

Lake St. Martin Outlet Channels – Vegetation Technical Report

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1.0 INTRODUCTION

Manitoba Infrastructure (MI) is currently developing options to address ongoing flood issues in the Assiniboine River and Lake Manitoba watershed basins. As part of this endeavour, MI initiated the Assiniboine River & Lake Manitoba Basins Flood Mitigation Study. This study, which was completed in 2011, included several components. In particular, the “Assiniboine River & Lake Manitoba Basins Flood Mitigation Study Lake Manitoba & Lake St. Martin Outlet Channels Conceptual Design - Stage 1 - Deliverable No: LMB-01” (KGS Group 2014) and the “Assiniboine River & Lake Manitoba Basins - Flood Mitigation Study LMB & LSM Outlet Channels Conceptual Design - Stage 2” (KGS Group 2016) were key to identifying future flood protection initiatives for the Assiniboine River and Lake Manitoba watershed basins.

The Stage 1 and Stage 2 Conceptual Designs prepared by KGS and MI included the three following components:

- further development of the Lake St. Martin Outlet Channel (LSMOC), which involves development of a channel in the area referred to as Reach 2 and completion of the channel referred to as Reach 3;
- construction and operation of a new channel from Lake Manitoba (LM) to Lake St. Martin (LSM) to increase flow capacity and expedite movement of flood waters between these waterbodies; and
- construction and operation of an All Season Road (ASR) in the area of the Lake St. Martin Outlet Channels to facilitate year-round vehicle, crew and equipment access to the Lake St. Martin Outlet Channels.

These three main components formed the overall MI Lake Manitoba and Lake St. Martin Access Road and Outlet Channels Project (the Project) at the time of this writing.

MI later engaged M. Forster Enterprises (MFE) and a team of professional consultants to conduct desktop and field investigations at varying spatial scales near the Project to provide information on the existing environmental conditions for each of the three Project components listed above. The intent of these investigations was to describe the baseline conditions in vicinity of the Project to support a future Environmental Impact Assessment (EIA). While the overall Project will require approval and licensing under the federal Canadian Environmental Assessment Act (CEAA) and the Manitoba Environment Act, the realignment and construction of an ASR for construction access will require regulatory approval and licensing from the Province of Manitoba.

This report provides a summary of the existing vegetation conditions for the vegetation component of the proposed LSMOC component of the Project, as identified through desktop, field studies and associated analysis, to provide the required baseline data for the environmental assessment and support the preparation of the provincial EIS for the ASR component of the Project.

1.1 Background

The following background information was obtained from the "*Assiniboine River & Lake Manitoba Basins - Flood Mitigation Study LMB & LSM Outlet Channels Conceptual Design - Stage 2*" (KGS 2016) and personal communications with MI.

The LSMOC extends approximately 27 km from LSM to Lake Winnipeg and consists of three linear sections referred to as reaches. The first reach (Reach 1) extends approximately 8 km from LSM to Big Buffalo Lake. The Reach 1 emergency outlet channel was constructed in 2011 in response to high water levels on LM and LSM. The existing LSMOC Reach 1 is about 6 km long, extending from LSM to the fen habitat surrounding Big Buffalo Lake. The proposed permanent LSMOC Reach 1 outlet channel would consist of upgrading the existing emergency outlet channel to a permanent status with additional capacity to provide a net increase in flow to LSM above the base condition of the existing Reach 1 channel. The proposed works would consist of widening the existing channel and extending it by about 2 km downstream to Big Buffalo Lake. A control structure would be constructed at the inlet of Reach 1 that would also act as a bridge to provide vehicle access to the northwest side of the channel.

The second reach (Reach 2) extends approximately 8.6 km from Big Buffalo Lake and the outlet of Reach 1 to the Inlet of Reach 3. The first half of Reach 2 is located within the fen habitat that surrounds Big Buffalo Lake, which becomes inundated with operation of the LSM outlet channel. Water then follows the natural drainage path into Big Buffalo Creek up to its diversion point into Reach 3.

Several options have been proposed for Reach 2. One option included the construction of a dike only, without the need for deepening or widening the existing natural channel. The proposed alignment of the Reach 2 dike would extend approximately 8 km and follow the high ground north of the fen area that surrounds Buffalo Lake and west of Big Buffalo Creek. The purpose of the dike would be to contain the inundation within the fen area and the flow within Buffalo Creek.

During meetings and discussions with MI in April 2016, MI indicated that the Reach 2 alignment and dike options described for the original assignment were being revisited. Three other channel alignment and/or dike options were being investigated, in addition to the Reach 2 dike option. The Reach 2 dike was referred to as Option 1, and the additional alignments were referred to as Option 2, Option 3 and Option 4. The three new options were added to examine other routes that could be used to manage flows from LSM to Lake Winnipeg, and included the construction of a new emergency channel to the east of the existing Reach 1 channel, which would tie into Reach 3 at Big Buffalo Creek.

The third reach (Reach 3) extends approximately 10 km from Big Buffalo Creek to Lake Winnipeg. The Reach 3 Emergency Channel was partially constructed in 2012 to divert flows away from the Dauphin River. However, due to extremely mild winter conditions, operation of the Reach 3 channel was not required; therefore, this channel currently remains in an incomplete condition. The existing Reach 3 Emergency Channel starts at Buffalo Creek and extends about 6 km, exiting into a forested and bog area where the land slopes downwards to Lake Winnipeg. The completion of the Reach 3 channel would require deepening, widening and lengthening of the existing incomplete channel.

There were two alignment options proposed to lengthen Reach 3 to Lake Winnipeg: extending the existing channel straight to Johnson Beach, or extending the existing channel to the east side of Willow Point.

1.2 Study Area

Given that the information collected for the baseline studies will be used in the environmental assessment for the Project, the study design for the vegetation baseline studies and technical report included the establishment of appropriate study area spatial boundaries. For the purposes of environmental assessment, the spatial boundaries for a project are typically described for three spatial scales: a Project Footprint (PF), a Local Study Area (LSA) and a Regional Study Area (RSA). The PF is the physical space or directly affected area on which the Project components or activities are located; the LSA is the area beyond the Project footprint in which Project effects are measurable; and the RSA is the area beyond the LSA within which most indirect and cumulative effects would occur (CEAA 2015).

The conceptual design information provided in KGS Group (2016) indicated the following dimensions for the LSMOC channel options:

- Reach 1: length of about 6 km and Right of Way (RoW) width of 300 m;
- Reach 2 berm: length of about 8.6 km and RoW width of 500m;
- Reach 3 - Johnson Beach Option: length of about 9.7 km and RoW width of 200 m; and
- Reach 3 - Willow Point Option: length of about 10.6 km and RoW width of 275 m.

As such, the PF area for the LSMOC options was designated as the area encompassed by the total length of the route option and the total width of the route option, including the RoW.

Figure 1 shows the location of the LSMOC channels and designated PF, LSA and RSA for the vegetation studies. For vegetation, the LSA was designated as the total length of the LSMOC with a width of 1 km from either side of the centreline of the LSMOC to reflect the mostly sessile nature of plants, but include areas of potential seed dispersal and new growth/colonization. The RSA for vegetation was designated as the total length of the LSMOC with a width of 5 km from either side of the centreline of the LSMOC to allow for the assessment of vegetation at a community level, if required (Figure 1).

As noted in Section 1.1, MI was reviewing the proposed alignment for the Reach 2 dike option at the time of this writing. In addition to the Reach 2 dike option, three other channel alignment and/or dike options were being investigated. The Reach 2 dike was referred to as Option 1, and the additional alignments were referred to as Option 2, Option 3 and Option 4. The three new options were added to examine other routes that could be used to manage flows from LSM to Lake Winnipeg, and included the construction of a new emergency channel to the east of the existing Reach 1 channel, which would tie into Reach 3 at Big Buffalo Creek. Other than the proposed lengths and locations, there were no other data available for the additional conceptual options at the time of this writing. Figure 2 provides an illustration of the location of the proposed lengths and locations for the conceptual Options 1 to 4.

