924	2,226	11	309	898	6	191	1,213	3	38	1,475	0	0	0
white spruce	4	13	438	0	0	0	1	20	750	0	0	0	0	0	0
black spruce	119	6,589	7,474	29	5,509	6,079	35	9,632	10,458	96	8,273	9,911	26	782	1,594
tamarack	21	101	649	9	264	939	16	624	1,483	38	491	1,486	25	860	1,823
trembling aspen sapling	6	73	1,633	1	13	400	0	0	0	1	3	400	0	0	0
trembling aspen DBH 0-8 cm	22	163	1,000	4	69	550	0	0	0	1	2	200	0	0	0
trembling aspen DBH 9-15 cm	19	53	375	4	66	525	1	7	250	0	0	0	0	0	0
trembling aspen DBH 16-20 cm	18	27	203	3	14	150	1	6	225	0	0	0	0	0	0
trembling aspen DBH > 20 cm	14	14	139	0	0	0	1	1	50	0	0	0	0	0	0
balsam poplar sapling	1	1	200	0	0	0	2	16	300	0	0	0	0	0	0
balsam poplar DBH 0-8 cm	9	22	333	2	44	700	1	5	200	0	0	0	0	0	0
balsam poplar DBH 9-15 cm	5	12	330	3	20	217	1	3	125	0	0	0	0	0	0
balsam poplar DBH 16-20 cm	3	1	50	2	2	25	0	0	0	0	0	0	0	0	0
balsam poplar DBH > 20 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
white birch sapling	16	104	875	2	69	1,100	1	5	200	2	16	900	2	8	200
white birch DBH 0-8 cm	41	446	1,468	4	81	650	3	68	867	8	144	2,075	3	11	200
white birch DBH 9-15 cm	46	80	236	4	16	131	3	22	283	1	3	350	2	8	200
white birch DBH 16-20 cm	21	17	107	5	8	50	1	1	25	0	0	0	1	2	100
white birch DBH > 20 cm	5	3	90	1	1	25	0	0	0	0	0	0	0	0	0
jack pine sapling	1	4	600	1	19	600	1	32	1,200	0	0	0	0	0	0
jack pine DBH 0-8 cm	20	770	5,200	3	194	2,067	3	105	1,333	2	38	2,200	0	0	0
jack pine DBH 9-15 cm	42	90	288	8	49	197	5	40	305	1	0	25	0	0	0

Table 3C-3: Tree Density Statistics by Site Type for Regional Study Area Inland Plots

Site Type	Deep Dry			Deep Moist			Feathermoss Bog			Sphagnum Bog			Fen		
Number of Plots Total	**135**			**32**			**38**			**115**			**53**		
Tree Species	**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**	
		All Plots	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**
		Mean	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**
jack pine DBH 16-20 cm	34	38	150	6	31	167	3	12	150	0	0	0	0	0	0
jack pine DBH > 20 cm	28	21	103	4	16	125	1	3	100	0	0	0	0	0	0
white spruce sapling	1	4	600	0	0	0	0	0	0	0	0	0	0	0	0
white spruce DBH 0-8 cm	0	0	0	0	0	0	1	11	400	0	0	0	0	0	0
white spruce DBH 9-15 cm	3	5	242	0	0	0	1	5	200	0	0	0	0	0	0
white spruce DBH 16-20 cm	3	3	117	0	0	0	1	1	50	0	0	0	0	0	0
white spruce DBH > 20 cm	3	1	25	0	0	0	1	3	100	0	0	0	0	0	0
black spruce sapling	98	2,416	3,329	19	1,875	3,158	33	4,047	4,661	96	4,000	4,792	20	355	940
black spruce DBH 0-8 cm	93	3,887	5,643	25	3,175	4,064	33	5,258	6,055	89	4,158	5,373	18	370	1,089
black spruce DBH 9-15 cm	78	239	413	22	412	599	26	312	456	56	114	233	6	46	408
black spruce DBH 16-20 cm	42	38	123	10	41	130	6	14	88	4	1	38	3	8	133
black spruce DBH > 20 cm	22	8	48	3	7	75	1	1	50	0	0	0	2	4	100
tamarack sapling	3	6	267	4	94	750	9	189	800	29	155	614	19	230	642
tamarack DBH 0-8 cm	12	83	933	6	144	767	9	416	1,756	33	323	1,127	17	608	1,894
tamarack DBH 9-15 cm	12	11	119	4	24	194	6	13	83	10	12	135	3	15	258
tamarack DBH 16-20 cm	5	1	40	2	2	38	2	6	113	1	1	100	2	8	200
tamarack DBH > 20 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

DBH= diameter at breast height.

Table 3C-4: Shrub Density Statistics for Regional Study Area Inland Plots

Tree Species and Diameter Class	Number of Plots	Stems per hectare				
		All Plots				Plots Where Present
		Mean	SD	Min	Max	Mean
swamp birch	92	3,203	9,639	0	69,000	13,126
green alder	108	4,886	10,692	0	58,800	17,056
speckled alder	33	900	4,399	0	37,600	10,279
alder-leaved buckthorn	4	100	1,196	0	19,800	9,450
low bush cranberry	8	48	555	0	8,600	2,250
Saskatoon	3	2	25	0	400	267
Canada buffalo-berry	13	149	1,169	0	15,800	4,323
red-osier dogwood	2	168	3,075	0	59,600	31,600
willow	189	4,432	12,955	0	90,800	8,840

Note: SD= standard deviation; Min= minimum; Max= maximum

Table 3C-5: Comparison of Willow Species Between the Regional Study Area and the LNR Region, Including Distribution and Mean Abundance Within Inland Plots

