

**MANITOBA-MINNESOTA TRANSMISSION PROJECT
BOTANICAL AND VEGETATION ENVIRONMENTAL MONITORING**

ANNUAL TECHNICAL REPORT – Year II

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SENSITIVE DATA REDACTED

SUMMARY

Botanical and vegetation resources were assessed in Year II post-construction environmental monitoring. Surveys were completed for wetlands, traditional use plant species, and golden-winged warbler habitat, each with botanical summaries presented. Invasive plant species and species of conservation concern were recorded where observed. The accuracy of effect predictions and the effectiveness of mitigation are discussed.

Sixteen wetland sites were re-visited for vegetation monitoring. These sites reflect the diversity of wetlands found in the region, from species poor sedge meadows to herb and shrub rich wetlands, with tall shrub canopies originally present. Species cover across all sites ranged from 26 to 98% vegetation cover, recorded from the herb and low shrub stratum. Vegetation cover in this layer is significantly greater in 2021 than monitoring in 2020 ($p < 0.04$). Average species richness increased slightly to 20.1 from 18.6 last season. Construction of the transmission line does not appear to decrease any diversity measures in the vegetation canopy, outside the removal of woody growth from upper canopies where originally found. Three community types were identified, distinguished by species composition, abundance and structure. Since pre-construction, the community types have remained consistent. The presence of soil disturbance along the RoW continues to be infrequent in wetland sites. Wetland distribution and function remained unchanged at monitoring sites as a result of the project. No project related wetland loss was observed along the RoW during monitoring in 2021.

Eleven sites were re-visited to sample traditional use plant species. These sites supported total traditional plant cover recorded from all strata. Total species cover for vegetation surveys ranged from 23 to 116% in the herb and low shrub stratum, with an average of 33 species in plots. Both, the mean diversity measure and evenness value were high for all sites with 2.7 and 0.76, respectively. The cover and richness in the lower vegetation canopies has increased between this year and last year's post-construction growth. Vegetation cover and diversity measures of the understory however have remained comparable between pre-construction and monitoring years ($p > 0.05$). Two community types were identified based on species assemblages and cover. Abundant traditional use plant species were recorded this season with a total of 58 species observed during all surveys, including four trees, 20 shrubs and 34 herbs. Species with a frequency of occurrence (45% or greater) among traditional use plots included wild rose, red-osier dogwood, wild red raspberry, common dandelion, smooth wild strawberry, trailing dewberry, and two-leaved Solomon's-seal.

Thirteen sites were re-visited to monitor golden-winged warbler habitat that intersects the FPR RoW. There is a general increase in cover and richness in the lower vegetation

canopies between this year and last year's post-construction growth. This season, mean species cover in sites ranged from 32 to 90% in the herb and low shrub layer, with an average richness of 34 species recorded. Mean diversity and evenness were relatively high for all sites, with 2.8 and 0.8 respectively. Average cover in the tall shrub layer was 6%, ranging from 0.2 to 14%, with a mean richness of 2.6 species recorded. Common species recorded in the tall shrub stratum included balsam poplar, bur oak, red-osier dogwood, trembling aspen, and willows. Although the mid-canopy layer is regenerating post-construction, species cover, richness and diversity measures remain significantly lower ($p \leq 0.01$) than baseline measures. Tree canopy cover was generally absent from GWW sites. Three community types were identified based on degree of regeneration, vegetation structure and cover, and species assemblages at sites.

Forty-two noxious, invasive or non-invasive SNA species were recorded along the RoW throughout vegetation monitoring this season. Of these, 18 species are listed in the Manitoba Noxious Weed Act as noxious weeds harmful to livestock or agricultural crops. Four notable Tier 2 noxious species recorded were hoary alyssum, ox-eye daisy, common tansy, and scentless false mayweed. At least 11 species are considered invasive (not listed noxious) due to their tendency to outcompete native species, and dominate habitats once introduced. Over time, there is a general increase in noxious, invasive and non-native species recorded in surveys from pre-construction through Year I and II of monitoring.

During sampling this season, 28 species of conservation concern were recorded in plots and as incidentals from sampling, throughout the RoW. Among these, seven are ranked Critically Imperilled (S1-S1S2) or Imperilled (S2-S2S3), with the remaining 21 species ranked Vulnerable (S3 to S3S5). One species at risk was observed during project monitoring. Riddell's goldenrod is listed as Threatened under the Manitoba's *Endangered Species and Ecosystems Act* and Special Concern by the federal *Species at Risk Act* and the Committee on the Status of Endangered Wildlife in Canada. Black ash also recorded, is designated Threatened by the Committee on the Status of Endangered Wildlife in Canada.

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1.0 INTRODUCTION

On April 4 2019, the Minister of Sustainable Development granted an Environment Act Licence (Class 3 No. 3288) to Manitoba Hydro for the construction, operation, and decommissioning of the Manitoba-Minnesota Transmission Project. On June 13 2019, a Certificate of Public Convenience and Necessity was obtained from the National Energy Board (EC-059). Clearing and construction for the Project began in the fall of 2019 and was completed during the spring of 2020. In the summer of 2021, botanical and vegetation resources were assessed in Year II of environmental monitoring for the Manitoba-Minnesota Transmission Project.