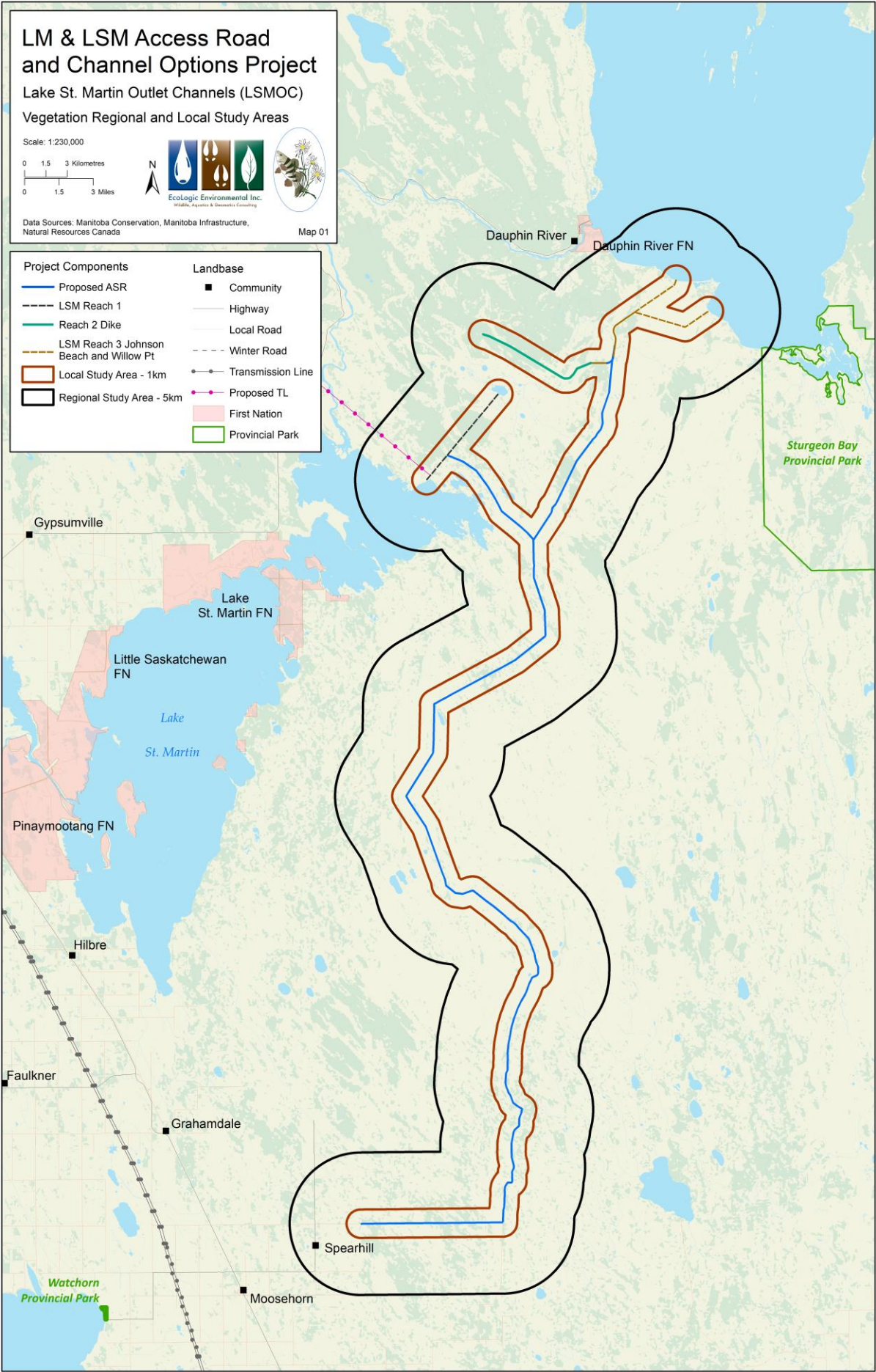


Figure 1: Lake St. Martin Outlet Channels Vegetation Study Areas

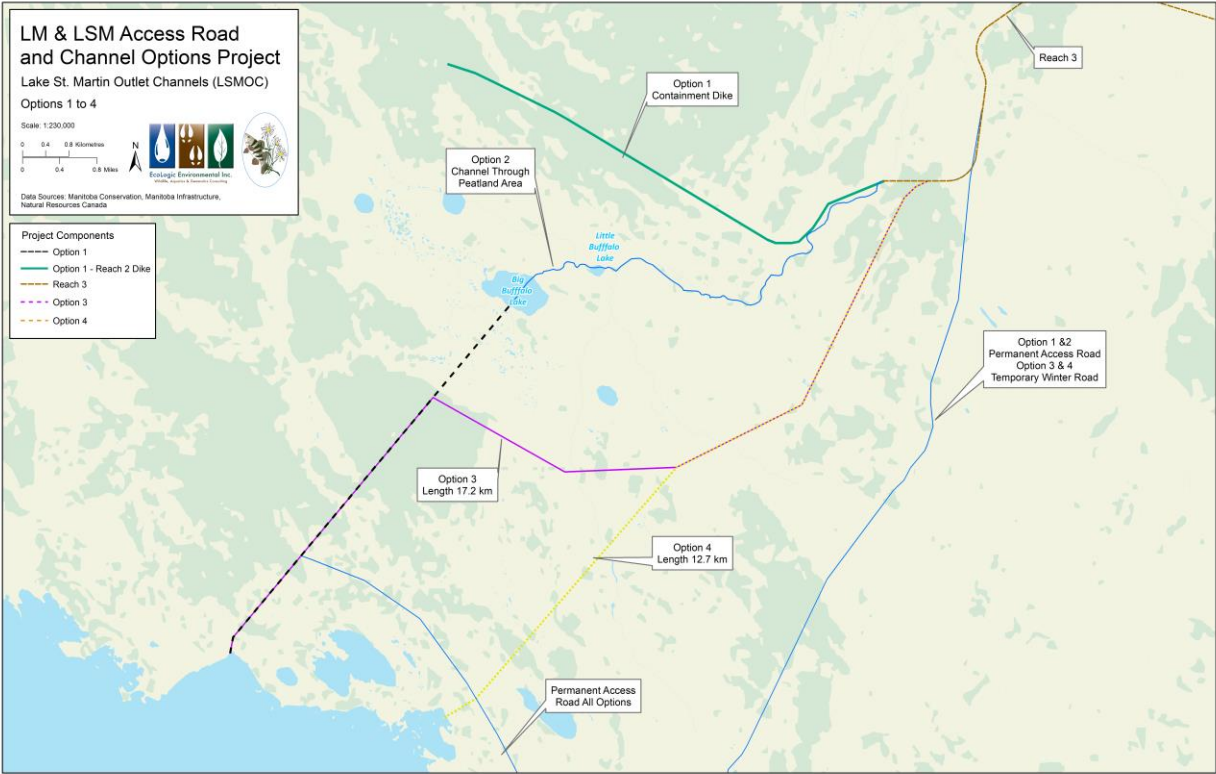


Figure 2: Lake St. Martin Outlet Channels – Location of Options 1 to 4

1.3 Study Objectives

The objectives of the LSMOC vegetation studies and technical report included:

- determination of the existing baseline vegetation within the LSA of the LSMOC;
- delineation of habitat types in the LSA and RSA, including sensitive habitat (i.e. rare ecosystems, habitats that support rare or endangered species, and areas that are easily disturbed or degraded by human activities and developments);
- identification of any species at risk or species of conservation concern in the LSA;
- documentation of any plant species of significance to First Nations in the LSA and RSA; and
- identification of species that are exotic (i.e., non-native but not invasive) or invasive (non-native and threaten the diversity or abundance of native species or their habitats).

1.4 Plant Species of Conservation Concern

For the purpose of this assessment, a species at risk (SAR) is defined as any species protected under the federal *Species at Risk Act* (SARA) (Minister of Justice 2002) and/or the *Manitoba Endangered Species and Ecosystems Act* (MESEA) (MC 2012). Under these acts, it is considered a provincial and/or federal offence to kill, injure, harass, capture, possess, sell, or export an individual belonging to an extirpated, endangered, or threatened species and/or damager, or destroy its habitat. The identification and assessment of SAR is conducted federally by Committee of the Status of Endangered Wildlife in Canada (COSEWIC) and provincially by the Manitoba Conservation Data Centre (MBCDC).

In addition to species designated as extirpated, endangered, and threatened, species may also be identified federally as species of special concern. These species do not receive immediate protection under SARA, but require a management plan and assessment by COSEWIC, and may be eligible for further protection under provincial regulatory bodies (Minister of Justice 2002). Similarly, the MBCDC maintains a list of tracked species considered to be rare or uncommon within Manitoba (MBCDC 2013).

Species listed by the MBCDC that are of conservation concern, meaning they are rare, disjunct, or at risk throughout their range, as well as species listed under MESEA, SARA, and species that have a special designation from COSEWIC, were focused on during the desktop analysis and field surveys.

The MBCDC lists "species of conservation concern", which are species that are ranked on their abundance throughout Manitoba as per the following chart:

Table 1: Ranking of Species of Concern

Rank	Definition
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.

Source: Manitoba Conservation Data Centre, 2013

1.5 Plant Species of Significance to First Nations

MI and First Nations consultations were ongoing at the time of this writing, and a list of species important to the local First Nation communities had yet to be compiled. It is recognized that there are many plant species of significance to many First Nations peoples, and that the plant species of significance will vary by the practices of each First Nation, and their gathering locations. It is recognized that First Nations people have a special relationship with the earth and all living things in it. This relationship is based on a profound spiritual connection to the environment that guided indigenous peoples to practice reverence, humility and reciprocity. First Nations people have been sustainably harvesting plants based on subsistence needs and values extending back thousands of years.

Sweetgrass (*Hierochloe odorata*) is one of the four main plants (tobacco, sage, cedar and sweetgrass) considered as sacred to First Nations, Inuit and Métis Peoples (WEAP 2013a). It is known for its sweet scent, due to the presence of coumarins (Marles et al. 2000). Sweetgrass is usually associated with the prairies but is found in many different growing conditions including low meadows, forest openings, and along lakeshores. The best time to harvest sweetgrass is late June to early July. Sweetgrass is often picked, dried, and braided; the three sections representing mind, body and soul. One end of the braid is lit and the smoke is used for smudges, healings or talking circles because of its purification effects (WEAP 2013a).

Pasture sage (*Artemisia frigida*) and prairie sage (*Artemisia ludoviciana*) are broadly used for many purposes by First Nations. Pasture and prairie sages are common in meadows and pastures throughout the prairies and parklands. Like sweetgrass, sage may be burned for meditation, smudging, and cleansing of spirit and dwelling. In some beliefs, sage smoke is believed to provide a barrier that prevents negative spirits from entering the room in which the ceremony is being held (WEAP 2013b). Sage is also high in

protein and its leaves have proven to have insect-repellent properties. The boiled leaves have also been used to make a tea as a diuretic, and to treat kidney pain and headaches (Marles et al. 2000).

Seneca root (*Polygala senega*) is another plant that is widely used by First Nations and is expected to occur within the RSA. It is fairly common prairies and dry open woodland across southern Canada, from New Brunswick to Alberta (Marles et al. 2000). The common name for the plant ‘Seneca snakeroot’ is from the Seneca First Nations’ use of the plant as a treatment for snakebites (CHIN 2005). The root is often used to treat sore throats, respiratory problems, headaches, and stomachaches (CHIN 2005).

1.6 Invasive Species

Invasive species are those that are not native to the area and tend to reproduce rapidly, displace native plants, and are difficult to control or eradicate. They can threaten the native biodiversity and pose a threat to natural habitats. Most alien species are adapted to habitats that have been disturbed in some way. This disturbance for a wetland could be in the form of changes in the regime of water level fluctuations, and for an upland forest it could be encroaching clearing of adjacent lands that increase the likelihood of the introduction or spread of invasive species into an area.

Environment Canada categorizes species into three levels of invasiveness: principal, moderate, and minor (EC 1999). Principal Invasives contains species that are considered to pose the greatest threat to natural areas (e.g. Upland habitat - leafy spurge *Euphorbia esula*], common buckthorn [*Rhamnus cathartica*]; Wetland habitat - flowering-rush (*Butomus umbellatus*), reed canary grass (*Phalaris arundinacea*), purple loosestrife [*Lythrum salicaria*]). Moderate Invasives includes several species that are considered to be moderately invasive such as Canada thistle (*Cirsium arvense*), yellow and white sweet clover (*Melilotus spp.*), smooth brome grass (*Bromus inermis*), great manna grass (*Glyceria maxima*), and marsh cress (*Rorippa ainphibia*). Minor Invasives includes the species that are considered to be only minor problems (e.g. nodding thistle [*Carduus nutans*], absinthe [*Artemisia absinthium*], Kentucky blue grass [*Poa pratensis*]) (EC 1999). Although no principal invasive species are known or expected to occur within the RSA, several moderate and minor invasives such as Canada thistle, sweet clover, brome grass, and Kentucky blue grass are likely to occur within disturbed areas.

The Invasive Species Council of Manitoba (ISCM) has created an Early Detection and Rapid Response (EDRR) list and placed invasive species into two categories: Category 1 and Category 2 (ISCM 2016). Category 1 species are those that are not yet known to be present in Manitoba or if so, only in cultivation, are listed as a Manitoba Noxious Weed and has the capability of establishing in Manitoba with a pathway of introduction (e.g. spotted knapweed [*Centaurea stoebe*]). Category 2 species are those that are already known to occur in Manitoba and capable of further spread (e.g. scentless chamomile [*Tripleurospermum inodorum*]). Eradication is the first management option if a Category 1 or 2 species is detected and if feasible. Otherwise, containment and control programs are recommended. If a Category 1 species is found, the ISCM should be contacted and a management committee will be formed to develop an eradication strategy (ISCM 2016).

The Noxious Weeds Act (NWA) of Manitoba lists 79 species and has placed them into three categories:

Tier 1, Tier 2 and Tier 3. Many of the invasive species listed by EC and the ISCM are also considered a noxious weed under the NWA. A noxious weed, as defined by the act, is a plant that is likely to negatively affect any aspect of Manitoba's economy, the environment, or the well-being of residents if allowed to spread. As with the EDRR Category 1 species, the Tier 1 species are those that are most threatening though may not yet be present in Manitoba. Under the NWA, it is required to destroy or eradicate them before they establish. (e.g. spotted knapweed). Tier 2 species are already present in Manitoba and can be easily spread (e.g. scentless chamomile, leafy spurge). The mitigation for Tier 2 species depends on the size of infestation. An infected area under five acres is required to have all individuals destroyed; whereas, infected areas over five acres require the noxious weed to be controlled from spreading. Tier 3 species are all other species that are designated as noxious weeds but do not pose an immediate threat. These species do not require immediate mitigation, though would require control measures if the spread of the species poses a threat to the economy, the environment, or the well-being of residents. These species include common dandelion (*Taraxacum officinale*), Canada thistle and perennial sow thistle (*Sonchus arvensis*) (Minister of Justice 2017).

2.0 STUDY METHODS

2.1 Desktop Studies

Prior to field work, a review of the current and historical vegetation data, specifically rare plants, was conducted as a key component to planning field strategies and assessing the effects of the Project on local and regional vegetation communities.

2.2 Data Sources

The desktop review of existing information was completed using available data sources such as:

- The Earth Observation for Sustainable Development of Forests (EOSD) Land Cover Classification (LCC) spatial database;
- aerial photographs provided by M.Forster Enterprises;
- previous studies completed in the Study Area;
- information and reports provided by MI,
- published and online reports for the Study Area;
- wetland classifications from the Ducks Unlimited Canada's *Enhanced Wetland Classification: Boreal Wetland Classes in the Boreal Plains Ecozone of Canada*;
- plant species and ecosystems listed by the Manitoba Conservation Data Centre (MBCDC);
- plant species and ecosystems listed under the MESEA; the COSEWIC database and the SARA registry; and
- through a review and research on local species and habitat of interest.

2.3 Field Studies

2.3.1 Aerial Surveys

On October 9, 2015, biologists from M. Forster Enterprises and AAE Tech Services Inc. conducted a helicopter flyover of the proposed ASR and the LSMOC areas. Georeferenced photographs and observational notes on the existing vegetation cover were collected during these surveys. These photographs and observations, in conjunction with the LCC data and previous studies in the RSA, were used to describe the existing habitat types and dominant vegetative cover along the LSA in preparation of the planned 2016 field surveys.