Species	Keeyask RSA			Lower Nelson River Region		
	Distribution		Abundance	Distribution		Abundance
	Number of plots	Percent plots	Mean	Number of plots	Percent plots	Mean
shrubby willow (*Salix arbusculoides*)	10	3	0.1	203	20	0.5
Bebb's willow (*Salix bebbiana*)	104	28	0.8	378	37	1.2
hoary willow (*Salix candida*)	6	2	0.1	19	2	0.1
grey-leaved willow (*Salix glauca*)	21	6	0.1	197	19	0.5
myrtle-leaved willow (*Salix myrtillifolia*)	90	24	1.2	307	30	1.3
bog willow (*Salix pedicellaris*)	34	9	0.6	74	7	0.4
satin willow (*Salix pellita*)	5	1	0.0	23	2	0.1
flat-leaved willow (*Salix planifolia*)	61	16	0.8	140	14	0.6
false mountain willow (*Salix pseudomonticola*)	1	0	0.0	143	14	0.3
tall blueberry willow (*Salix pseudomyrsinites*)	15	4	0.1	86	8	0.4
willow (*Salix* spp.)	50	13	0.5	61	6	0.2
rock willow (*Salix vestita*)	8	2	0.1	141	14	0.5

Table 3C-6: Shrub Density Statistics by Vegetation Structure Type for Regional Study Area Inland Plots

Vegetation Structure	Forest			Woodland			Sparsely Treed			Tall Shrub			Low Shrub			Bryoid			Sparse		
Number of Plots	**18**			**100**			**137**			**25**			**30**			**58**			**9**		
Species	**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**	
		All Plots	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**
		Mean	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**
swamp birch	0	0	0	17	1,240	7,294	26	1,785	9,408	15	16,864	28,107	8	4,753	17,825	24	4,590	11,092	2	956	4,300
green alder	15	25,144	30,173	49	7,048	14,384	37	4,679	17,324	1	472	11,800	2	927	13,900	4	69	1,000	0	0	0
speckled alder	0	0	0	10	1,102	11,020	7	382	7,486	10	6,424	16,060	3	367	3,667	3	86	1,667	0	0	0
alder-leaved buckthorn	0	0	0	1	8	800	2	201	13,800	1	376	9,400	0	0	0	0	0	0	0	0	0
low bush cranberry	1	33	600	1	4	400	4	115	3,950	1	32	800	0	0	0	0	0	0	1	44	400
Saskatoon	0	0	0	2	6	300	0	0	0	0	0	0	0	0	0	1	3	200	0	0	0
Canada buffalo-berry	1	11	200	4	94	2,350	6	245	5,600	0	0	0	0	0	0	0	0	0	2	1,444	6,500
red-osier dogwood	0	0	0	0	0	0	0	0	0	2	2,528	31,600	0	0	0	0	0	0	0	0	0
willow	7	378	971	59	1,906	3,231	66	1,969	4,088	24	39,656	41,308	11	4,907	13,382	19	986	3,011	3	867	2,600

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Table 3C-7: Shrub Density Statistics by Site Type for Regional Study Area Inland Plots

Site Type		Deep Dry			Deep Moist			Feathermoss Bog			Sphagnum Bog			Fen	
Number of Plots Total		**135**			**32**			**38**			**115**			**53**	
Species	**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**		**Number of Plots**	**Stems per hectare**	
		All Plots	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**
		Mean	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**
swamp birch	6	358	7,933	6	2,524	14,300	16	3,600	8,550	35	3,251	9,383	29	11,491	21,000
green alder	75	9,800	18,163	19	12,465	19,211	8	2,532	12,025	4	55	1,400	1	11	600
speckled alder	4	262	8,700	4	1,118	9,500	4	1,563	14,850	10	176	1,780	10	3,457	18,320
alder-leaved buckthorn	1	6	800	1	582	19,800	0	0	0	0	0	0	2	325	8,600
low bush cranberry	5	63	1,680	0	0	0	0	0	0	1	2	200	2	177	4,700
Saskatoon	1	2	200	1	12	400	1	5	200	0	0	0	0	0	0
Canada buffalo-berry	11	418	5,055	2	18	300	0	0	0	0	0	0	0	0	0
red-osier dogwood	1	27	3,600	0	0	0	0	0	0	0	0	0	0	0	0
willow	82	2,567	4,202	17	1,447	2,706	21	4,826	8,733	35	2,671	7,709	30	12,894	22,780

Table 3C-8: Abundance of Widespread and Scattered Understorey Species in Regional Study Area Inland Plots

Species	Distribution		Abundance	
	N	Percentage of Plots	Mean	Mean Where Present
Very Widespread and Widespread				
Rhododendron groenlandicum	333	88	8.5	9.6
Picea mariana seedling	291	77	3.3	4.3
Vaccinium vitis-idaea	288	76	7.0	9.2
Moss species	360	95	7.2	7.6
Scattered				
Carex aquatilis	100	27	1.7	6.5
Carex spp.	110	29	1.6	5.6
Chamaedaphne calyculata	102	27	2.1	7.6
Chamerion angustifolium	133	35	1.3	3.8
Cornus canadensis	130	34	2.2	6.4
Equisetum arvense	96	25	1.3	4.9
Equisetum scirpoides	124	33	1.5	4.5
Equisetum sylvaticum	113	30	1.5	5.0
Geocaulon lividum	99	26	1.1	4.2
Kalmia polifolia	108	29	1.3	4.4
Linnaea borealis	114	30	1.7	5.7
Maianthemum trifolium	120	32	1.7	5.3
Rosa acicularis	145	38	2.2	5.8
Rubus chamaemorus	122	32	2.3	7.1
Vaccinium oxycoccos	172	46	3.3	7.2
Vaccinium uliginosum	175	46	2.8	5.9
Dicranum spp	82	33	1.9	5.9
Hylocomium splendens	196	52	3.1	5.9
Pleurozium schreberi	248	66	4.5	6.8
Sphagnum capillifolium	73	29	2.3	8.0