The Manitoba-Minnesota Transmission Project is a new high voltage alternating current (AC) transmission project required to deliver contracted quantities of power to and from the United States. It will improve reliability through an increase in capacity during drought and emergency situations, and increase Manitoba Hydro's involvement in the electricity markets in the United States (Manitoba Hydro 2015). The Manitoba-Minnesota Transmission Project involved construction of a 500-kilovolt AC transmission line in southeastern Manitoba and upgrades to associated converter stations at Dorsey, Riel and Glenboro. The transmission line starts at the Dorsey Converter Station (located near Rosser, northwest of Winnipeg) and travels south around Winnipeg and passes near the Riel Station, east of the city (Southern Loop corridor). The line continues south to the Manitoba-Minnesota border and connects to the Great Northern Transmission Line (Map 1-1, Appendix II).

The Manitoba-Minnesota Transmission Project occurs over four ecoregions including (from west to east) the Aspen Parkland, Lake Manitoba Plain, Interlake Plain, and Lake of the Woods. The Glenboro South Station is the only project component located in the Aspen Parkland Ecoregion. The Project traverses developed land, agricultural land, and native vegetation including deciduous forest, coniferous forest, mixedwoods, shrubland, grassland, and wetlands. All four ecoregions are heavily influenced by agricultural activities.

This assessment involved environmental monitoring along the final preferred route right-of-way (RoW). Potential environmental effects as a result of the Project are listed in Appendix III, which were identified in the Manitoba-Minnesota Transmission Project Environmental Impact Statement (Assessment of Potential Environmental Effects on Vegetation and Wetlands, Chapter 10; Manitoba Hydro 2015). Project commitments for environmental monitoring of botanical and vegetation resources are identified in Appendix IV. The specific objectives established for this study, based on the Environmental Monitoring Plan (Manitoba Hydro 2019a), and review of the Report on Public Hearing

(Manitoba Clean Environment Commission 2017), Environment Act Licence, and National Energy Board Certificate, were as follows:

- Conduct environmental monitoring of wetlands;
- Conduct environmental monitoring of traditional use plant species;
- Conduct environmental monitoring of golden-winged warbler habitat;
- Conduct environmental monitoring for invasive and noxious plant species; and
- Conduct environmental monitoring of species of conservation concern.

The following hypotheses were developed for environmental monitoring of botanical and vegetation resources for the MMTP project:

Hypothesis 1: *There are observed differences in species composition within sites being monitored over successive years along the transmission line right-of-way.*

Hypothesis 2: *Invasive and non-native species abundance is related to transmission line clearing and construction activities along the right-of-way.*

2.0 BACKGROUND

The following section discusses the environmental monitoring background for wetlands, traditional use plant species, invasive plant species, golden-winged warbler habitat, and plant species of conservation concern.

2.1 Wetlands

Wetlands perform many important functions which include water storage, flood control, ground water recharge, sediment trapping, shoreline protection, nutrient cycling and carbon sequestration. Wetlands also provide valuable habitat for wildlife and plant species, and may support species of conservation concern. Wetland conservation is a priority under The Federal Policy on Wetland Conservation (Government of Canada 1991).

Wetland function includes three major components: habitat, hydrological and biogeochemical function (Halsey et al. 1997, Hanson et al. 2008). Wetland alteration can result in a loss of wetland function. Threats to wetlands include drainage, erosion and degradation, lowered water tables, increased run-off, and reduced plant productivity of adjacent areas.

Large intact wetlands are present in the Local Assessment Area (LAA) in addition to smaller degraded wetlands in cultivated areas. As described in Chapter 10 of the EIS, the Project LAA intersects approximately 1884 ha of wetlands, of which 56 ha are within the Project Development Area (PDA). Wetland classes occurring along the PDA include bog, fen, swamp, marsh, and shallow open water. Main effects to wetlands as a result of the project include site disturbance or loss of plants from construction, maintenance and decommissioning activities. To validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, post-construction monitoring will identify any changes to wetland area affected, and species composition and abundance. Monitoring activities for wetlands are identified in Table 2-1.

Mitigation measures identified in the Construction Environmental Protection Plan

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction matting will be used to protect the area from rutting and exposure to mineral soil during non-frozen ground conditions.
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site.
- Maintain shrub and herbaceous vegetation to the extent possible.
- The application of herbicide is prohibited.
- Refer to Clearing Management Plan for clearing prescription.

Table 2-1. Monitoring activities for wetlands.