2.3.2 Ground Surveys

To determine the existing baseline vegetation and habitat types within the LSMOC LSA, qualitative vegetation surveys were conducted in spring (June 7, 2016 to June 10, 2016) and summer (August 3, 2016 to August 5, 2016) to capture species with different emergence periods. A qualitative sampling method involves the recording of all species identified within a survey plot and is the most effective way to capture the species composition and distribution within a study area. As the total sampled area is larger than that of

a more quantitative approach, it also provides a better opportunity to identify any rare species that may be present.

Qualitative vegetation surveys were conducted along the Reach 1 widening and extension, the proposed Reach 2 options, as well as in the areas of the Reach 3 widening and Johnson Beach and Willow Point extension options of the proposed LSMOC. There were no spatial attribute data available for the newly revised Reach 2 Options; therefore, additional survey sites along the proposed alignments were identified visually using a topographic map of the area and the location information provided by MI. The spring and summer 2016 field studies were expanded to include these additional areas. The sampling site locations and data from these additional areas are provided in Section 4.2.

Sample sites were pre-selected and stratified based on habitat-type encountered along the proposed LSMOC using the LCC data and information gathered during the 2015 aerial survey. A handheld Garmin Oregon 450 GPS pre-loaded with the tracks of the LSMOC and each sample site were used to navigate to the survey locations. Due to wetland habitats posing constraints to ground access, all sample sites for the LSMOC vegetation surveys were accessed by helicopter.

A total of 24 sample plots were selected to provide a sufficient number of plots within different habitat types, and each site was surveyed during both the spring and summer surveys. Where a new channel or berm was being proposed, two 100 m transects were placed perpendicular on either side of the centre line of the proposed channel/berm. Where an existing channel exists and the scope of work requires widening (i.e. Reach 1 and portions of Reach 3), one 100 m transect was placed perpendicular on the east side (area to be widened) of the centre line of the proposed channel. Transects were walked and all vascular plants and mosses observed (within a 5m visual radius) were recorded and identified to species. Immature plants or plants missing structures (e.g., fruiting bodies, etc.) that could not be identified to species were identified to genus or family.

Additional data collected at each sample site included: soil type, site location and description of the vegetation community. No voucher specimens were collected. Photographs of the plant and identifying characteristics were taken of any species not identifiable in the field. The relative location of each sample site, as with any observations of invasive species, potential plants of significance to Aboriginal peoples, and/or species of conservation concern (S1, S2, S3), were recorded with a handheld Garmin Oregon 450 GPS and incorporated into the data collected for the LSMOC component of the Project. Incidental observations of plant species along the proposed LSMOC that occurred outside of the sample sites, were also documented.

3.0 ENVIRONMENTAL SETTING

3.1 Ecological Land Classification

The RSA is located within the Boreal Plains Ecozone. In Manitoba, the ecozone extends from the central portion of the Manitoba-Saskatchewan border east to Lake Winnipeg, and then south in a narrow band along the Red River (Smith et al. 1998). White spruce (*Picea glauca*), black spruce (*Picea mariana*), jack pine (*Pinus banksiana*), tamarack (*Larix laricina*), white birch (*Betula papyrifera*), trembling aspen (*Populus tremuloides*), and balsam poplar (*Populus balsamifera*) are the most common tree species in the ecozone (Smith et al. 1998). Within the Boreal Plains Ecozone, the RSA is situated in the Gypsumville and Ashern Ecodistricts of the Interlake Plain Ecoregion and the southwest portion of the Sturgeon Bay Ecodistrict within the Mid-boreal Lowland Ecoregion, which straddles the west side of Lake Winnipeg (Smith et al. 1998).

The Ashern Ecodistrict occupies a major portion of the area generally referred to as the “Interlake”. Trembling aspen dominates the forest stands in the ecodistrict, while balsam poplar and white spruce occur to a lesser extent (Smith et al. 1998). Poorly drained areas have willow (*Salix* spp.), sedge (*Carex* spp.) and meadow grass (e.g. *Poa* spp.) vegetation. Black spruce and tamarack dominate the vegetative cover in the bogs in association with swamp birch (*Betula pumila*), ericaceous shrubs (e.g. Labrador tea [*Rhododendron groenlandicum*]) and sphagnum (*Sphagnum* spp.) and other mosses. Willows and sedges, and to a lesser extent tamarack, and various herbs and forbs, are dominant in fen peatlands (Smith et al. 1998).

The Gypsumville Ecodistrict occupies a small area in the north-central part of the Interlake Plain Ecoregion and encompasses Lake St. Martin (Smith et al. 1998). Nearly all of the soils are imperfectly drained, and the vegetation varies based on moisture content of the soils (Smith et al. 1998). The forest stands in the ecodistrict are a mixture of trembling aspen, balsam poplar and white spruce in varying quantities. Jack pine is prevalent on drier sites (Smith et al. 1998).

The Sturgeon Bay ecodistrict has poor drainage due to surface topography (Smith et al. 1998). Peatlands are extensive in the area; most being flat bogs and peat plateau bogs, but also consisting of horizontal and water track fens (Smith et al. 1998). Due to the extensive amounts of peatlands and poorly drained mineral soils, the majority of the Sturgeon Bay Ecodistrict consists of black spruce dominant bogs, transitional bogs and areas of poorly drained mineral soils. The associated vegetation in these stands varies from sphagnum and feather (e.g., *Ptilium crista-castrensis*) mosses, swamp birch and ericaceous shrubs such as Labrador tea, leatherleaf (*Chamaedaphne calyculata*) and bog rosemary (*Andromeda polifolia*) on bogs, to sedges, mosses, tamarack and willow on transitional bogs (Smith et al. 1998). Fens have vegetation dominated by tamarack, sedges, brown mosses, willow and swamp birch shrub, and occasionally some black spruce (Smith et al. 1998). The uplands have varied vegetation dependent on drainage, soil texture and fire history. Stands are generally mixed with black spruce, jack pine, trembling aspen and white spruce (Smith et al. 1998). Shrubs include willow and red-osier dogwood (*Cornus sericea*) on wetter sites and ericaceous shrubs on dry sites. Feather mosses are common as groundcover in coniferous stands, whereas deciduous stands have a forb dominant ground cover, with a hazel (*Corylus* spp.) shrub layer (Smith et al. 1998).

3.2 Vegetation Cover Classification

Vegetative cover classes used to represent the communities and habitats within the RSA and LSA were obtained from the LCC. The LCC is a national database map layer that has been harmonized across the major federal departments involved in land management and land change detection that includes Agriculture and Agri-Foods Canada (AAFC), the Canadian Forest Service (CFS), and the Canadian Centre for Remote Sensing (CCRS). The LCC provides vegetated and non-vegetated land cover classes that identify the primary ecological and vegetation/habitat conditions of an area. The LCC for the RSA and LSA are provided in Figure 3 and a summary of the LCC information for the RSA and LSA is provided on Table 2. The primary land cover types in the RSA and within the LSA are shrub dominant wetlands, with small areas of upland coniferous dominant forests (Figure 3).

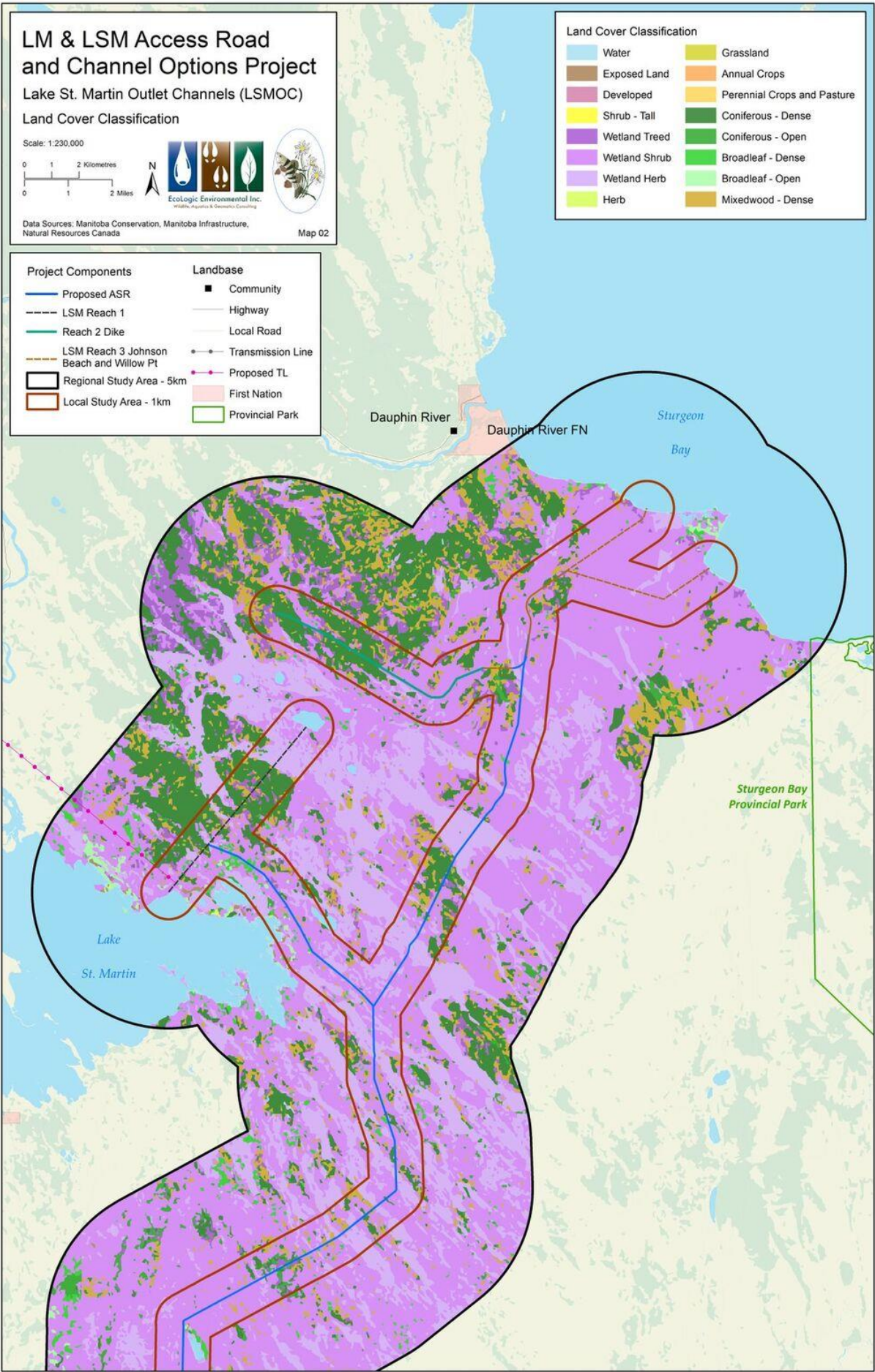


Figure 3: LSMOC Project Study Area Land Cover Classification (LCC)

**Table 2: Land Cover Classification for the Vegetation Regional
Study Area and Local Study Area**

LCC Habitat Code	Habitat Class	RSA		LSA	
		Area km ²	% Total	Area km ²	% Total
20	Water	93.58	24.33%	4.45	6.46%
33	Exposed Land	0.45	0.12%	0.12	0.17%
81	Wetland Treed	48.75	12.67%	5.90	8.56%
82	Wetland Shrub	129.81	33.75%	35.67	51.81%
83	Wetland Herb	18.73	4.87%	3.62	5.25%
100	Herb	0.09	0.02%	0.00	0.01%
211	Coniferous - Dense	59.45	15.45%	14.02	20.36%
212	Coniferous - Open	3.28	0.85%	0.36	0.53%
221	Broadleaf - Dense	3.36	0.87%	0.42	0.61%
222	Broadleaf - Open	1.56	0.40%	0.14	0.20%
231	Mixedwood - Dense	25.61	6.66%	4.16	6.04%
Total		384.66	100.00%	68.85	100.00%

3.3 Wetland Classification

The wetland classifications used to identify the wetland habitats within the PF and LSA were obtained from the Ducks Unlimited Canada's *Enhanced Wetland Classification* and conform to the Canadian Wetland Classification System (Ducks Unlimited Canada 2014). This classification system identifies five major wetland classes (Bogs, Fens, Swamps, Marshes, and Shallow Open Water) and 19 minor wetland classes.