Table 3C-8: Abundance of Widespread and Scattered Understorey Species in Regional Study Area Inland Plots

Species	Distribution		Abundance	
	N	Percentage of Plots	Mean	Mean Where Present
Sphagnum fuscum	94	38	3.4	8.9
Sphagnum spp	206	55	4.4	8.1
Cladina mitis	264	70	5.8	8.3
Cladina rangiferina	159	42	2.6	6.1
Cladina stellaris	117	31	1.5	4.8
Cladonia spp.	248	66	3.5	5.3
Peltigera spp.	144	38	1.2	3.1

Table 3C-9: Mean Abundance of Widespread Understorey Species for All Plots, and Plots Only Where Present Along With Number of Plots Where Present in the Regional Study Area Upland / Peatland Plots by Vegetation Structure Type

Structure Type	Forest			Woodland			Sparsely Treed			Tall Shrub			Low Shrub			Bryoid			Sparse		
Number of Plots Total	**18**			**100**			**137**			**25**			**30**			**58**			**9**		
		Abundance			**Abundance**			**Abundance**			**Abundance**			**Abundance**			**Abundance**			**Abundance**	
Species	**Number of Plots**	**All Plots**	**Plots where Present**	**Number of Plots**	**All Plots**	**Plots where Present**	**Number of Plots**	**All Plots**	**Plots where Present**	**Number of Plots**	**All Plots**	**Plots where Present**	**Number of Plots**	**All Plots**	**Plots where Present**	**Number of Plots**	**All Plots**	**Plots where Present**	**Number of Plots**	**All Plots**	**Plots where Present**
		Mean	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**
Cornus canadensis	16	8.8	9.9																		
Chamerion angustifolium	14	3.2	4.1																8	6.3	7.1
Rhododendron groenlandicum	18	4.8	4.8	98	8.2	8.4	132	11.4	11.8										9	8.3	8.3
Linnaea borealis	16	7.4	8.3																		
Picea mariana seed				87	3.5	4.0	117	4.0	4.7										8	2.8	3.1
Rosa acicularis	15	6.6	7.9																		
Vaccinium oxycoccos													24	7.8	9.7	48	7.1	8.6			
Vaccinium vitis-idaea	15	6.3	7.5	91	7.9	8.7	126	9.9	10.8										7	6.9	8.9
Hylocomium splendens	17	7.3	7.8	83	6.0	7.2															
Moss spp.	17	5.0	5.3	100	7.8	7.8	133	6.9	7.1	25	9.5	9.5	25	6.5	7.8	51	6.7	7.6	9	9.1	9.1
Pleurozium schreberi	17	5.8	6.1	86	6.7	7.8	116	5.9	6.9												
Sphagnum spp.													26	9.2	10.6	52	8.8	9.8			
Cladina mitis				78	5.7	7.3	123	8.6	9.6												
Cladonia spp.				78	4.1	5.2	115	4.5	5.4												

Table 3C-10: Mean Abundance of Widespread Understorey Species for All Plots and Plots Only Where Present Along With Number of Plots Where Present in the Regional Study Area Inland Plots Stratified by Site Type

Site Type	Deep Dry			Deep Moist			Feathermoss Bog			Sphagnum Bog			Fen		
Number of Plots Total	**135**			**32**			**38**			**115**			**53**		
Species	**Number of Plots**	**Abundance**		**Number of Plots**	**Abundance**		**Number of Plots**	**Abundance**		**Number of Plots**	**Abundance**		**Number of Plots**	**Abundance**	
		All Plots	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**		**All Plots**	**Plots where Present**
		Mean	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**		**Mean**	**Mean**
Rhodendron groenlandicum	126	6.5	7.0	31	9.4	9.7	38	12.7	12.7	103	11.6	13.0			
Maianthemum trifolium													40	5.1	6.8
Picea mariana seedling				25	2.8	3.5	36	4.7	4.9	103	4.9	5.4			
Rubus chamaemorus										87	6.2	8.3			
Vaccinium oxycoccos										104	7.1	7.8			
Vaccinium vitis-idaea	118	7.7	8.8	30	8.3	8.8	35	9.4	10.2	93	8.2	10.1			
Hylocomium splendens				28	5.3	6.1	29	5.0	6.6						
Moss spp.	132	6.7	6.8	32	7.2	7.2	37	8.4	8.6	107	7.3	7.8	48	7.8	8.6
Pleurozium schreberi	105	6.2	7.9	27	6.7	7.9	32	6.6	7.8						
Sphagnum fuscum										73	7.2	8.9			
Sphagnum spp.										109	8.6	9.0	46	8.5	9.8
Cladina mitis				26	6.3	7.7	31	7.7	9.4	98	8.4	9.9			
Cladonia spp.				25	3.2	4.1				91	4.4	5.5			

Table 3C-11: Distribution of Scattered Understorey Species in Regional Study Area Wetland Transects

Species	Percent of Plots
Calamagrostis canadensis	43
Carex aquatilis	31
Equisetum arvense	32
Rhododendron groenlandicum	40
Moss spp	32
Vaccinium vitis-idaea	26

Table 3C-12: Distribution of Scattered Understorey Species in Off-System Versus On-System Regional Study Area wetland transects

Species	Off-System Percent of Plots	On-System Percent of plots
Alnus incana	36	
Calamagrostis canadensis	58	28
Carex aquatilis	43	
Chamaedaphne calyculata	27	
Equisetum arvense		41
Rhododendron groenlandicum	32	47
Moss spp	36	28
Picea mariana tree		26
Salix planifolia		26
Vaccinium vitis-idaea		39