Phase	Task Description	Environmental Indicator	Site Location	Duration	Frequency	Timing	Measurable Parameter
Baseline Information	Wetland desktop and field surveys	Wetland classification	74 sites surveyed in PDA, LAA	1 field season	Once	2014	Wetland class (bog, marsh, swamp, shallow open water)
Pre-construction	Ground surveys to confirm location and record baseline wetland information	Area of wetland intersected by the project, vegetation cover	PDA	Pre-construction	Once	Summer	Wetland class, species composition and abundance
Construction	Ground surveys to identify wetland changes not discernible from habitat mapping and to monitor wetland protection measures	Area of wetland affected by the project, vegetation cover	PDA	During construction	Annual	Summer	Wetland class, species composition and abundance
Post-construction	Ground surveys to identify wetland changes not discernible from habitat mapping	Area of wetland affected by the project, vegetation cover	PDA	2 yrs	Annual	Summer	Area affected (ha); species composition and abundance

2.2 Traditional Use Plant Species

As outlined in Chapter 11 of the EIS, a change in traditional plant species abundance and distribution is a concern to First Nations and Metis. Plants and plant communities have been identified as being particularly important to First Nations and Metis. These areas are valued for their provision of resources used by First Nations and Metis including gathering of food and medicines and harvesting plants and trees.

Several traditional use plant sites were visited during pre-construction surveys to validate sites and sample vegetation along the final preferred route. General harvesting areas were identified in traditional use reports. A total of 61 traditional use plants were observed during all surveys in 2017, with 44 of these species recorded in surveys only for traditional use plants (Szwaluk Environmental Consulting and Newman 2017). Aboriginal Traditional Knowledge (ATK) reports were submitted by Black River First Nation, Swan Lake First Nation, Long Plain First Nation, Peguis First Nation, Dakota Plains Wahpeton Oyate, Roseau River Anishinabe First Nation, Sagkeeng First Nation and the Manitoba Metis Federation (MMF).

To validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, post-construction monitoring will identify changes in composition and abundance of traditional use plant species. Monitoring activities for areas of traditional use plant species are identified in Table 2-2.

Mitigation measures identified in the Construction Environmental Protection Plan

- Construction matting will be used along access trail to protect the area from rutting and exposure of soil during saturated soil conditions.
- Use existing access roads and trails to the extent possible.
- Refer to Clearing Management Plan for clearing prescription.
- Confine vehicle traffic to established trails to the extent possible.
- In the event of ground disturbance refer to Rehabilitation and Invasive Species Management Plan for mitigation.

Table 2-2. Monitoring activities for traditional use plant species.

Phase	Task Description	Environmental Indicator	Site Location	Duration	Frequency	Timing	Measurable Parameter
Baseline Information	Desktop, field surveys and ATK reports	Species names and locations	Sites identified in PDA, LAA	1 field season	Once	2014	Species composition and abundance
Pre-construction	Ground surveys to identify traditional use plant species	Species occurrence	PDA	Pre-construction	Once	Summer	Species composition and abundance
Construction	Ground surveys to confirm traditional use plant species presence and monitor protection measures	Species occurrence	ESS	During construction	Annual	Summer	Species composition and abundance
Post-construction	Ground surveys to confirm traditional use plant species presence	Species occurrence	ESS	2 yrs	Annual	Summer	Species composition and abundance

2.3 Invasive Plant Species

As outlined in Chapter 10 of the EIS, the prevalence of non-native and invasive plant species (including noxious species) may increase as a result of the Project. Non-native species are plants that grow outside of their normal range while invasive species are plants that out-compete native species when introduced outside of their natural setting. Noxious species have the ability to spread rapidly and are designated by regulation, *The Noxious Weeds Act* (Manitoba Government 2020).

Construction equipment and vehicles can introduce non-native and invasive plants. During the field assessments in 2014, 10 noxious species were observed in the PDA (Manitoba Hydro 2015). About half of the species were encountered in areas of disturbance (i.e., cleared areas, gravel pits, roads, ATV trail edges) or near agricultural fields (cultivated and pasture). During pre-construction surveys for ATK, WET (2017) and GWW (2019), there

were seven noxious speices (all Tier 3) recorded, with a total of 16 noxious, invasive or non-native species in these components. In Year II of monitoring there are 16 noxious species recorded, with a total of 40 noxious, invasive or non-native species recorded in ATK, GWW and WET surveys.

Non-native and invasive species can be problematic by displacing or outcompeting native species through several mechanisms. Non-native and invasive species can grow vigorously under a wide range of climatic and soil conditions, they are often early colonizers after disturbance, and plants persist even with removal of vegetative portions. Seed production is generally abundant and can occur under conditions otherwise adverse for native plants. The seeds of many invasive and non-native plants are easily disseminated and can be long lived in the seed bank.

To validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, post-construction monitoring will identify changes in species composition and abundance. Monitoring activities for invasive plant species are identified in Table 2-3.

Mitigation measures identified in the Construction Environmental Protection Plan

- Implement Biosecurity cleaning measures as per the Biosecurity Management Plan (for Tier 1 Noxious Weeds).
- Confine vehicle traffic to established trails to the extent possible.
- In the event of ground disturbance refer to Rehabilitation and Invasive Species Management Plan for mitigation.