Bogs are organic peatlands that are stagnant, non-flowing systems and receive water only through precipitation. They have a thick sphagnum moss layer and have a low diversity of plants due to the low nutrient availability. Fens are peatlands that receive water from a combination of precipitation, surface runoff and groundwater. Fens have a complex hydrology and can transport large volumes of water and nutrients across the landscape, often connecting wetland systems over large distances. Fens are more nutrient-rich than bogs and have greater plant diversity. Swamps are mineral wetlands that receive water from runoff, precipitation and groundwater. Swamps have fluctuating water tables and are seasonally flooded.

Marshes are often a transition between open water and shoreline. They can be heavily influenced by stream inflow and fluctuate seasonally. Shallow Open Water wetlands have a water depth of less than two meters, yet are deep enough to prevent the establishment of emergent plants such as cattails and rushes. They look

like shallow lakes with pond lily and other floating leaf, free-floating and submergent aquatic vegetation present and are generally permanently flooded (Ducks Unlimited Canada 2014).

This wetland classification system was used in combination with the LCC data to identify and classify the wetland areas in the PF and LSA, as well as identify potential habitat for rare species.

3.4 Plant Species of Conservation Concern

Based on the desktop review, there are seven vascular plant species at risk that occur in the Interlake Plain Ecoregion and none in the Mid-Boreal Lowland Ecoregion. However, no plant listed under MESEA, SARA, or that having a special designation by COSEWIC are known or expected to occur in the RSA (GC 2015; MC 2012). The small white lady's-slipper (*Cypripedium candidum*) and the rough agalinis (*Agalinis aspera*), are both Federally and Provincially Endangered, and have known distributions 100 km south of the RSA, close to St. Laurent, MB (MC 2015; EC 2015). Based on the grassland, prairies and wet meadows habitat requirements of these species, there is an extremely low probability of these species' occurrence in the RSA (MC 2015; EC 2015).

The MBCDC lists 108 vascular plant species of conservation concern within the Interlake Plain Ecoregion (**Appendix A**) and 55 species within the Mid-Boreal Lowland Ecoregion (**Appendix B**) that have a provincial status of S1, S2 or S3. A search of the MBCDC database for recorded occurrences of rare species in the RSA and LSA found occurrences of one species of conservation concern in both the RSA and LSA, the ram's-head lady's-slipper (*Cypripedium arietinum*), which has a S2S3 designation (Friesen 2015, pers. comm.). The ram's-head lady's-slipper can be found in black spruce and tamarack sphagnum bogs and less so in drier upland coniferous forests (Foster and Reimer 2007).

A vegetation survey conducted by KGS in 2011, in the RSA, found two species listed by MBCDC to be of conservation concern (S2) that were identified during the field survey (KGS 2013). Three occurrences of green adder's mouth orchid (*Malaxis unifolia*) (S2) were encountered within damp black spruce sphagnum bogs. Two occurrences were located approximately 1.5 km and 2 km north of the Reach 1 Outlet Channel inlet, while one was encountered near the confluence of Buffalo Creek and the Dauphin River (KGS 2013). Habitat for this species was cited as common throughout the study (KGS 2013). The second species of conservation concern identified during the KGS field survey was eelgrass (*Zostera marina*) (S2), which was encountered at one location along Buffalo Creek beside a fen habitat (KGS 2013).

Black spruce and tamarack sphagnum bogs are common throughout the RSA and LSA and there is a high potential to encounter green adder's mouth orchid, ram's-head lady's-slipper, or other species of conservation concern that have similar habitat preferences (Foster and Reimer 2007). Eelgrass is an aquatic plant native to marine environments growing in the intertidal and subtidal zones of shallow bays, coves and estuaries (Hanson 2004). The known distribution of eelgrass in Manitoba is restricted to the Hudson Bay coastline and it is unlikely that this species is present within the RSA. It is possible that the eelgrass encountered during the KGS survey was misidentified as *Zostera marina* and is actually *Vallisneria spiralis*, the freshwater eelgrass, which is not a listed species.

3.5 Plant Species of Significance to First Nations

MI and First Nations consultations were ongoing at the time of this writing, and a list of species important to the local First Nation communities had yet to be compiled. It is recognized that there are many plant species of significance to many First Nations peoples, and that the plant species of significance will vary by the practices of each First Nation, and their gathering locations. It is recognized that First Nations people have a special relationship with the earth and all living things in it. This relationship is based on a profound spiritual connection to the environment that guided indigenous peoples to practice reverence, humility and reciprocity. It is known that Seneca root is gathered in the area and is an important plant used for medicinal and ceremonial purposes (NLHS 2015). The First Nations also used to gather various species of edible berries such as gooseberries, as well as medicinal plants such as sweet flag (*Acorus calamus*), which is chewed for sore throats and to prevent colds, and found along riverbanks and wetland habitats (Traverse 1999).

3.6 Invasive Species

There is no historical information on invasive species within the LSMOC LSA or RSA. Much of the area has been left untouched; therefore a pathway of introduction has not been available. However, it is expected that some minor invasive species may have been introduced within the LSA from wildlife traffic or during the construction of the existing outlet channels. Common dandelion, perennial sow thistle and Canada thistle commonly occur along disturbed roadsides and heavy traffic areas and could be introduced along the channel edges. Invasive phragmites (*Phragmites australis* sub. *australis*) is a wetland invader that spreads quickly and outcompetes native species for water and nutrients. Invasive phragmites is commonly found in disturbed wet roadside ditches and can quickly crowd out native wetland vegetation, resulting in decreased plant diversity. There has been no known occurrences of invasive phragmites within the RSA, though it may pose a threat in the future, as much of the RSA is located in low-lying wet habitats that could be vulnerable to invasive phragmites establishment.

4.0 VEGETATION SURVEY RESULTS

Figure 4 shows the location of the vegetation sampling sites for the LSMOC study area, including the additional sites added to examine the four proposed Reach 2 alignments (Options 1 to 4). A total of 126 plant species were identified during the spring and summer field surveys, including: two non-vascular species, 19 graminoids (sedges, grass, rushes), 30 shrubs, eight trees and 67 herbaceous species. Complete species lists are provided in **Appendix C**. Plant communities were classified by ‘V-type’ based on the Forest Ecosystem Classification (FEC) system for Manitoba developed by the CFS (Zoladeski et al. 1995).

Much of the RSA lies within a wet depression zone that is dominated by vast interconnecting areas of treeless graminoid rich fens with scattered black spruce/tamarack sphagnum bogs and tamarack dominant transitional bog peatlands. Scattered glacial moraine ridges in the area have created strips of upland habitat

dominated by coniferous jack pine stands and mixedwood forests comprised of tamarack, trembling aspen, balsam poplar and white spruce.

4.1 Reach 1

The Section between LSM and Big Buffalo Lake is comprised of upland early-mid serial aspen dominant mixedwood forest (FEC V-Type V9) with some areas of black spruce sphagnum forest (V33) and a large expansive floating fen surrounding Big Buffalo Lake (Photo 1). The upland forests contained a mixture of shrub species such as willow, hazel, sweet bayberry (*Myrica gale*) and speckled alder (*Alnus incana*) and were more prevalent with increasing proximity to Lake St. Martin (Plot 1, Plot 2) (Photo 2). The graminoid poor fen habitat surrounding Buffalo Lake consisted mainly of floating sedge and buckbean (*Menyanthes trifoliata*) mats with areas of common reed grass (*Phragmites australis*), bog birch (*Betula glandulosa*) and willows (Plot 7) (Photo 5).

Scattered along the Reach 1 alignment were several pockets of black spruce and tamarack sphagnum bog habitat (V33) consisting of typical bog vegetation such as Labrador tea, small bog cranberry (*Vaccinium oxycoccos*), and three-leaved false Solomon's seal (*Maianthemum trifolium*) (Plot 3, Plot 4) (Photo 3). Much of the bog habitats adjacent to the existing channel were flooded due to alteration of surface water flow from the construction of the emergency channel (Photo 4). Many of the black spruce and tamarack trees were dead and more emergent marsh-type species were taking over, such as common cattail (*Typha latifolia*), mint species and a variety of willows (Plot 5, Plot 6).

Much of the disturbed area along the banks of the existing channel was dominated by invasive species such as common dandelion, Kentucky bluegrass, Canada thistle, yellow sweet clover (*Melilotus officinalis*), perennial sow thistle and meadow buttercup (*Ranunculus acris*). Other invasive species present included stinging nettle (*Urtica dioica*) and hemp nettle (*Galeopsis tetrahit*), and were found within the flooded marsh/bog area beyond the banks of the channel.

One species of conservation concern, dragon's mouth orchid (*Arethusa bulbosa*) (S2), was observed within one of the black spruce sphagnum bog habitats close to Big Buffalo Lake (Plot 6). One single individual orchid was observed, which was located just outside of the flooded area on a raised hummock of sphagnum moss at the base of an immature tamarack tree, surrounded by Labrador tea and bog rosemary. Much of the surrounding bog habitat adjacent to the existing channel and close to where the orchid was found was completely flooded. No species of significance to First Nations were observed along Reach 1 of the LSMOC.

4.2 Reach 2

The area along the proposed Reach 2 dike option (Option 1), north of Big Buffalo Lake, is composed of a black spruce dominant transitional upland forest/treed bog habitat with pockets of true shrubby and treed sphagnum bogs throughout. The transitional habitat contains a mix of microhabitats of upland black spruce stands (Plot 17) (Photo 11) with a shrub layer of red osier dogwood and alder, as well as treed bogs

dominated by black spruce and tamarack with a sphagnum moss and Labrador tea understory (Plot 16) (Photo 12).

Close to Buffalo Creek, the habitat was characterized by a mixedwood river-bottom forest habitat dominated by white spruce and aspen with a thick shrub understory of hazel and alder (Plot 18) (Photo 10). No invasive species, species/communities of conservation concern and/or species of significance to First Nations were observed along the proposed Reach 2 dike option.

The majority of the areas where the proposed Options 2, 3 and 4 of Reach 2 are located is one large graminoid poor fen connected to Big Buffalo Lake and characterized by floating sedge and buckbean mats with patches of common reed grass, bog birch and willows (Plot 8 to Plot 15) (Photo 6 and Photo 7). Scattered throughout the large fen network are small pockets of treed and shrubby sphagnum bogs dominated by Labrador tea, small bog cranberry, bog rosemary, bog laurel (*Kalmia polifolia*) and three-leaved false Solomon's seal (Photo 8). Much of the area has witnessed little to no human activity. As a result, no invasive species were present in the area, except for Canadian thistle and yellow sweet clover, which were only found along the shoreline of Lake St. Martin (Plot 9) due to more human exposure. No species/communities of conservation concern and/or species of First Nation's interest were observed.

4.3 Reach 3

The existing Reach 3 channel heads north from Buffalo Creek and passes predominantly through treed black spruce and tamarack sphagnum bog habitats. As with the existing Reach 1 channel, much of these bog habitats on either side of the channel are flooded and transitioning to more of a marsh-type wetland (Photo 13).

Johnson Beach

The area along the Johnson Beach option is primarily comprised of expansive black spruce/tamarack treed sphagnum bogs. An existing berm along the proposed alignment created from the original construction of the Reach 3 emergency channel resulted in flooding of adjacent bog habitats and the emergence of marsh-like habitats dominated by cattails, horsetail (*Equisetum* spp.) and willow shrubs, similar to the habitat present along the existing Reach 1 and Reach 3 channels (Photo 14). With increasing proximity to Lake Winnipeg, black spruce sphagnum bog habitats yield to early hardwood riparian communities with willow/alder thickets, along with coastal marshlands and sedge meadows (Photo 15).

No species/communities of conservation concern and/or species of importance to First Nations were observed along the Johnson Beach option. Invasive species observed included common dandelion, perennial sow thistle and hemp nettle; these species were observed at several locations within the disturbed area along the existing berm that was previously constructed.

Willow Point

The area along the Willow Point alignment was composed largely of shrubby and open sphagnum bog habitat with few trees (Photo 16). Similar to the Johnson Beach option, as the alignment reaches Lake Winnipeg, the sphagnum bog habitats give way to hardwood riparian communities, coastal marshlands and sedge meadows (Photo 17).