Table 3C-13: Distribution of Widespread and Scattered Understorey Species in Regional Study Area Wetland Transects by Area

Species	Keeyask Percent of Plots	Stephens Lake Percent of Plots	Long Spruce Forebay Percent of Plots	Limestone Forebay Percent of Plots
Widespread				
Rhododendron groenlandicum			89	
Moss spp			78	
Picea mariana tree			78	
Vaccinium uliginosum		78		
Scattered				
Alnus incana ssp. rugosa	29			
Alnus viridis ssp. crispa				32
Calamagrostis canadensis	57	48	67	
Carex aquatilis	39	57	67	
Carex canescens			33	
Carex chordorrhiza			33	
Carex diandra			44	
Carex gynocrates		35		
Carex magellanica			56	
Chamaedaphne calyculata			44	
Cladina mitis			67	
Cladina rangiferina			33	
Chamerion angustifolium				46
Comarum palustris		48	56	
Equisetum arvense	28	52		38
Galium trifidum		48		
Hylocomium splendens				39
Rhododendron groenlandicum	28	70		52
Moss spp	29			45
Myrica gale		30		
Picea mariana sapl			56	
Picea mariana seed			44	
Picea mariana tree		30		28
Pleurozium schreberi		26		
Rubus acaulis		30		
Rubus chamaemorus			44	
Salix myrtillifolia		57		
Salix planifolia	27	65	44	
Vaccinium vitis-idaea	29	26	56	57

Table 3C-14: Distribution of Scattered Understorey Species in Regional Study Area Wetland Transects by Substrate type

Species	Organic	Organic-Mineral Mix	Fine Mineral	Fine-Coarse Mineral Mix
	Percent of Plots	Percent of Plots	Percent of Plots	Percent of Plots
Argentina anserina				27
Calamagrostis canadensis	52	41		45
Carex aquatilis	51			
Carex utriculata	30			
Chamaedaphne calyculata	33			
Chamerion angustifolium		34	32	
Comarum palustris	40			
Cornus canadensis				27
Equisetum arvense	27	51	37	52
Galium trifidum	27			
Hylocomium splendens		25		
Rhododendron groenlandicum	62	53	37	36
Moss spp	33	47	37	45
Picea mariana tree	35	29	26	
Salix planifolia	46	28		
Vaccinium uliginosum	32			
Vaccinium vitis-idaea	30	38	37	30

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APPENDIX 3D
INVASIVE PLANTS

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3.10 APPENDIX 3D – INVASIVE PLANTS

Table 3D-1: Occurrences and Habitats of Invasive Plant Species Found during Field Studies or Could Potentially Occur in the Regional Study Area

Species	Common Name	S-Rank	Number in LSA	Number in RSA	Habitats*	Habitat from Literature	Source**
Bromus inermis	smooth brome grass	SNA	0	5	D	thickets, clearings, waste places and roadsides	F, H, L
Chenopodium album	lamb's-quarters	SNA	2	2	D	fields, waste places and roadsides	F, H
Chenopodium glaucum var. salinum	oakleaf goosefoot	SNA	11	11	D, U	roadsides, waste places, saline marshes and riverbank seepage areas	F
Leucanthemum vulgare	ox-eye daisy	SNA	1	1	D	waste places, meadows and roadsides	F, H, L
Cirsium arvense	Canada thistle	SNA	0	1	D, U	fields, waste places and roadsides	F, L
Crepis tectorum	narrow-leaf hawk's-beard	SNA	1	6	D	waste places and roadsides	F, H
Elymus repens	quack grass	SNA	0	2	D, U	fields, waste places and roadsides	F, H
Hordeum jubatum	wild barley	S5	6	27	W, D	fields, waste places and roadsides	F, H
Matricaria discoidea	pineappleweed	SNA	0	1	D	waste places, clearings and roadsides	F, H

Table 3D-1: Occurrences and Habitats of Invasive Plant Species Found during Field Studies or Could Potentially Occur in the Regional Study Area

Species	Common Name	S-Rank	Number in LSA	Number in RSA	Habitats*	Habitat from Literature	Source**
Melilotus albus	white sweet-clover	SNA	0	30	D	fields, waste places and roadsides	F, L
Melilotus officinalis	Yellow sweet clover	SNA	0	3	D	Fields, wast places and roadsides	F, L
Phalaris arundinacea	reed-canary grass	S5	20	27	U, W, S	meadows, marshes and shore zones	F, H, L
Plantago major	common plantain	SNA	20	24	D, U	waste places, roadsides and shore zones	F, H
Polygonum aviculare spp. depressum	common knotweed	SNA	8	8	D	waste places and disturbed areas	F, H
Rumex crispus	curled dock	SNA	1	1	D	moist ground and waste places	F
Silene csereii	smooth catchfly	SNA	0	4	D	railways and roadsides	F, H
Sonchus arvensis	perennial sow thistle	SNA	0	8	D	waste places and roadsides	F, H
Taraxacum officinale	common dandelion	S5	4	32	U, S, F	waste places, roadsides and shore zones	F, H
Trifolium hybridum	alsike clover	SNA	0	5	D, U	waste places, fields and roadsides	F, H

* Habitats include upland (U), wetland (W), shore zone (S), physically disturbed (D), forest (F) or aquatic (A) and are listed from most to least common).
** Sources include field studies (F), herbarium information (H) and literature (L).