Table 2-3. Monitoring activities for invasive plant species.							
Phase	Task Description	Environmental Indicator	Site Location	Duration	Frequency	Timing	Measurable Parameter
Baseline Information	Desktop and field surveys	Species names and locations	Sites surveyed in PDA, LAA	1 field season	Once	2014	Species composition and abundance
Pre-construction	Ground surveys to record non-native and invasive species	Species occurrence	PDA	Pre-construction	Once	Summer	Species composition and abundance

Construction	Ground surveys to identify and measure occurrence of invasive species on ROW and monitor protection measures	Species occurrence	PDA	During construction	Annual	Summer	Species composition and abundance
Post-construction	Ground surveys to identify and measure occurrence of invasive species on ROW	Species occurrence	PDA	1yr	Annual	Summer	Species composition and abundance

2.4 Golden-winged Warbler Habitat

The Golden-winged warbler (*Vermivora chrysoptera*) is a species of conservation concern listed as Threatened by *The Endangered Species and Ecosystems Act* (ESEA) in Manitoba, the federal *Species at Risk Act* (SARA), and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). In Manitoba, the golden-winged warbler is ranked as uncommon throughout its range or in the province, with breeding status (S2S3B), by the Manitoba Conservation Data Centre (MBCDC). The golden-winged warbler is a ground-nesting songbird that breeds in shrubby habitats adjacent to mature stands of deciduous and mixedwood forest. It uses forest edge habitat and openings containing shrubs and grasses. Habitat is often regenerated by natural and human disturbances, including hydroelectric utility corridors, which can be preferred habitat for this species if corridors are maintained in a manner that retains shrubs and herbs along forest edges (Environment and Climate Change Canada 2016).

Golden-winged warblers were identified as a species requiring careful consideration due to their Threatened designation, and the identification of critical habitat along a portion of the Project area. As outlined in the environmental assessment, Manitoba Hydro carried out detailed studies on the breeding locations, habitat preferences, and species biology in preparing the Construction Environmental Protection Plan and Environmental Monitoring Plan. Thirteen sites were surveyed for golden-winged warbler habitat along the final preferred route during pre-construction surveys (Szwaluk Environmental Consulting and Newman 2019).

Clearing of the RoW is the primary project activity that may result in a change in habitat for the golden-winged warbler. In recognition of this, Manitoba Hydro has developed a Right-of-Way Habitat Management Plan for Managing Critical Golden-winged Warbler Habitat during Construction and Operation of the Manitoba-Minnesota Transmission Project (Environment Canada IR EC/MH-003). To validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, post-construction monitoring will identify changes to golden-winged warbler habitat. Monitoring activities for golden-winged warbler habitat are identified in Table 2-4.

Mitigation measures identified in the Construction Environmental Protection Plan

- Refer to Clearing Management Plan for detailed clearing prescriptions.
- Retain shrubs and herbaceous vegetation <4m tall to the extent possible.
- Typically, 5-10 perch trees must be retained per span where feasible.

Table 2-4. Monitoring activities for golden-winged warbler habitat.

Phase	Task Description	Environmental Indicator	Site Location	Duration	Frequency	Timing	Measurable Parameter
Baseline Information	Desktop and field surveys	Habitat location	Identified in PDA, LAA, RAA	1 field season	Once	2014	Habitat composition; auditory or visual detection
Pre-construction	Analyze imagery to confirm location and record baseline vegetation information	Vegetation cover	PDA	Pre-construction	Once	Summer	Species composition and abundance
Construction	Ground surveys to identify vegetation changes not discernible from habitat mapping	Vegetation cover	PDA	During construction	Annual	Summer	Species composition and abundance
Post-construction	Ground surveys to identify vegetation changes not discernible from habitat mapping	Vegetation cover	PDA	2yrs	Annual	Summer	Species composition and abundance

2.5 Plant Species of Conservation Concern

Species of conservation concern include species of plants that are protected under *The Endangered Species and Ecosystems Act* (ESEA) in Manitoba, the federal *Species at Risk Act* (SARA), The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or are listed by the Manitoba Conservation Data Centre (MBCDC) as plants that are Critically Imperilled to Vulnerable. These species generally exist in low numbers and/or have limited distributions, however they play an important role in helping to preserve species diversity.

As described in Chapter 10 of the EIS, two plant species of conservation concern were previously known to occur (three historical locations) along the Project Development Area (PDA); six species were known to occur along the LAA (at 15 locations) and 62 species occurred along the Regional Assessment Area (RAA) (MBCDC records). No historical occurrences of protected plants are known to occur within the Project PDA or LAA. Protected species have historical occurrences within the RAA.

Field assessments in 2014 identified three species of conservation concern in the PDA (Manitoba Hydro 2015). During pre-construction surveys, a total of 37 species of conservation concern were recorded along the final preferred route (Szwaluk Environmental Consulting and Newman 2017). None of these species are listed under ESEA or SARA. Black ash (*Fraxinus nigra*) is designated as Threatened by COSEWIC.

Construction activities can potentially negatively affect plant species of conservation concern through the use of heavy equipment (crushing plants) and from clearing and grubbing (removal of roots) of vegetation. Herbicide use during maintenance activities can also negatively affect desirable species. To validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, post-construction monitoring will identify any impact to plant species of conservation concern. Monitoring activities for species of conservation concern are identified in Table 2-5.