One species of conservation concern, dragon’s mouth orchid (S2), was observed at two locations along this proposed alignment. Two occurrences of single individuals were observed in close proximity to each other within a sample plot at the start of the Willow Point option (50 m from where it branches off from the existing Reach 3 channel) (Plot 20). Another 13 individuals were observed as individuals and small colonies within another plot along the Willow Point alignment option (Plot 23).

At both locations, the habitat consisted of an open bog dominated by scattered immature tamaracks and willow and bog birch shrubs with the orchids found growing on high hummocks of sphagnum moss surrounded by buckbean, creeping juniper and Labrador tea. No species of significance to First Nations that were identified for the Project (Section 1.5) were observed. The majority of the alignment was free of invasive species, except within the hardwood riparian area along the shoreline of Lake Winnipeg, where some common dandelions were found.

Table 3: Summary of Habitats Encountered within the PF during the Vegetation Surveys

Plot	LCC Data	Habitat Type (FEC V-Type if applicable)	Wetland Classification (DU system)
Plot 1	Wetland Shrub (82)/Broadleaf - Dense (221)	Aspen Hardwood (V5)	N/A
Plot 2	Wetland Herb (83)	Aspen Hardwood (V5)	N/A
Plot 3	Wetland Shrub (82)/Coniferous Dense (211)	Black Spruce/Sphagnum (V33)	treed bog
Plot 4	Coniferous Dense (211)	Black Spruce/Sphagnum (V33)	treed bog
Plot 5	Wetland Shrub (82)/Grassland (110)	Black Spruce/Sphagnum (V33)	treed bog
Plot 6	Wetland Shrub (82)/Coniferous Dense (211)	Black Spruce/Sphagnum (V33)	treed bog
Plot 7	Wetland Herb (83)/Wetland Shrub (82)	N/A (Wetland habitat)	graminoid poor fen
Plot 8	Wetland Herb (83)	N/A (Wetland habitat)	graminoid poor fen
Plot 9	Wetland Shrub (82)	Aspen Hardwood (V5)	N/A
Plot 10	Wetland Herb (83)	N/A (Wetland habitat)	graminoid poor fen
Plot 11	Wetland Herb (83)/Wetland Shrub (82)	N/A (Wetland habitat)	graminoid poor fen
Plot 12	Wetland Herb (83)/Wetland Shrub (82)	N/A (Wetland habitat)	graminoid poor fen
Plot 13	Wetland Herb (83)	N/A (Wetland habitat)	graminoid poor fen
Plot 14	Wetland Herb (83)/Wetland Shrub (82)	N/A (Wetland habitat)	shrubby poor fen

Plot 15	Wetland Shrub (82)	N/A (Wetland habitat)	shrubby bog/graminoid poor fen
Plot 16	Wetland Shrub (82)/Coniferous Dense (211)	N/A (Wetland habitat)	treed bog
Plot 17	Coniferous Dense (211)	Black spruce / herb rich / sphagnum/feather moss (V31)	N/A
Plot 18	Wetland Shrub (82)/Grassland (110)	Trembling Aspen Mixedwood (V9)	N/A
Plot 19	Wetland Shrub (82)/Coniferous Dense (211)	Black Spruce/Sphagnum V33	treed swamp
Plot 20	Wetland Herb (83)	N/A (Wetland habitat)	open bog
Plot 21	Wetland Shrub (82)	Black Spruce/Sphagnum V33	treed bog
Plot 22	Wetland Shrub (82)/Open Water (20)	Aspen Hardwood (V5) /Shoreline	N/A
Plot 23	Wetland Herb (83)/Wetland Shrub (82)	N/A (Wetland habitat)	open bog
Plot 24	Wetland Shrub (82)/Open Water (20)	Aspen Hardwood (V5) /Shoreline	N/A



Photo 1: View of Reach 1 of the LSMOC, looking north from the inlet at Lake St. Martin (taken on October 09, 2015)



Photo 2: View of a aspen hardwood forest at Plot 2 along Reach 1 of the LSMOC, looking east from the banks of the channel (taken on August 03, 2016)



Photo 3: View of a black spruce/tamarack treed bog at Plot 3 along Reach 1 of the LSMOC, looking east from the banks of the channel (taken on August 03, 2016)



Photo 4: View of a flooded black spruce treed bog at Plot 5 along Reach 1 of the LSMOC, looking east from the banks of the channel (taken on August 03, 2016)



Photo 5: Aerial view of large graminoid poor fen habitat surrounding Big Buffalo Lake, looking south from Big Buffalo Lake (taken on October 09, 2015)



Photo 6: Aerial view, looking west, of large graminoid poor fen habitat surrounding Big Buffalo Lake in vicinity of proposed Reach 2 options (taken on August 03, 2016)



Photo 7: View of graminoid poor fen habitat, looking south, at Plot 14 with pockets of bog habitats in distance (taken on June 10, 2016)



Photo 8: View of shrubby bog habitat within Plot 15, looking south (taken on June 07, 2016)



Photo 9: Aerial view of Buffalo Creek, looking west at where the Reach 2 berm is proposed to be constructed (taken on August 03, 2016)



Photo 10: View of the river bottom forest along Buffalo Creek, at the start of the Reach 2 berm at Plot 18, looking west from the banks of Buffalo Creek (taken on August 03, 2016)



Photo 11: View of upland black spruce stand, looking west, at Plot 17 along the proposed Reach 2 berm (taken on June 07, 2016)

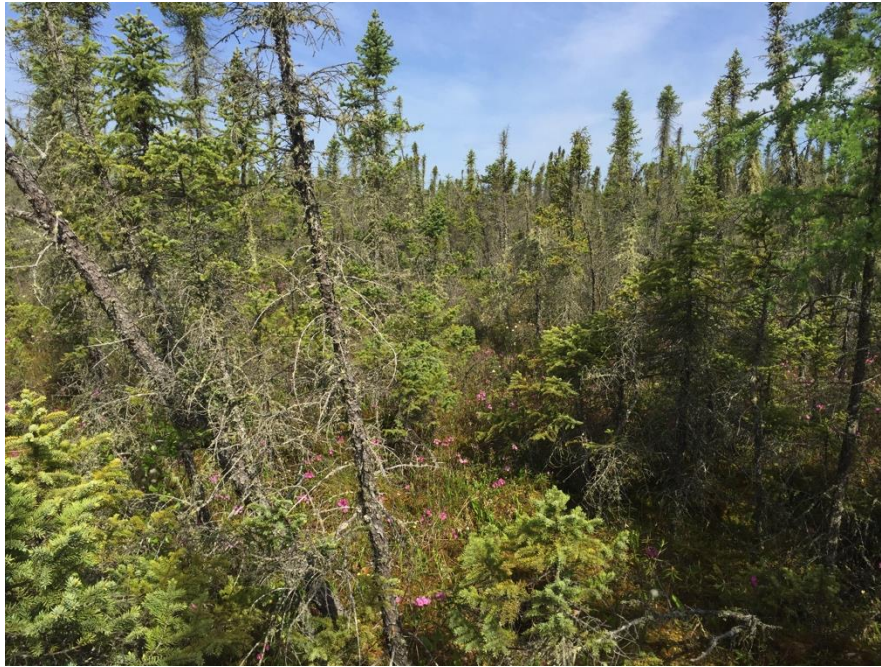


Photo 12: View of treed black spruce bog, looking west, at Plot 16 along the proposed Reach 2 berm (taken on June 08, 2016)



Photo 13: Aerial view of the Johnson Beach and Willow Point Reach 3 extension options, looking north, (taken on August 03, 2016)



Photo 14: View of flooded habitat along the berm, looking north, at Plot 21 along the Reach 3 Johnson Beach extension option (taken on June 07, 2016)

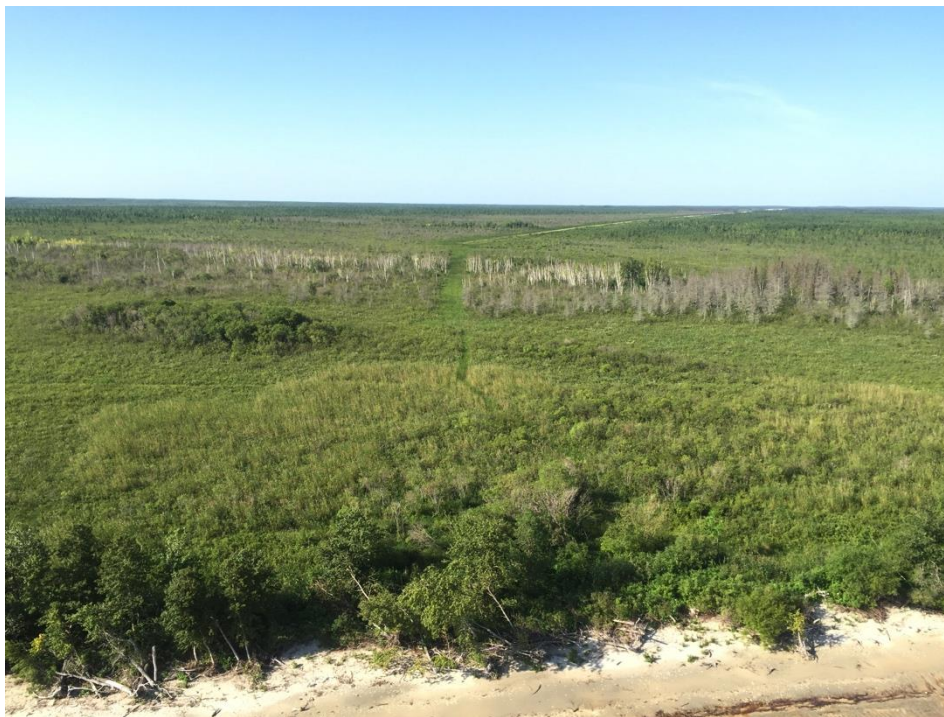


Photo 15: Aerial view of Lake Winnipeg shoreline, at the outlet of the proposed Johnson Beach option, looking West at Plot 22 (taken on August 03, 2016)



Photo 16: View of an open bog habitat with immature tamarack trees, looking east, at Plot 23 along the Reach 3 Willow Point extension option (taken on June 07, 2016)



Photo 17: Aerial view of Lake Winnipeg shoreline, at the outlet of the proposed Willow Point option, looking west at plot 24 (taken on August 03, 2016)

4.4 Plant Species of Conservation Concern

No federally or provincially listed species were observed during the vegetation surveys. One species listed by the MBCDC as a species of conservation concern was identified at several locations along the LSMOC. Dragon's mouth orchid (*Arethusa bulbosa*) (S2) is considered rare throughout its range or in the province (6 to 20 occurrences) and may be vulnerable to extirpation. Most often found singly, in suitable habitats it may be found in small colonies.

A single individual dragon's mouth orchid was observed within one of the densely treed black spruce sphagnum bog habitats close to Big Buffalo Lake (Photo 18). Although much of the surrounding habitat was flooded, the orchid was found on a hummock of sphagnum moss at the base of an immature tamarack tree, surrounded by Labrador tea and bog rosemary.

Two more occurrences of single individuals were observed in close proximity to each other at the start of the Willow Point option, where it branches off from the existing Reach 3 channel. The habitat where these occurrences were made was more of an open bog with scattered immature tamaracks and some willow and bog birch shrubs (Photo 19). Further along the Willow Point alignment, another single individual and several small colonies of 3-5 individuals (13 in total) were observed within another survey plot (Photo 20). The habitat was similarly an open bog dominated by immature tamaracks and shrubs, where the orchids were found growing on high hummocks of sphagnum moss surrounded by buckbean and Labrador tea.

The habitat in which the occurrences of dragon's mouth orchid were made is found throughout the RSA of the LSMOC, and other individuals or communities of this species may be present that were not observed during the survey.



Photo 18: Dragon's mouth orchid (*Arethusa bulbosa*) observed at the base of a tamarack tree in a black spruce dominated sphagnum bog habitat at Plot 6 (taken on June 8, 2016)



Photo 19: Dragon's mouth orchid (*Arethusa bulbosa*) observed in an open tamarack dominated sphagnum bog habitat at Plot 20 (taken on June 7, 2016)



Photo 20: Dragon's mouth orchid (*Arethusa bulbosa*) observed in an open tamarack dominated sphagnum bog habitat at Plot 23 (taken on June 7, 2016)

4.5 Plant Species of Significance to First Nations

The plant species of significance to First Nations identified for the Project in Section 1.5 and Section 3.5 were not observed during the spring and summer vegetation surveys of the LSMOC.