APPENDIX 3E
PRIORITY PLANT SPECIES

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3.11 APPENDIX 3E – PRIORITY PLANT SPECIES

Table 3E-1: SARA, COSEWIC and MESA Listed Endangered Species Which Occur in Manitoba

Species		List		
Scientific Name	**Common Name**	**SARA**	**COSEWIC**	**MBESA**
Endangered				
Agalinis aspera	rough agalinis	X	X	
Agalinis gattingeri	Gattinger's agalinis	X	X	
Cypripedium candidum	small white lady's-slipper	X	X	X
Platanthera praeclara	western prairie fringed-orchid	X	X	X
Spiranthes magnicamporum	Great Plains lady's tresses			X
Threatened				
Buchloë dactyloides	buffalograss	X	X	X
Celtis occidentalis	common hackberry			X
Chenopodium subglabrum	smooth goosefoot	X	X	
Dalea villosa	prairie clover	X	X	X
Leptogium rivulare	flooded jellyskin	X	X	
Solidago riddellii	Riddell's goldenrod			X
Symphyotrichum sericeum	western silvery aster	X	X	X
Tradescantia occidentalis	western spiderwort	X	X	X
Veronicastrum virginicum	Culver's-root			X

Table 3E-2: Priority Plant Species and Reasons for Inclusion

Scientific Name	Common Name	MBCDC S-Rank[2]	Reasons for Inclusion[1]					Number in LSA[3]	Number in RSA	Habitats	Habitat from Literature[4]
			Endangered or Threatened	Provincially Very Rare to Uncommon	Regionally Rare	Range Limit	KCN importance				
Acorus americanus	sweet flag	S5					1	0	0	S, A	swamps, marshes and quiet streams
Anemone parviflora	Northern anemone	S4			1			1	2	F, S	open woods and river flats
Antennaria pulcherrima	showy pussytoes	S4			1			0	1	U, S	moist river flats and meadows
Anthoxanthum alpina	holy grass	S2		1				0	0		
Anthoxanthum alpina spp. alpina	holy grass	S2		1				0	0		
Aquilegia brevistyla	blue columbine	S4			1			0	3	U, F	open woods, meadows and rocky slopes
Artemisia tilesii	Herriot's sage	S2		1				0	0		
Artemisia tilesii spp. elatior	Herriot's sage	S2		1				0	0		
Astragalus americanus	American milk-vetch	S3		1				0	9		
Astragalus bodinii	milkvetch	S1		1				0	0		
Betula papyrifera/neoalaskana	white birch/Alaskan birch	S5					1	82	197	S, W	marshes, ditches, shallow water and shores
Botrychium minganense	mingan moonwort	S1S2		1				0	0		
Braya humilis	low braya	S2		1				0	0		
Calamagrostis lapponica	reed grass	S2?		1				0	0		
Calamagrostis purpurascens	purple reed grass	S2		1				0	0		
Calypso bulbosa	Venus'-slipper	S4			1			1	3	F	coniferous forest
Carex arcta	narrow sedge	S1		1				0	0		
Carex buxbaumii	brown sedge	S4S5			1			0	5	W, S	swamps, bogs, meadows and river banks
Carex cryptolepis	northeastern sedge	S1		1				0	0		
Carex garberi	elk sedge	S1?		1				0	0		
Carex heleonastes	Hudson Bay sedge	S2		1				0	0		
Carex heleonastes spp. heleonastes	Hudson Bay sedge	S2		1				0	0		
Carex loliacea	rye-grass sedge	S2		1				0	0		
Carex maritima	curved sedge	S2		1				0	0		
Carex michauxiana	long-fruited sedge	S2		1				0	0		
Carex microglochin	short-awned sedge	S2		1				0	0		
Carex pauciflora	fewflower sedge	S3		1				0	0		

Table 3E-2: Priority Plant Species and Reasons for Inclusion

Scientific Name	Common Name	MBCDC S-Rank[2]	Reasons for Inclusion[1]					Number in LSA[3]	Number in RSA	Habitats	Habitat from Literature[4]
			Endangered or Threatened	Provincially Very Rare to Uncommon	Regionally Rare	Range Limit	KCN importance				
Carex sychnocephala	long-beaked sedge	S4?			1			4	4		
Cicuta virosa	Mackenzie's water-hemlock	S4			1			0	1	S, W	lakeshores, wetlands and shallow water
Coptis trifolia	goldthread	S5				1		1	2	U, F	damp woods
Crepis elegans	elegant hawk's-beard	S1S2		1		1		0	9	S, D	sandy floodplains, gravel flats and shore zones
Descurainia sophioides	northern flixweed	S2		1				0	0		
Drosera anglica	oblong-leaved sundew	S3		1	1			2	5	W, S	poor fens, bogs and shore zones
Elaeagnus commutata	wolf-willow	S4				1		0	10	S, U	streambanks, lakeshores, floodplains
Eleocharis quinqueflora	few-flowered spike-rush	S4			1			1	1	W	wetlands
Epilobium davuricum	willowherb	S2S3		1				0	0		
Equisetum palustre	marsh horsetail	S4S5			1			0	1	S, W	lakeshores, meadows, fens and marshes
Equisetum pratense	meadow horsetail	S4S5			1			3	3	U, F	moist open woodlands
Erigeron elatus	tall fleabane	S4			1			0	1	U, F, S	woodlands, clearings and lakeshores
Erigeron hyssopifolius	wild daisy	S4			1			0	2	U, W, F	clearings, bogs and open woods
Eriophorum callitrix	beautiful cotton-grass	S2		1				0	0		
Eriophorum scheuchzeri	one-spike cotton-grass	S2?		1				0	0		
Eriophorum viridicarinatum	thin-leaved cotton-grass	S4			1			1	1	W	fens
Euphrasia arctica	northern eyebright	S4S5			1			0	1	U, D	open, disturbed areas
Festuca richardsonii	Richardson's fescue	S1		1				0	0		
Fragaria vesca	woodland strawberry	S4S5			1			0	1	U, S	open woods, streambanks
Fragaria virginiana	smooth wild strawberry	S5					1	21	34	U, F	rock outcrops, clearings and open woodlands
Glaux maritima	sea-milkwort	S4S5			1			2	2	S, W	salt flats and saline wetlands
Glyceria pulchella	graceful manna grass	S2		1				0	0		
Gymnocarpium robertianum	limestone oak fern	S1		1				0	0		
Huperzia selago	mountain club-moss	S2S3		1				0	0		
Juncus stygius spp. americanus	moor rush	S1?		1				0	0		
Leymus mollis	sea lyme-grass	S2?		1				0	0		