Mitigation measures identified in the Construction Environmental Protection Plan

- Identify and flag prior to start of work.
- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion.
- Provide 10m vegetated (shrub and herbaceous) buffer around site.
- Confine vehicle traffic to established trails to the extent possible.
- Construction matting will be used along access trail to protect the area from rutting and exposure of soil during saturated soil conditions.

- Use existing access roads and trails to the extent possible.
- Refer to Clearing Management Plan for clearing prescription.
- In the event of ground disturbance refer to Rehabilitation and Invasive Species Management Plan for mitigation.
- Pre-construction surveys may be conducted to confirm presence of Species of Concern.

Table 2-5. Monitoring activities for species of conservation concern.

Phase	Task Description	Environmental Indicator	Site Location	Duration	Frequency	Timing	Measurable Parameter
Baseline Information	Desktop, key person interviews and field surveys	Species names and locations	95 sites surveyed in PDA, LAA	1 field season	Once	2014	Species presence/absence
Pre-construction	Ground surveys to record species of concern	Species occurrence	PDA	Pre-construction	Once	Summer	Species presence/absence
Construction	Ground surveys to monitor species of concern and protection measures	Species occurrence	ESS	During construction	Annual	Summer	Species presence/absence
Post-construction	Ground surveys to monitor species of concern	Species occurrence	ESS	1yr	Annual	Summer	Species presence/absence

3.0 METHODS

The methods used to assess the botanical and vegetation resources can be divided into three general groups, those used for: i) project review and site selection; ii) environmental monitoring; and iii) data preparation and analyses. The following sections summarize the specific techniques used in each of these three groups.

3.1 Project Review and Sample Site Selection

Biophysical information collected and prepared for the Manitoba-Minnesota Transmission Project with relevance to pre-construction surveys and subsequent environmental monitoring was reviewed prior to fieldwork. Applicable documents included the Environmental Impact Statement (Manitoba Hydro 2015), Environmental Monitoring Plan (Manitoba Hydro 2019a), Construction Environmental Protection Plan (Manitoba Hydro 2019b) and Mapbook (Manitoba Hydro 2020a), Botanical and Vegetation Pre-construction Surveys (Szwaluk Environmental Consulting and Newman 2017 and 2019), the Invasive Plant Pre-construction Survey (Szwaluk Environmental Consulting 2018), and the Botanical and Vegetation Environmental Monitoring Technical Report (Szwaluk Environmental Consulting and Newman 2020). Pre-construction and environmental monitoring requirements for vegetation are specified in the Environmental Monitoring Plan (Manitoba Hydro 2019a). Regulatory documents were also reviewed to determine environmental monitoring requirements for vegetation (see Appendix IV).

To select preliminary pre-construction and environmental monitoring sites for the Project, the Environmental Protection Information Management System (EPIMS) Map Viewer was used to view project footprint imagery (pre-clearing digital ortho-rectified imagery). EPIMS Map Viewer imagery provides information on land use, environmentally sensitive sites, and the Manitoba land cover classification. Eighteen cover classes are identified, with broad vegetation classes including coniferous, deciduous and mixedwood forest, wetland and grassland.

Suitable sites were selected based on vegetation type, accessibility, disturbance (i.e., sites where invasive and non-native species may establish and proliferate), and landowner permission. Manitoba Hydro contacted landowners for access permission to sites selected on private lands. In 2021, previously surveyed sites (2017 through 2020) were reviewed to determine their location with reference to the final preferred route (FPR) RoW. Field maps (1:10,000) were provided by Manitoba Hydro prior to fieldwork (Construction Environmental Protection Mapbook; Manitoba Hydro 2020a).

Valued components of the biophysical environment to sample and monitor for the Manitoba-Minnesota Transmission Project included vegetation and wetlands.

Environmental indicators were identified based on regulatory, environmental and cultural importance, identified through the environmental assessment process and preparation of the monitoring plan. Indicators included wetlands, traditional use plant species, invasive plant species, golden-winged warbler habitat, and plant species of conservation concern.

3.2 Environmental Monitoring

Post-construction environmental monitoring began in 2020 after clearing and construction activities were completed. This season (2021) represents Year II of post-construction monitoring. Pre-construction surveys for the project were conducted in 2017 (ATK, WET, INV, Roadside INV, SCC, PRA, preliminary GWW), 2018 (borrow areas off-RoW) and 2019 (baseline GWW).

Environmental monitoring involved native vegetation surveys (quantitative) in selected habitats along the FPR. In 2021, environmental monitoring included sites for wetlands (WET), golden-winged warbler habitat (GWW), and traditional use plant species (ATK). The monitoring schedule for invasive plant species and plant species of conservation concern from pre-construction through one-year post-construction was completed in 2020. No further targeted monitoring for these components occurred in 2021 with the exception of three site visits on the FPR to assess invasive plant species composition and distribution.