4.6 Invasive Species

There were eight species that are invasive to Manitoba that were identified within the LSA during the spring and summer surveys, all of which were Tier 3 noxious weeds under the Manitoba NWA (Table 5).

Canada thistle and yellow sweet clover are identified as moderate invasives by Environment Canada (EC 1999) and were found at several locations within the LSA. Other minor invasive plant species such as Kentucky bluegrass, perennial sow thistle and common dandelion were also observed at several locations within the LSA. These minor and moderate invasives were found predominantly along the disturbed banks of the existing emergency channel of Reach 1 and Reach 3, and along the shorelines of LSM and Lake Winnipeg, where human and animal traffic is more prevalent.

Invasive species vary in aggressiveness and are well adapted to a variety of habitats. They can quickly establish in disturbed areas and propagate by seed, and therefore can be easily spread. Preventing seed production and spreading using an integrated approach of combining herbicide and/or mechanical treatment with competition from desirable native plants is an effective way of controlling these species. Another important method to prevent the spread of invasive species is the use of clean native seeds in seeding rights-of-way (Parks 2010).

Table 5: Summary of Invasive Plant Species Found within the LSA during the Vegetation Surveys

Scientific Name	Common Name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24
Vascular Plant Species																									
Graminoids																									
<i>Poa pratensis</i>	Kentucky blue grass	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Herbaceous Species																									
<i>Cirsium arvense</i>	Canada thistle	X	X	-	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Galeopsis tetrahit</i>	hemp nettle	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Melilotus officinalis</i>	yellow sweet clover	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ranunculus acris</i>	meadow buttercup	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Sonchus arvensis</i>	perennial sow thistle	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-
<i>Taraxacum officinale</i>	common dandelion	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	X
<i>Urtica dioica</i>	stinging nettle	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

5.0 SUMMARY

This study was conducted to determine the existing vegetation and delineate the vegetation habitat types within the proposed LSMOC project area. The 5km RSA for the proposed LSMOC lies within a large depression area that is widely covered by an expansive graminoid dominant rich fen with scattered ‘islands’ of treed and shrubby sphagnum bogs.

The existing Reach 1 channel between LSM and Big Buffalo Lake was comprised of upland mixedwood forest with some areas of black spruce and tamarack sphagnum bogs, and a large expansive floating fen surrounding Big Buffalo Lake. The area along the proposed Reach 2 dike option north of Big Buffalo Lake was composed of a black spruce dominant transitional upland forest-treed bog habitat with pockets of true shrubby and treed sphagnum bogs throughout. The majority of the area where the proposed Options 2, 3 and 4 of Reach 2 are located was one large graminoid rich fen connected to Big Buffalo Lake with small pockets of treed and shrubby sphagnum bogs. The existing Reach 3 channel heads north from Buffalo Creek and passes through predominantly black spruce and tamarack sphagnum bog habitats. The area along the Johnson Beach option was primarily comprised of expansive black spruce/tamarack treed sphagnum bogs, whereas the habitat along the Willow Point alignment was composed largely of shrubby and open sphagnum bog habitat with few trees. As both alignment options reach Lake Winnipeg, the sphagnum bog habitats give way to hardwood riparian communities, coastal marshlands and sedge meadows.

An additional focus of the study was the identification of any species at risk or species of conservation concern, species of significance to First Nations, and/or invasive species within the study area. One species of conservation concern listed by the MBCDC was identified during the vegetation surveys, dragon’s mouth orchid (S2). This species was found within a treed black spruce bog along the Reach 1 channel, just south of Big Buffalo Lake and at several locations along the Willow Point option of the Reach 3 channel within open sphagnum bogs. The habitats in which the dragon’s mouth orchids were found are common habitat types throughout the study area. Although not encountered during the 2016 field surveys, there is a potential to encounter green adder’s mouth orchid, ram’s-head lady’s-slipper, and/or other species of conservation concern that have similar habitat preferences. No species of significance to First Nations that had been identified for the Project were found during the field surveys. Eight invasive species were identified within the LSA during the field surveys, all of which were Tier 3 noxious weeds. These species were found predominantly along the disturbed banks of the existing emergency channel of Reach 1 and Reach 3, and along the shorelines of LSM and Lake Winnipeg, where human and animal traffic are more prevalent.

Information collected during this baseline assessment will be used for future environmental assessment initiatives and to help establish subsequent mitigation strategies.

6.0 CLOSURE

We trust that the above information meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

Respectfully submitted,

SG Environmental Services Inc.



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Biologist

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Appendix A
Potential Plant Species of Conservation
Concern for the Interlake Plain Ecoregion

Appendix A: Potential Plant Species of Conservation Concern for the Interlake Plain Ecoregion

Scientific Name	Common Name	Provincial Conservation Status
<i>Achnatherum richardsonii</i>	Richardson needle grass	S1S2
<i>Agalinis aspera</i>	rough agalinis	S2
<i>Agalinis tenuifolia</i>	narrow-leaved agalinis	S2S3
<i>Agrimonia gryposepala</i>	common agrimony	S1S2
<i>Alisma gramineum</i>	narrow-leaved water-plantain	S1
<i>Amorpha fruticosa</i>	false indigo	S1S2
<i>Arabidopsis lyrata</i>	lyre-leaved rock cress	S1S2
<i>Aralia racemosa</i>	spikenard	S2
<i>Arethusa bulbosa</i>	dragon's-mouth orchid	S2
<i>Asarum canadense</i>	wild ginger	S3S4
<i>Asclepias verticillata</i>	whorled milkweed	S3
<i>Astragalus australis</i>	indian milkvetch	S1S2
<i>Astragalus neglectus</i>	neglected milkvetch	S1
<i>Astragalus pectinatus</i>	narrow-leaved milkvetch	S2
<i>Boltonia asteroides</i> var. <i>recognita</i>	white boltonia	S2S3
<i>Botrychium campestre</i>	prairie moonwort	S1
<i>Botrychium lunaria</i>	common moonwort	S3S4
<i>Botrychium matricariifolium</i>	daisy-leaf moonwort	S1
<i>Bouteloua curtipendula</i>	side-oats grama	S2
<i>Bromus kalmii</i>	wild chess	S2S3
<i>Bromus porteri</i>	porter's chess	S2S3
<i>Calamagrostis montanensis</i>	plains reed grass	S3
<i>Calopogon tuberosus</i>	swamp-pink	S2
<i>Canadanthus modestus</i>	large northern aster	S2
<i>Cardamine bulbosa</i>	spring cress	SH
<i>Carex conoidea</i>	field sedge	S1
<i>Carex douglasii</i>	douglas sedge	S2
<i>Carex flava</i>	yellow sedge	S2
<i>Carex hystericina</i>	porcupine sedge	S3
<i>Carex livida</i>	livid sedge	S3
<i>Carex parryana</i>	parry's sedge	S3
<i>Carex pedunculata</i>	stalked sedge	S3
<i>Carex sterilis</i>	dioecious sedge	S2
<i>Carex supina</i> ssp. <i>spaniocarpa</i>	weak sedge	S2S3
<i>Carex tetanica</i>	rigid sedge	S3
<i>Carex vulpinoidea</i>	fox sedge	S3
<i>Caulophyllum thalictroides</i>	papoose-root	S2
<i>Ceanothus herbaceus</i>	New Jersey tea	S2S3

Appendix A: Potential Plant Species of Conservation Concern for the Interlake Plain Ecoregion

Scientific Name	Common Name	Provincial Conservation Status
<i>Chrysosplenium iowense</i>	iowa golden-saxifrage	S1
<i>Cladium mariscoides</i>	twig rush	S2S3
<i>Clematis ligusticifolia</i>	western virgin's-bower	S1
<i>Clematis virginiana</i>	virgin's-bower	S2?
<i>Corallorhiza striata</i>	striped coralroot	S3S4
<i>Corispermum villosum</i>	hairy bugseed	S1S2
<i>Cyperus erythrorhizos</i>	red-root flatsedge	S1
<i>Cyperus houghtonii</i>	houghton's umbrella-sedge	S2S3
<i>Cypripedium arietinum</i>	ram's head lady's-slipper	S2S3
<i>Cypripedium candidum</i>	small white lady's-slipper	S1
<i>Desmodium canadense</i>	beggar's-lice	S2
<i>Drosera anglica</i>	oblong-leaved sundew	S3S4
<i>Epilobium brachycarpum</i>	annual willowherb	SU
<i>Festuca hallii</i>	plains rough fescue	S3
<i>Fraxinus nigra</i>	black ash	S2S3
<i>Gentiana rubricaulis</i>	closed gentian	S3
<i>Geranium maculatum</i>	wild crane's-bill	S1
<i>Goodyera tessellata</i>	tesselated rattlesnake plantain	S2
<i>Helianthus pauciflorus</i> ssp. <i>pauciflorus</i>	stiff sunflower	SU
<i>Hudsonia tomentosa</i>	false heather	S3
<i>Hypoxis hirsuta</i>	yellow stargrass	S3S4
<i>Krigia biflora</i>	two-flowered dwarf-dandelion	S2S3
<i>Lactuca floridana</i>	woodland lettuce	SH
<i>Lechea intermedia</i>	pinweed	S1?
<i>Leucophysalis grandiflora</i>	large white-flowered ground-cherry	S3S4
<i>Linum sulcatum</i>	grooved yellow flax	S3
<i>Liparis loeselii</i>	yellow twayblade	S3S4
<i>Lomatium foeniculaceum</i>	hairy-fruited parsley	S3
<i>Lomatium macrocarpum</i>	long-fruited parsley	S2S3
<i>Lysimachia quadriflora</i>	whorled loosestrife	S2
<i>Maianthemum racemosum</i>	false spikenard	S1
<i>Malaxis monophyllos</i>	white adder's-mouth	S2?
<i>Malaxis paludosa</i>	bog adder's-mouth	S1?
<i>Malaxis unifolia</i>	green adder's-mouth	S2?
<i>Muhlenbergia andina</i>	foxtail muhly	S1
<i>Nassella viridula</i>	green needle grass	S3S4
<i>Oenothera perennis</i>	sundrops	S1
<i>Onoclea sensibilis</i>	sensitive fern	S3?

Appendix A: Potential Plant Species of Conservation Concern for the Interlake Plain Ecoregion

Scientific Name	Common Name	Provincial Conservation Status
<i>Ophioglossum pusillum</i>	northern adder's-tongue	S1
<i>Orobanche fasciculata</i>	clustered broom-rape	S3
<i>Orobanche ludoviciana</i>	Louisiana broom-rape	S2
<i>Osmunda claytoniana</i>	interrupted fern	S2S3
<i>Oxytropis lambertii</i>	purple locoweed	S3
<i>Parietaria pensylvanica</i>	american pellitory	S3S4
<i>Parnassia parviflora</i>	small grass-of-parnassus	S1
<i>Pellaea gastonyi</i>	gastony's cliffbrake	S1
<i>Pellaea glabella</i>	smooth cliffbrake	S2
<i>Pellaea glabella ssp. occidentalis</i>	western dwarf cliffbrake	S2
<i>Penthorum sedoides</i>	ditch-stonecrop	S1S2
<i>Phryma leptostachya</i>	lopseed	S3
<i>Physostegia virginiana</i>	false dragonhead	S4
<i>Platanthera orbiculata</i>	round-leaved bog orchid	S3S4
<i>Platanthera praeclara</i>	western prairie fringed orchid	S1
<i>Polygala verticillata</i>	whorled milkwort	S2
<i>Pyrola americana</i>	round-leaved pyrola	S2?
<i>Ranunculus hispidus</i> var. <i>caricetorum</i>	bristly buttercup	S2
<i>Rhynchospora alba</i>	white beakrush	S3
<i>Rhynchospora capillacea</i>	horned beakrush	S2S3
<i>Sceptridium multifidum</i>	leathery grape-fern	S3
<i>Selaginella densa</i>	prairie spike-moss	S3
<i>Selaginella selaginoides</i>	low spike-moss	S3S4
<i>Sisyrinchium campestre</i>	white-eyed grass	S3
<i>Solidago riddellii</i>	riddell's goldenrod	S2S3
<i>Spiranthes magnicamporum</i>	great plains ladies'-tresses	S1S2
<i>Symphyotrichum ericoides</i> var. <i>ericoides</i>	white heath aster	S3?
<i>Symphyotrichum sericeum</i>	western silvery aster	S2S3
<i>Teucrium canadense</i>	american germander	S3
<i>Thalictrum revolutum</i>	waxleaf meadow-rue	S1
<i>Utricularia cornuta</i>	horned bladderwort	S3S4
<i>Utricularia minor</i>	lesser bladderwort	S3
<i>Vaccinium caespitosum</i>	dwarf bilberry	S3
<i>Vernonia fasciculata</i>	western ironweed	S1
<i>Veronicastrum virginicum</i>	culver's-root	S1S2
<i>Viola labradorica</i>	early blue violet	S3
<i>Vitis riparia</i>	riverbank grape	S3S4