Table 3E-2: Priority Plant Species and Reasons for Inclusion

Scientific Name	Common Name	MBCDC S-Rank[2]	Reasons for Inclusion[1]					Number in LSA[3]	Number in RSA	Habitats	Habitat from Literature[4]
			Endangered or Threatened	Provincially Very Rare to Uncommon	Regionally Rare	Range Limit	KCN importance				
Limosella aquatica	mudwort	S4S5			1			5	5	S, A	shores, mud flats and shallow water
Luzula wahlenbergii	Wahlenberg's woodrush	S2?		1				0	0		
Lycopodium sitchense	ground-fir	S1		1				0	0		
Moehringia macrophylla	large-leaved sandwort	S1S2		1				0	0		
Muhlenbergia glomerata	bog muhly	S4			1			1	1	W, U, S	fens, meadows and shores
Myriophyllum alterniflorum	water-milfoil	S2?		1				0	0		
Najas flexilis	slender naiad	S4			1			0	2	A	lakes, ponds and rivers
Nuphar variegata	small yellow pond-lily	S5				1		13	67	A	ponds, lakes and quiet streams
Nymphaea tetragona	small water-lily	S2		1				0	0		
Parnassia kotzebuei	small grass-of-parnassus	S4			1			0	1	S, U	shores and wet meadows
Parnassia palustris var. *parviflora*	small grass-of-parnassus	S1		1				0	0		
Pedicularis lapponica	Lapland lousewort	S2S3		1				0	0		
Pedicularis macrodonta	muskeg lousewort	S2		1				0	0		
Pellaea glabella	purple cliff-brake	S2		1				0	0		
Pellaea glabella spp. *occidentalis*	purple cliff-brake	S2		1				0	0		
Pinus banksiana	jack pine	S5				1		31	104	U, F	rock outcrops, sandy substrates and poor quality sites
Platanthera hookeri	Hooker's orchid	S2		1				0	0		
Platanthera orbiculata	round-leaved bog-orchid	S3		1				0	0		
Populus balsamifera	Balsam-poplar	S5			1			16	62	U, F, S	moist depressions and shores
Potamogeton amplifolius	large-leaved pondweed	S2?		1				0	0		
Potamogeton pusillus spp. *tenuissimus*	small pondweed	S2		1				4	27	A	shallow lakes, ponds and streams
Potamogeton robbinsii	Robbin's pondweed	S2		1				1	20	A	lakes, ponds and rivers
Potamogeton strictifolius	narrowleaf pondweed	S3		1				0	0		
Potentilla pensylvanica var. *litoralis*	prairie cinquefoil	S2S3		1				0	0		
Pyrola grandiflora	Arctic wintergreen	S4				1		0	3	U, F	open woodlands
Rhododendron tomentosum	northern labrador tea	S4				1	1	1	7	U, W, F	muskeg, bogs, wet woodlands and rocky areas
Ribes lacustre	bristly black currant	S4			1		1	0	3	U, W, F	clearings, swamps and woodlands

Table 3E-2: Priority Plant Species and Reasons for Inclusion

Scientific Name	Common Name	MBCDC S-Rank[2]	Reasons for Inclusion[1]					Number in LSA[3]	Number in RSA	Habitats	Habitat from Literature[4]
			Endangered or Threatened	Provincially Very Rare to Uncommon	Regionally Rare	Range Limit	KCN importance				
Ribes triste	red currant	S5					1	18	66	U, W, F	clearings, swamps and woodlands
Rubus chamaemorus	cloudberry	S5					1	55	178	W	bogs
Rubus idaeus	red raspberry	S5					1	10	30	U, F	clearings and open woods
Rubus pubescens	dewberry	S5					1	17	55	F, U	open woods and clearings
Sagina caespitosa	tufted pearlwort	S2		1				0	0		
Sagina nodosa	knotted pearlwort	S4			1			0	1	U, D	bare ground
Salix arbusculoides	shrubby willow	S3		1		1		11	38	U, W, S, F	swamps, muskeg, shore zone and woodlands
Salix serissima	autumn willow	S4			1			0	4	S, W	bogs, marshes and shore zones
Salix vestita	rock willow	S3		1		1		8	28	U, F, S	ridges, shaded shore zones and woodlands
Selaginella selaginoides	northern spike-moss	S2		1				0	0		
Solidago hispida	hairy goldenrod	S5				1		12	30	U, F	rocky substrates and open woodland
Thalictrum sparsiflorum	few-flowered meadow-rue	S2S3		1				0	0		
Tofieldia pusilla	Scotch false asphodel	S4			1			0	1	W, F	bogs and forests
Trichophorum caespitosum	tufted bulrush	S4			1			0	4	W	bogs and marshes
Vaccinium caespitosum	dwarf bilberry	S2		1				0	0		
Vaccinium uliginosum	bog bilberry	S5					1	92	309	U, F	open woods
Vaccinium vitis-idaea	rock cranberry	S5					1	144	392	W, F, U	bogs, forests and bare ground
Viola palustris	marsh violet	S4S5			1			0	3	W, S, F	swamps, fens and streambanks
Woodsia alpina	northern woodsia	S1		1				0	0		
Woodsia glabella	smooth woodsia	S2		1				0	0		
Zannichellia palustris	horned pondweed	S3?		1	1			0	3	A	saline ponds or streams