3.2.1 Native Vegetation Survey

Sites previously selected for native vegetation surveys were used for continued monitoring of wetlands, traditional use plant species, and golden-winged warbler habitat. The native vegetation survey consisted of establishing sample plots on sites with relatively homogenous vegetation. Vegetation was sampled for composition, abundance and structure.

Sampling of selected sites followed methods outlined by Redburn and Strong (2008) and involved the establishment of five 1 m² quadrats nested within 2.5 m² quadrats to sample herbs and low shrubs (≤ 1 m) and tall shrubs and saplings (>1 - 2.5 m), respectively. Quadrats were spaced at 5 m increments along a 30 m transect, starting at the 5 m mark. The composition of vegetation cover >2.5 m tall was estimated using a 20 m by 30 m plot centered on each transect. Plant cover was estimated to the nearest 1% for species $<15\%$ cover and nearest 5% for those with higher cover. Other incidentally observed species were recorded. Ground cover estimates (percent) were recorded and included inanimate cover of exposed soil, litter, rock, water and wood. Site condition measurements included percent slope and aspect. Plot locations were marked at the beginning of each transect with GPS coordinates, and staked with a 30 cm section of conduit pipe driven into the ground with a pin flag inserted.

3.2.2 Conservation Status Ranking

Species of conservation concern encompass plants tracked by the Manitoba Conservation Data Centre (MBCDC), and include those listed provincially under Manitoba's *Endangered Species and Ecosystems Act* (ESEA), or federally under the *Species at Risk Act* (SARA) or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Species are ranked provincially by the MBCDC according to a standardized procedure used by Conservation Data Centres and Natural Heritage Programs in North America on a five-point scale from Critically Imperilled to Secure. Listed below are definitions for interpreting conservation status ranks at the subnational or provincial (S) level. Ranks may also be intermediary between levels.

CRITICALLY IMPERILLED (S1): At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.

IMPERILLED (S2): At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

VULNERABLE (S3): At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

APPARENTLY SECURE (S4): At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

SECURE (S5): At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.

Under ESEA, SARA and COSEWIC, species are designated into the following categories: Endangered, Threatened, Extirpated, and Special Concern (See Appendix I).

Environmental monitoring for species of conservation concern was completed in 2020, one-year post-construction.

3.2.3 Invasive Plant Monitoring

Surveys for invasive plant species occurred at three select locations along the FPR to monitor species composition and distribution. Weed density distribution (Appendix V) followed Adams et al. (2009). At each location, the site site was traversed by foot and

scanned for invasive species problems. Environmental monitoring for all other invasive plant species sites was completed in 2020, one-year post-construction.

3.3 Data Preparation and Analyses

All vascular plants were recorded and voucher specimens were collected for those unidentifiable in the field, where the population size permits. Specimens were collected following guidelines of the Alberta Native Plant Council (2006). Identification of vascular plants followed Flora of North America (1993+), and other flora as needed. Plant nomenclature followed the Manitoba Conservation Data Centre (MBCDC 2020a).

Upon completion of field sampling, the data was digitized and verified for accuracy. For each plot with quantitative sampling, mean values for vegetation percent cover were calculated in plots for tree and tall shrub strata, herb and low shrub understory, the non-vascular stratum, as well as inanimate ground cover.

Total species cover (summed % plant cover) and species richness (actual number of species present) were determined for each plot. Species diversity was calculated using the Shannon diversity index, which combines species richness with relative abundance. Equitability was calculated to determine the evenness of species in their distribution within the site.

The Shannon diversity index (1) and equitability (2) are calculated as shown below. The diversity index values fall generally between 1.5 (i.e., low diversity) and 3.5 (Kent and Coker 1996, p97). The equitability (or evenness) value, with an upper limit of 1, is a measure of whether species abundance in a community is evenly distributed.

$$(1) \quad \text{Diversity } H' = -\sum_{i=1}^s p_i \ln p_i$$

where s = the number of species

p_i = the proportion of individuals or the abundance of the i th species expressed as a proportion of total cover

\ln = log base _{e}

$$(2) \quad \text{Equitability } J = \frac{H'}{H'_{\max}} = \frac{\sum_{i=1}^s p_i \ln p_i}{\ln s}$$

where s = the number of species

p_i = the proportion of individuals of the i th species or the abundance of the i th species expressed as a proportion of total cover

\ln = log base _{e}

Although recent research suggests that H' is becoming an expected standard for assessing biological diversity, Strong (2016) suggests that this measure be accompanied by independent analyses of richness and evenness to ensure proper representation of abundance data in ecology.

Wilcoxon tests were used to determine if significant ($P \leq 0.05$) differences occurred between paired sets of samples.

Sites were described by classifying community types based on plant species composition and abundance using hierarchical cluster analysis. Ward's method was used as the clustering algorithm, with squared Euclidean distance as the dissimilarity measure. Where vegetation community types are listed, naming was based on their structure and species dominance by stratum. Species separated by a slash (/) indicates a change in stratum, while co-dominant species are separated by a dash (-) indicating similar abundance within the stratum. Stand cover followed categories identified in The Canadian Vegetation Classification System (Strong et al. 1990) and included closed (>60%), open (>25-60%), and sparse ($\leq 25\%$).