Source: (MBCDC 2016)

Appendix B
Potential Plant Species of Conservation
Concern for the Mid-Boreal Lowland
Ecoregion

Appendix B: Potential Plant Species of Conservation Concern for the Mid-Boreal Lowland Ecoregion

Scientific Name	common name	Provincial Conservation Status
<i>Aralia racemosa</i>	spikenard	S2
<i>Arethusa bulbosa</i>	dragon's-mouth orchid	S2
<i>Calopogon tuberosus</i>	swamp-pink	S2
<i>Carex flava</i>	yellow sedge	S2
<i>Carex garberi</i>	elk sedge	S1?
<i>Carex hystericina</i>	porcupine sedge	S3
<i>Carex pedunculata</i>	stalked sedge	S3
<i>Carex projecta</i>	necklace sedge	S3?
<i>Carex vulpinoidea</i>	fox sedge	S3
<i>Cyperus houghtonii</i>	Houghton's umbrella-sedge	S2S3
<i>Cypripedium arietinum</i>	ram's head lady's-slipper	S2S3
<i>Drosera anglica</i>	oblong-leaved sundew	S3S4
<i>Drosera linearis</i>	slender-leaved sundew	S2?
<i>Dulichium arundinaceum</i>	three-way sedge	S2
<i>Eleocharis engelmannii</i>	Engelmann's spike-rush	S1S2
<i>Eriophorum callitrix</i>	beautiful cotton-grass	S2
<i>Galium aparine</i>	cleavers	S3
<i>Goodyera tessellata</i>	tesselated rattlesnake plantain	S2
<i>Gymnocarpium continentale</i>	nahanni oak fern	S3S4
<i>Gymnocarpium robertianum</i>	limestone oak fern	S1
<i>Heteranthera dubia</i>	water star-grass	S2S3
<i>Leucophysalis grandiflora</i>	large white-flowered ground-cherry	S3S4
<i>Liparis loeselii</i>	yellow twayblade	S3S4
<i>Listera auriculata</i>	auricled twayblade	S1
<i>Malaxis monophyllos</i>	white adder's-mouth	S2?
<i>Malaxis unifolia</i>	green adder's-mouth	S2?
<i>Nymphaea odorata</i>	fragrant water-lily	S2?
<i>Onoclea sensibilis</i>	sensitive fern	S3?
<i>Osmunda claytoniana</i>	interrupted fern	S2S3
<i>Pellaea gastonyi</i>	Gastony's cliffbrake	S1
<i>Pellaea glabella ssp. occidentalis</i>	western dwarf cliffbrake	S2
<i>Pinus resinosa</i>	red pine	S2S3
<i>Plantago maritima</i>	seaside plantain	S2
<i>Platanthera lacera</i>	fringed orchid	S1S2
<i>Platanthera orbiculata</i>	round-leaved bog orchid	S3S4
<i>Pogonia ophioglossoides</i>	rose pogonia	S1
<i>Polypodium sibiricum</i>	siberian polypody	S3
<i>Potamogeton strictifolius</i>	straightleaf pondweed	S2S3
<i>Pyrola americana</i>	round-leaved pyrola	S2?
<i>Rhynchospora alba</i>	white beakrush	S3

Appendix B: Potential Plant Species of Conservation Concern for the Mid-Boreal Lowland Ecoregion

Scientific Name	common name	Provincial Conservation Status
<i>Rhynchospora capillacea</i>	horned beakrush	S2S3
<i>Sceptridium multifidum</i>	leathery grape-fern	S3
<i>Taxus canadensis</i>	canada yew	S3
<i>Thalictrum sparsiflorum</i>	few-flowered meadow-rue	S1S3
<i>Vaccinium caespitosum</i>	dwarf bilberry	S3
<i>Viola labradorica</i>	early blue violet	S3
<i>Viola selkirkii</i>	long-spurred violet	S2
<i>Woodsia glabella</i>	smooth woodsia	S2

Source: (MBCDC 2016)

Appendix C
List of Plant Species Observed During the 2016
Spring and Summer Field Surveys

Appendix C: List of Plant Species Observed During the 2016 Spring and Summer Field Surveys

Table i: Species List by Conservation Status

Scientific Name	Common Name	Provincial Conservation Status	SARA	COSEWIC	Manitoba Endangered Species List
Non Vascular Species					
<i>Sphagnum spp</i>	sphagnum moss	-	-	-	
<i>Brachythecium spp.</i>	feather moss	-	-	-	-
Vascular Plant Species					
Ferns and Fern Allies					
<i>Equisetum arvense</i>	common horsetail	S5	-	-	-
<i>Equisetum fluviatile</i>	swamp horsetail	S5	-	-	-
<i>Equisetum hyemale</i>	scouring rush	S5	-	-	-
Graminoids					
<i>Carex gynocrates</i>	northern bog sedge	S5	-	-	-
<i>Carex lacustris</i>	water sedge	S5	-	-	-
<i>Carex lenticularis</i>	lakeshore sedge	S5	-	-	-
<i>Carex rostrata</i>	beaked sedge	S4	-	-	-
<i>Carex spp.</i>	sedges	-	-	-	-
<i>Carex viridula</i>	green sedge	S4	-	-	-
<i>Eleocharis palustris</i>	common spike rush	S5	-	-	-
<i>Eriophorum gracile</i>	slender cotton grass	S5	-	-	-
<i>Eriophorum angustifolium</i>	tall cotton-grass	S5	-	-	-
<i>Glyceria striata</i>	fowl mannagrass	S5	-	-	-
<i>Juncus balticus</i>	wirerush	S5	-	-	-
<i>Phragmites australis</i>	common reed grass	S5	-	-	-
<i>Poa pratensis</i>	kentucky blue grass	S5	-	-	-
<i>Schoenoplectus acutus</i>	hardstem bulrush	S5	-	-	-
<i>Scirpus cyperinus</i>	woolgrass	S4	-	-	-
<i>Triglochin maritima</i>	seaside arrow grass	S5	-	-	-
Woody Species - Trees					
<i>Betula papyrifera</i>	white birch	S5	-	-	-

Appendix C: List of Plant Species Observed During the 2016 Spring and Summer Field Surveys

Scientific Name	Common Name	Provincial Conservation Status	SARA	COSEWIC	Manitoba Endangered Species List
<i>Larix laricina</i>	tamarack	S5	-	-	-
<i>Picea glauca</i>	white spruce	S5	-	-	-
<i>Picea mariana</i>	black spruce	S5	-	-	-
<i>Pinus banksiana</i>	jackpine	S5	-	-	-
<i>Populus balsamifera</i>	balsam poplar	S5	-	-	-
<i>Populus tremuloides</i>	trembling aspen	S5	-	-	-
<i>Ulmus americana</i>	american elm	S5	-	-	-
Woody Species - Shrubs					
<i>Acer spicatum</i>	mountain maple	S5	-	-	-
<i>Alnus incana</i>	speckled alder	S5	-	-	-
<i>Alnus viridis</i>	green alder	S5	-	-	-
<i>Amelanchier alnifolia</i>	saskatoon serviceberry	S5	-	-	-
<i>Arctostaphylos uva-ursi</i>	bearberry	S5	-	-	-
<i>Betula glandulosa</i>	bog birch	S5	-	-	-
<i>Betula occidentalis</i>	water birch	S5	-	-	-
<i>Cornus sericea</i>	red osier dogwood	S5	-	-	-
<i>Corylus cornuta</i>	beaked hazel	S5	-	-	-
<i>Dasiphora fruticosa</i>	shrubby cinquefoil	S5	-	-	-
<i>Juniperus horizontalis</i>	creeping juniper	S5	-	-	-
<i>Kalmia polifolia</i>	bog lauriel	S5	-	-	-
<i>Lonicera dioica</i>	twining honeysuckle	S5	-	-	-
<i>Myrica gale</i>	Sweet bayberry	S5	-	-	-
<i>Rhamnus alnifolia</i>	alder leaved buckthorn	S5	-	-	-
<i>Rhododendron groenlandicum</i>	labrador tea	S5	-	-	-
<i>Ribes americanum</i>	wild black currant	S5	-	-	-
<i>Rubus idaeus</i>	raspberry	S5	-	-	-
<i>Ribes lacustre</i>	black gooseberry	S5	-	-	-
<i>Ribes triste</i>	wild red current	S5	-	-	-

Appendix C: List of Plant Species Observed During the 2016 Spring and Summer Field Surveys

Scientific Name	Common Name	Provincial Conservation Status	SARA	COSEWIC	Manitoba Endangered Species List
<i>Rosa acicularis</i>	prickly rose	S5	-	-	-
<i>Salix bebbiana</i>	beaked willow	S5	-	-	-
<i>Salix lutea</i>	yellow willow	S5	-	-	-
<i>Salix pedicellaris</i>	bog willow	S5	-	-	-
<i>Salix spp.</i>	willow	-	-	-	-
<i>Symphoricarpos albus</i>	common snowberry	S5	-	-	-
<i>Vaccinium oxycoccos</i>	small bog cranberry	S5	-	-	-
<i>Vaccinium vitis-idaea</i>	lingonberry	S5	-	-	-
<i>Viburnum edule</i>	low-bush cranberry	S5	-	-	-
Herbaceous Species					
<i>Achillea millefolium</i>	common yarrow	S5	-	-	-
<i>Actaea rubra</i>	red baneberry	S5	-	-	-
<i>Andromeda polifolia</i>	bog rosemary	S5	-	-	-
<i>Anemone canadensis</i>	canadian anemone	S5	-	-	-
<i>Apocynum androsaemifolium</i>	wild sarsparilla	S5	-	-	-
<i>Arethusa bulbosa</i>	dragon's mouth orchid	S2	-	-	-
<i>Argentina anserina</i>	silverweed	S5	-	-	-
<i>Asclepias syriaca</i>	common milkweed	S5	-	-	-
<i>Caltha palustris</i>	marsh marigold	S5	-	-	-
<i>Campanula rotundifolia</i>	harebell	S5	-	-	-
<i>Cerastium arvense</i>	field chickweed	S5	-	-	-
<i>Chamerion angustifolium</i>	common fireweed	S5	-	-	-
<i>Cirsium arvense</i>	Canada thistle	S5	-	-	-
<i>Comandra umbellata</i>	bastard toadflax	S5	-	-	-
<i>Comarum palustre</i>	marsh cinquefoil	S5	-	-	-
<i>Cornus canadensis</i>	bunchberry	S5	-	-	-
<i>Cypripedium parviflorum</i>	yellow lady slipper	S5	-	-	-
<i>Disporum trachycarpum</i>	rough-fruited fairybell	S5	-	-	-
<i>Drosera rotundifolia</i>	sundew	S5	-	-	-

Appendix C: List of Plant Species Observed During the 2016 Spring and Summer Field Surveys