[1] Reasons for inclusion: An "X" in a column indicates that the species met this criterion. Endangered (bolded letters)/threatened species are listed according to which list they appear on (SARA (S), COSEWIC (C) or MESA (M)). Habitats include upland (U), wetland (W), shore zone (S), physically disturbed (D), forest (F) or aquatic (A) and are listed from most to least common).
[2] MBCDC S-Ranks: The term "species of conservation concern" includes species that are rare, disjunct, or at risk throughout their range or in Manitoba and in need of further research. The term also encompasses species that are listed under the Manitoba Endangered Species Act (MESA), or that have a special designation by the Committee On the Status of Endangered Wildlife In Canada (COSEWIC) (MBCDC website 2010). S1 - Very rare throughout its range or in the Province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation; S2 - Rare throughout its range or in the Province (6 to 20 occurrences). May be vulnerable to extirpation. 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.
[3] Number of sample locations the species was found at. Species with zero values for the Regional Study Area were identified as having the potential to occur there.
[4] Sources: Soper and heimburger 1982, FNA 1993+, Johnson *et al.* 1995, Lahring 2003

Endangered and Threatened

Flooded jellyskin (*Leptogium rivulare* (Ach.) Mont.) is a small foliose lichen that has been found at several locations in Ontario and at one location near Flin Flon, Manitoba (COSEWIC 2004). This lichen is restricted to the bark of deciduous trees growing along stream and pond shores, which become periodically flooded (COSEWIC 2004). In Canada, flooded jellyskin is locally healthy and well established on a few small ponds at each of two localities. It is highly vulnerable to changes in normal annual flooding patterns, as it grows exclusively in the zone between the high and low water marks around these ponds (COSEWIC 2004). It is difficult to comment on its range and the extent of the Flin Flon population is not well known. No information on flooded jellyskin exists in Brodo *et al.* (2001), as decades of searching by many researchers has failed to provide much information (see COSEWIC 2004). The species has very restricted habitat requirements, found primarily at the margins of seasonal (vernal) pools, where it grows on rocks and at the base of living deciduous trees between seasonal high and low water marks, and always below the high-water mark (COSEWIC 2004). Flooded jellyskin is not expected to occur in the Local Study Area because it has very restricted habitat requirements and is a temperate to northern temperate species.

Table 3E-3: Occurrences and Habitats of Provincially Rare Plant Species Found in the Regional Study Area During Field Studies

S-Rank	Species		Number of Records		Habitat Association
	Scientific Name	Common Name	Field Data from Keeyask RSA	Field Data from Rest of LNR Region	
S1	*Astragalus bodinii*	milkvetch	-	-	disturbance
S1	*Carex arcta*	narrow sedge	-	-	wetland
S1	*Carex cryptolepis*	northeastern sedge	-	-	upland
S1	*Festuca richardsonii*	Richardson's fescue	-	-	?
S1	*Gymnocarpium robertianum*	limestone oak fern	-	-	upland
S1	*Lycopodium sitchense*	ground-fir	-	-	?
S1	*Parnassia palustris* var. *parviflora*	small grass-of-parnassus	-	-	range
S1	*Ranunculus hyperboreus*	high northern buttercup	-	3	wetland
S1	*Woodsia alpina*	northern woodsia	-	-	upland
S1?	*Carex garberi*	elk sedge	-	-	upland
S1?	*Juncus stygius* spp. *americanus*	moor rush	-	-	wetland
S1S2	*Botrychium minganense*	mingan moonwort	-	-	disturbance
S1S2	*Crepis elegans*	elegant hawk's-beard	9	2	disturbance
S1S2	*Moehringia macrophylla*	large-leaved sandwort	-	-	upland
S2	*Anthoxanthum alpina*	holy grass	-	-	?
S2	*Anthoxanthum alpina* spp. *alpina*	holy grass	-	-	?
S2	*Argentina egedii*	Egede's cinquefoil	-	1	upland
S2	*Artemisia tilesii*	Herriot's sage	-	105	upland
S2	*Artemisia tilesii* spp. *elatior*	Herriot's sage	-	-	upland
S2	*Braya humilis*	low braya	-	-	upland
S2	*Calamagrostis purpurascens*	purple reed grass	-	-	upland
S2	*Carex heleonastes*	Hudson Bay sedge	-	-	upland
S2	*Carex heleonastes* spp. *heleonastes*	Hudson Bay sedge	-	-	upland
S2	*Carex loliacea*	rye-grass sedge	-	-	range
S2	*Carex maritima*	curved sedge	-	-	upland
S2	*Carex michauxiana*	long-fruited sedge	-	-	wetland

Table 3E-3: Occurrences and Habitats of Provincially Rare Plant Species Found in the Regional Study Area During Field Studies