Statistical analyses were performed using the R Statistical Package (R Core Team 2019). Cluster analyses followed (Maechler et al. 2019) in the R Statistical Package. Diversity and evenness measures were calculated in Excel.

4.0 RESULTS

The following section discusses the results for the environmental indicators monitored, including wetlands (WET), traditional use plant species (ATK), and golden-winged warbler habitat (GWW). Although monitoring for invasive plant species (INV) and species of conservation concern (SCC) was completed in 2020, species presence was recorded project wide where observed.

The botanical summary for sites sampled by quantitative survey includes total species cover, species richness, species diversity index, and species evenness. The complete flora is provided in Appendix VIII, with at least 302 plant species across 66 families, recorded in 2021. Throughout results, plants are referred to by English name, with scientific name included on first mention. The accuracy of effect predictions and the effectiveness of mitigation for sites are also presented.

4.1 Wetlands

Sixteen wetland (WET) sites were sampled between July 18 to 21 for post-construction monitoring (Map 4-1, Appendix II) (Field Activity ID MMTP_CON_FA561). These sites reflect the diversity of wetlands found in the region, from species poor sedge meadows to herb and shrub rich wetlands with tall shrub canopies present.

4.1.1 Data Analysis of Wetlands

Diversity measures from wetland monitoring are presented in detail for the current year, and means are compared between pre-construction and subsequent monitoring years. Vegetation descriptions are provided for the lowest canopy (<1m) and the mid canopy (>1 to 2.5m, where present) in Table 4-1a. No tree canopy vegetation is present in wetland sites. In 2021, across all sites, species cover ranged from 26 to 98% vegetation cover, recorded from the herb and low shrub stratum, sites ranging from species poor (7 species) to rich (40 species). Species diversity in wetlands ranged from low (0.50) to moderately high (2.63), with wide ranging species evenness at sites, from 0.26 to 0.79. Sites with a low evenness are generally sites with only a few species that dominate, and they also tend to be species poor. Sites with higher evenness values showed less domination of any one species (a more even occurrence of species). Both the cover and richness in the herb and low shrub canopy have increased between this year and last year's post-construction growth.

Table 4-1a. Vegetation measures for species cover, richness, diversity and evenness in wetland monitoring sites, 2021.

Sites	Herb and Low Shrub Canopy				Tall Shrub Canopy			
	Cover	Richness	Div.	Even.	Cover	Richness	Div.	Even.
WET-120	97.6	26	2.29	0.70	14.8	5	0.51	0.32
WET-121	86.8	20	1.78	0.59	1.4	1	0.07	-
WET-123	92.0	19	1.77	0.60	0.4	1	0.02	-
WET-125	65.6	29	2.02	0.60	0.0	-	-	-
WET-137	98.2	23	1.84	0.59	0.0	-	-	-
WET-139	80.6	40	2.34	0.63	0.0	-	-	-
WET-141	26.0	14	2.09	0.79	0.0	-	-	-
WET-142	36.6	15	1.77	0.65	0.2	1	0.03	-
WET-186	38.0	7	0.69	0.35	0.0	-	-	-
WET-188	60.0	10	1.70	0.74	0.4	2	0.04	0.05
WET-194	32.2	12	1.89	0.76	0.0	-	-	-
WET-197	44.4	14	1.43	0.54	0.0	-	-	-
WET-199	29.2	7	0.50	0.26	0.0	-	-	-
WET-200	56.0	26	1.97	0.60	5.0	2	0.26	0.38
WET-201	61.0	32	2.61	0.75	0.0	-	-	-
WET-209	62.8	28	2.63	0.79	2.2	3	0.14	0.13
Mean 2021	60.4	20.1	1.83	0.62	1.5	2.1	0.15	0.22

Vegetation cover in the herb and low shrub layer is significantly greater in 2021 than both pre-construction ($p=0.001$) and monitoring in 2020 ($p<0.04$), Table 4-1b. Understory vegetation cover in successive years is likely to fluctuate depending on climatic conditions and water levels. In monitoring of wetland sites, construction of the transmission line does not appear to decrease any diversity measure in the vegetation canopy, outside the removal of woody growth from upper canopies where originally found. Despite a numerical reduction in mid-canopy species measures in 2021 as compared to those from pre-construction surveys, this year's values are not significantly different from baseline data (all p values >0.4).

Table 4-1b. Mean vegetation measures in herb and low shrub understory and tall shrub mid-canopy, in wetland sites during pre-construction (2017) and monitoring (2020 and 2021).