Scientific Name	Common Name	Provincial Conservation Status	SARA	COSEWIC	Manitoba Endangered Species List
<i>Eutrochium maculatum</i>	spotted joe-pye weed	S5	-	-	-
<i>Fragaria vesca</i>	woodland strawberry	S5	-	-	-
<i>Fragaria virginiana</i>	common strawberry	S5	-	-	-
<i>Galeopsis tetrahit</i>	hemp nettle	S5	-	-	-
<i>Galium boreale</i>	northern bedstaw	S5	-	-	-
<i>Galium triflorum</i>	sweet scented bedstraw	S5	-	-	-
<i>Gentiana crinita</i>	fringed gentian	S5	-	-	-
<i>Iris versicolor</i>	blue flag iris	S5	-	-	-
<i>Lathyrus ochroleucus</i>	creamy peavine	S5	-	-	-
<i>Linnaea borealis</i>	twinflower	S5	-	-	-
<i>Lycopus uniflorus</i>	northern water-horehound	S5	-	-	-
<i>Lysimachia thyrsoiflora</i>	tuft loosetrife	S5	-	-	-
<i>Maianthemum canadense</i>	wild lily-of-the-valley	S5	-	-	-
<i>Maianthemum stellatum</i>	star flowered false solomon's seal	S5	-	-	-
<i>Maianthemum trifolium</i>	three-leaved false solomon's seal	S5	-	-	-
<i>Melilotus officinalis</i>	yellow sweet clover	S5	-	-	-
<i>Mentha arvensis</i>	wild mint	S5	-	-	-
<i>Menyanthes trifoliata</i>	buckbean	S5	-	-	-
<i>Oenothera biennis</i>	yellow evening primrose	S5	-	-	-
<i>Parnassia palustris</i>	grass of parnassus	S5	-	-	-
<i>Petasites frigidus</i> var. <i>sagittatus</i>	arrow-leaved coltsfoot	S5	-	-	-
<i>Physostegia virginiana</i>	false dragonhead	S5	-	-	-
<i>Platanthera viridis</i>	northern green bog-orchid	S5	-	-	-
<i>Polygala paucifolia</i>	fringed milkwort	S5	-	-	-
<i>Primula incana</i>	mealy primrose	S5	-	-	-
<i>Ranunculus acris</i>	meadow buttercup	S5	-	-	-
<i>Ranunculus gmelinii</i>	yellow water crowfoot	S5	-	-	-
<i>Ranunculus macounii</i>	macoun's buttercup	S5	-	-	-
<i>Rubus acaulis</i>	dwarf raspberry	S5	-	-	-

Appendix C: List of Plant Species Observed During the 2016 Spring and Summer Field Surveys

Scientific Name	Common Name	Provincial Conservation Status	SARA	COSEWIC	Manitoba Endangered Species List
<i>Rubus chamaemorus</i>	cloudberry	S5	-	-	-
<i>Rubus pubescens</i>	dew berry	S5	-	-	-
<i>Salicornia rubra</i>	red samphire	S5	-	-	-
<i>Sanicula marilandica</i>	black sanicle	S5	-	-	-
<i>Sarracenia purpurea</i>	pitcher plant	S5	-	-	-
<i>Scutellaria galericulata</i>	marsh skullcap	S5	-	-	-
<i>Sisyrinchium montanum</i>	common blue-eyed grass	S5	-	-	-
<i>Solidago canadensis</i>	canada goldenrod	S5	-	-	-
<i>Solidago graminifolia</i>	flat top goldenrod	S5	-	-	-
<i>Solidago rigida</i>	stiff goldenrod	S5	-	-	-
<i>Sonchus arvensis</i>	perennial sow thistle	S5	-	-	-
<i>Stellaria calycantha</i>	northern stitchwort	S5	-	-	-
<i>Symphyotrichum ericoides</i>	many-flowered aster	S5	-	-	-
<i>Symphyotrichum laeve</i>	smooth blue aster	S5	-	-	-
<i>Taraxacum officinale</i>	common dandelion	S5	-	-	-
<i>Thalictrum dasycarpum</i>	tall meadow rue	S5	-	-	-
<i>Trientalis borealis</i>	northern star flower	S5	-	-	-
<i>Typha latifolia</i>	common cattail	S5	-	-	-
<i>Vicia americana</i>	american vetch	S5	-	-	-
<i>Viola palustris</i>	marsh violet	S5	-	-	-

Appendix C: List of Plant Species Observed During the 2016 Spring and Summer Field Surveys

Table ii: List of Plant Species Observed by Survey Plot

<i>Scientific Name</i>	Common Name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24
Non Vascular Species																									
<i>Sphagnum spp</i>	sphagnum moss	-	-	X	X	X	X	-	-	-	X	X	X	X	-	X	X	-	-	-	X	-	-	X	-
<i>Brachythecium spp.</i>	feather moss	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
Vascular Plant Species																									
Fern and Fern Allies																									
<i>Equisetum arvense</i>	common horsetail	-	X	-	-	X	X	-	X	-	-	-	X	X	-	X	X	X	-	X	-	-	-	X	X
<i>Equisetum fluviatile</i>	swamp horsetail	-	-	-	X	-	-	-	X	-	X	X	-	-	-	-	X	-	-	-	X	X	-	-	-
<i>Equisetum hyemale</i>	scouring rush	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	X	-	-	-	X
Graminoids																									
<i>Carex gynocrates</i>	northern bog sedge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
<i>Carex lacustris</i>	water sedge	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	X	-	-	X	-
<i>Carex lenticularis</i>	lakeshore sedge	-	-	-	-	-	-	-	-	X	-	-	-	-	-	X	-	-	-	X	X	-	-	-	-
<i>Carex rostrata</i>	beaked sedge	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Carex spp.</i>	sedges	X	X	X	X	-	X	X	X	X	X	X	X	X	-	X	-	X	X	X	-	-	-	X	-
<i>Carex viridula</i>	green sedge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Eleocharis palustris</i>	common spike rush	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	-	-	X	-	-	X	X
<i>Eriophorum gracile</i>	slender cotton grass	-	-	-	-	-	-	-	X	-	-	-	-	X	-	-	-	-	-	X	X	-	-	-	-
<i>Eriophorum angustifolium</i>	tall cotton-grass	-	-	-	X	-	X	-	X	-	-	-	-	X	-	X	X	-	-	-	-	-	-	-	-
<i>Glyceria striata</i>	fowl mannagrass	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Juncus balticus</i>	wirerush	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-

Appendix C: List of Plant Species Observed During the 2016 Spring and Summer Field Surveys

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Appendix C: List of Plant Species Observed During the 2016 Spring and Summer Field Surveys

Scientific Name	Common Name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24
<i>Vaccinium oxycoccos</i>	small bog cranberry	-	-	X	-	-	X	-	-	-	X	X	X	X	-	X	X	-	-	-	X	-	-	X	-
<i>Vaccinium vitis-idaea</i>	lingonberry	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	-	-	X	-
<i>Viburnum edule</i>	low-bush cranberry	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X
Herbaceous Species																									
<i>Achillea millefolium</i>	common yarrow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Actaea rubra</i>	red baneberry	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X
<i>Andromeda polifolia</i>	bog rosemary	-	-	-	-	-	X	-	-	-	X	X	X	-	-	X	X	-	-	-	X	-	-	X	-
<i>Anemone canadensis</i>	canadian anemone	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Apocynum androsaemifolium</i>	wild sarsparilla	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	-	X
<i>Arethusa bulbosa</i>	dragon's mouth orchid	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X	-
<i>Argentina anserina</i>	silverweed	X	-	-	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
<i>Asclepias syriaca</i>	common milkweed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
<i>Caltha palustris</i>	marsh marigold	-	-	-	X	X	X	-	X	-	-	-	X	X	-	-	X	-	-	X	X	X	-	X	-
<i>Campanula rotundifolia</i>	harebell	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
<i>Cerastium arvense</i>	field chickweed	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Chamerion angustifolium</i>	common fireweed	-	-	-	-	X	X	-	-	X	-	-	-	-	-	X	-	-	X	X	-	-	-	-	-
<i>Cirsium arvense</i>	Canada thistle	X	X	-	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Comandra umbellata</i>	bastard toadflax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Cornus canadensis</i>	bunchberry	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	X	-

Appendix C: List of Plant Species Observed During the 2016 Spring and Summer Field Surveys

Scientific Name	Common Name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24
<i>Cypripedium parviflorum</i>	yellow lady slipper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
<i>Disporum trachycarpum</i>	rough-fruited fairybell	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Drosera rotundifolia</i>	sundew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
<i>Eutrochium maculatum</i>	spotted joe-pye weed	-	X	-	-	-	-	-	X	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-
<i>Fragaria vesca</i>	woodland strawberry	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Fragaria virginiana</i>	common strawberry	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X
<i>Galeopsis tetrahit</i>	hemp nettle	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Galium boreale</i>	northern bedstaw	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Galium triflorum</i>	sweet scented bedstraw	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-
<i>Gentiana crinita</i>	fringed gentian	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-
<i>Iris versicolor</i>	blue flag iris	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lathyrus ochroleucus</i>	creamy peavine	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Linnaea borealis</i>	twinflower	-	-	X	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lycopus uniflorus</i>	northern water-horehound	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X	-	-	-
<i>Lysimachia thyrsiflora</i>	tuft loosetrife	X	X	-	-	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
<i>Maianthemum canadense</i>	wild lily-of-the-valley	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Maianthemum stellatum</i>	star flowered false solomon's seal	X	X	-	-	-	X	-	-	-	-	-	-	X	-	-	-	-	X	-	-	-	X	-	X

Appendix C: List of Plant Species Observed During the 2016 Spring and Summer Field Surveys

Scientific Name	Common Name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24
<i>Maianthemum trifolium</i>	three-leaved false solomon's seal	-	-	-	-	-	X	-	-	-	X	X	X	X	-	X	-	-	-	-	X	-	-	-	-
<i>Melilotus officinalis</i>	yellow sweet clover	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Mentha arvensis</i>	wild mint	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X	-	-	-
<i>Menyanthes trifoliata</i>	buckbean	-	-	-	X	-	X	-	X	-	X	X	X	X	-	X	X	-	-	X	X	-	-	X	-
<i>Oenothera biennis</i>	yellow evening primrose	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
<i>Parnassia palustris</i>	grass of parnassus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
<i>Petasites frigidus</i> var. <i>sagittatus</i>	arrow-leaved coltsfoot	-	-	-	-	X	-	-	-	-	-	-	X	X	-	-	X	-	-	-	X	-	-	-	-
<i>Physostegia virginiana</i>	false dragonhead	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Platanthera viridis</i>	northern green bog-orchid	-	-	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
<i>Polygala paucifolia</i>	fringed milkwort	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
<i>Primula incana</i>	mealy primrose	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
<i>Ranunculus acris</i>	meadow buttercup	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ranunculus gmelinii</i>	yellow water crowfoot	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ranunculus macounii</i>	macoun's buttercup	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Rubus acaulis</i>	dwarf raspberry	-	-	X	-	-	X	-	-	-	X	-	X	X	-	X	X	-	-	-	X	-	-	X	-
<i>Rubus chamaemorus</i>	cloudberry	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Rubus pubescens</i>	dew berry	-	-	X	X	-	X	-	X	-	X	-	X	X	-	X	X	-	-	-	X	-	-	X	-

Appendix C: List of Plant Species Observed During the 2016 Spring and Summer Field Surveys

<i>Scientific Name</i>	Common Name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24
<i>Salicornia rubra</i>	red samphire	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Sanicula marilandica</i>	black sanicle	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Sarracenia purpurea</i>	pitcher plant	-	-	-	X	-	-	-	X	-	X	X	X	X	-	X	-	-	-	-	-	-	-	X	-
<i>Scutellaria galericulata</i>	marsh skullcap	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Sisyrinchium montanum</i>	common blue-eyed grass	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
<i>Solidago canadensis</i>	canada goldenrod	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Solidago graminifolia</i>	flat top goldenrod	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Solidago rigida</i>	stiff goldenrod	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-
<i>Sonchus arvensis</i>	perennial sow thistle	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-
<i>Stellaria calycantha</i>	northern stitchwort	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Symphyotrichum ericoides</i>	many-flowered aster	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-
<i>Symphyotrichum laeve</i>	smooth blue aster	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
<i>Taraxacum officinale</i>	common dandelion	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	X
<i>Thalictrum dasycarpum</i>	tall meadow rue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
<i>Trientalis borealis</i>	northern star flower	-	X	-	-	-	-	-	-	-	X	X	X	-	-	X	-	X	X	-	X	-	-	X	-
<i>Typha latifolia</i>	common cattail	X	-	-	X	X	X	X		X	-	-	-	-	-	-	X	-	-	X	X	X	-	-	X
<i>Vicia americana</i>	american vetch	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Viola palustris</i>	marsh violet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X	-