S-Rank	Species		Number of Records		Habitat Association
	Scientific Name	Common Name	Field Data from Keeyask RSA	Field Data from Rest of LNR Region	
S2	*Carex microglochin*	false uncina sedge	-	-	wetland
S2	*Descurainia sophioides*	northern flixweed	-	-	upland
S2	*Drosera linearis*	slender-leaved sundew	-	2	wetland
S2	*Eriophorum callitrix*	beautiful cotton-grass	-	-	wetland
S2	*Glyceria pulchella*	graceful manna grass	-	-	range
S2	*Listera borealis*	northern twayblade	-	3	upland
S2	*Nymphaea tetragona*	small water-lily	-	-	aquatic
S2	*Pedicularis macrodonta*	muskeg lousewort	-	12	wetland
S2	*Pellaea glabella*	Purple cliff-brake	-	-	upland
S2	*Pellaea glabella* spp. *occidentalis*	cliff-brake	-	-	upland
S2	*Platanthera hookeri*	Hooker's orchis	-	-	upland
S2	*Potamogeton pusillus* spp. *tenuissimus*	small pondweed	27	-	aquatic
S2	*Potamogeton robbinsii*	Robbin's pondweed	20	-	aquatic
S2	*Sagina caespitosa*	tufted pearlwort	-	-	upland
S2	*Selaginella selaginoides*	northern spike-moss	-	19	wetland
S2	*Vaccinium caespitosum*	dwarf bilberry	-	-	upland
S2	*Woodsia glabella*	smooth woodsia	-	-	upland
S2?	*Calamagrostis lapponica*	reed grass	-	-	?
S2?	*Danthonia intermedia*	poverty oat-grass	-	1	upland
S2?	*Eriophorum scheuchzeri*	one-spike cotton-grass	-	-	wetland
S2?	*Leymus mollis*	sea lyme-grass	-	-	upland
S2?	*Luzula wahlenbergii*	Wahlenberg's woodrush	-	-	range
S2?	*Myriophyllum alterniflorum*	water-milfoil	-	-	aquatic
S2?	*Potamogeton amplifolius*	large-leaved pondweed	-	-	aquatic
S2?	*Subularia aquatica*	waterawlwort	-		aquatic

Table 3E-4: Regionally rare and Range Limit Plant Species That Were Found in the Project Footprint or Habitat Zone of Influence

S-Rank	Species		Number of Locations*				
	Scientific Name	Common Name	Project Footprint	Construction Zone of Influence	Operation Zone of Influence	Regional Study Area	Downstream Study Area
Regionally Rare							
S4	*Anemone parviflora*	Northern anemone	0	1	1	2	28
S4	*Antennaria pulcherrima*	showy pussytoes	0	0	0	1	26
S4	*Aquilegia brevistyla*	blue columbine	0	0	0	3	36
S4	*Calypso bulbosa*	Venus'-slipper	1	1	1	3	3
S4S5	*Carex buxbaumii*	brown sedge	0	0	0	5	0
S4?	*Carex sychnocephala*	long-beaked sedge	4	4	4	4	0
S4	*Cicuta virosa*	Mackenzie's water-hemlock	0	0	0	1	0
S3	*Drosera anglica*	oblong-leaved sundew	2	2	2	4	22
S4	*Eleocharis quinqueflora*	few-flowered spike-rush	1	1	1	1	3
S4S5	*Equisetum palustre*	marsh horsetail	0	0	0	1	42
S4S5	*Equisetum pratense*	meadow horsetail	0	3	3	3	2
S4	*Erigeron elatus*	tall fleabane	0	0	0	1	0
S4	*Erigeron hyssopifolius*	wild daisy	0	0	0	2	21
S4	*Eriophorum viridicarinatum*	thin-leaved cotton-grass	1	1	1	1	2
S4S5	*Euphrasia arctica*	northern eyebright	0	0	0	1	7
S4S5	*Fragaria vesca*	woodland strawberry	0	0	0	1	1
S4S5	*Glaux maritima*	sea-milkwort	2	2	2	2	0
S4S5	*Limosella aquatica*	mudwort	5	5	5	5	0
S4	*Muhlenbergia glomerata*	bog muhly	1	1	1	1	1

Table 3E-4: Regionally rare and Range Limit Plant Species That Were Found in the Project Footprint or Habitat Zone of Influence

S-Rank	Species		Number of Locations*				
	Scientific Name	Common Name	Project Footprint	Construction Zone of Influence	Operation Zone of Influence	Regional Study Area	Downstream Study Area
S4	*Najas flexilis*	slender naiad	0	0	0	2	0
S4	*Parnassia kotzebuei*	small grass-of-parnassus	0	0	0	1	0
S5	*Populus balsamifera*	Balsam-poplar	9	13	13	60	949
S4	*Ribes lacustre*	bristly black currant	0	0	0	3	70
S4	*Sagina nodosa*	knotted pearlwort	0	0	0	1	1
S4	*Salix serissima*	autumn willow	0	0	0	4	2
S4	*Tofieldia pusilla*	Scotch false asphodel	0	0	0	1	9
S4	*Trichophorum caespitosum*	tufted bulrush	0	0	0	4	8
S4S5	*Viola palustris*	marsh violet	0	0	0	3	0
S3?	*Zannichellia palustris*	horned pondweed	0	0	0	3	0
Range Limit							
S5	*Coptis trifolia*	goldthread	1	1	1	2	3
S1S2	*Crepis elegans*	Elegant hawk's-beard	0	0	0	9	2
S4	*Elaeagnus commutata*	Wolf-willow	4	4	4	10	104
S5	*Nuphar variegata*	small yellow pond-lily	9	11	11	54	0
S5	*Pinus banksiana*	jack pine	23	25	26	99	56
S4	*Pyrola grandiflora*	Arctic wintergreen	0	0	0	3	21
S4	*Rhododendron tomentosum*	Northern Labrador-tea	0	1	1	6	221
S3	*Salix arbusculoides*	shrubby willow	9	10	10	38	745
S3	*Salix vestita*	rock willow	7	8	8	26	399
S5	*Solidago hispida*	hairy goldenrod	11	12	12	30	36

* Number of locations is the total within that area only except for Regional Study Area which includes all of the nested areas within it.

[DN: Herbarium record numbers are from MBCDC list and Manitoba museum. Data from other herbaria will be added.]