	Pre-constr.	Monitoring	
	2017	2020	2021
UNDERSTORY			
Understory Cover (%)	29.1	46.9	60.4
Species Richness	17.5	18.6	20.1
Diversity	1.86	1.75	1.83
Evenness	0.68	0.61	0.62
MID-CANOPY Tall Shrubs			
Tall Shrub Cover (%)	4.0	0.8	1.5
Species Richness	3.1	2.0	2.1
Diversity	0.25	1.31	0.15
Evenness	0.24	0.81	0.22
Number of Surveys	16	16	16

4.1.1.1 Cluster Analysis and Community Typing

The sixteen wetland surveys sampled are presented here by vegetation communities, described through hierarchical cluster analyses. All sites are sedge wetlands but are categorized into three community types (Table 4-1c), based on species assemblages and cover. Since pre-construction, the resultant community types have remained consistent, aside from removal of the sparse woody mid-canopy growth, where originally present. All sites are similar in terms of the inanimate ground covers; litter is high through all wetlands, bare soil is negligible and very occasional, woody debris is low and occasional. Standing water this year is much reduced due to the dryness of the 2021 season.

Table 4-1c. Community types for wetland surveys on the RoW, 2021.

Community Type	Sites	Species, total	Species, mean
Woolly Sedge Meadow –Marsh Reedgrass – Willows and Dwarf Birch seedlings	4	78	30.0
Hairy-fruited Sedge Meadow- Species Poor	5	33	10.8
Beaked Sedge –Mixed Graminoid or Cattail Meadow	7	107	23.1

Woolly Sedge Meadow –Marsh Reedgrass –Willow and Dwarf Birch seedlings

Four sites are characterized as woolly sedge (*Carex pellita*) communities. These sedge meadows are generally species (forb) rich, with approximately 28 species unique to this group of sites. Woolly sedge is dominant (35% cover on average), accompanied by bluejoint reedgrass (*Calamagrostis canadensis*), and a wide diversity of forbs including Canada goldenrod (*Solidago canadensis*), boreal aster (*Symphyotrichum boreale*), and violets (*Viola* spp.). These sites have a moderate woody cover, including dwarf birch

seedlings (*Betula pumila*), with occasional willow seedlings e.g., Bebb's willow (*Salix bebbiana*) and shrubby cinquefoil (*Dasiphora fruticosa*). The mean vegetation cover in the understory is high (86%) and tall shrubs may occasionally be present as a mid canopy. Woody debris is present in only one site, while moss cover is low or absent. Bare ground cover is consistently very low.

Hairy-fruited Sedge Meadow -Species Poor

Five sites are characterized as wet meadows with a lawn of hairy-fruited sedge (*Carex lasiocarpa*). Generally wet sites, the water table was very low this year. Sites are species poor, between only 7 to 14 species are present in each site, all are wetland obligates such as swamp horsetail (*Equisetum fluviatile*), flat-leaved bladderwort (*Utricularia intermedia*) and tufted loosestrife (*Lysimachia thyrsiflora*). Grass cover is absent, and there is very little woody seedling cover in the understory. Growth in the lowest canopy is moderately low, with overall vegetation cover 40% on average, and very sparse willows or no vegetation in the tall shrub canopy. Moss cover is low, bare soil is absent, woody debris negligible and standing water very low.

Beaked Sedge –Mixed Graminoid or Cattail Meadow

Seven sites are distinguished by dominant cover of mixed sedges, prominently beaked sedge (*Carex utriculata*) and water sedge (*Carex aquatilis*), with other mixed sedges, e.g., woolly sedge or prairie sedge (*Carex prairea*) and grasses, e.g., creeping bentgrass (*Agrostis stolonifera*), reed canary grass (*Phalaris arundinaceae*), or narrow-leaved cattail (*Typha angustifolia*). In these sites, sedge and grass cover is complemented by other obligate wetland forbs, such as tufted loosestrife, water smartweed (*Persicaria amphibia*) and swamp horsetail. There is little to no woody growth in the understory, though vegetation cover is high (64%). Moss cover is moderate, cover of bare soil and standing water are negligible, and woody debris is very low.

4.1.2 Accuracy of Effect Predictions and Effectiveness of Mitigation

For the project areas previously cleared (2019/2020), the effect prediction on wetlands from the EIS (Appendix III) included the following:

- Change in wetland cover class abundance, distribution, structure and function

A predicted change in wetlands (i.e., abundance, distribution, structure and function) did not occur as a result of the project. Mitigation measures identified in the Construction Environmental Protection Plan (Manitoba Hydro 2020a) and supported by the Botanical and Vegetation Environmental Monitoring Annual Technical Report (Szwaluk Environmental Consulting and Newman 2020) were previously assessed (after clearing) at

each wetland site sampled along the RoW (Table 4-1d.). Construction activities mostly occurred on frozen ground conditions to minimize surface damage, rutting and erosion. During non-frozen ground conditions, construction matting was used to protect wetlands from rutting and soil exposure. Shrub and herbaceous vegetation were maintained where possible, and trees were removed by low-disturbance methods. Clearing buffers were identified within wetlands, generally with reduced clearing where taller woody canopies originally occurred. Flagging tape used during clearing activities was occasionally observed remaining in the field. Recommended mitigation was effective for wetlands which minimized the disturbance (i.e., rutting, exposed soils) from clearing and construction activities. In 2021, no new wetland sites were sampled. Observations recorded in the field from 2021 are provided below.

Table 4-1d. Mitigation measures assessed at sites monitored for wetlands on the RoW.
Mitigation Measure
Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction matting will be used to protect the area from rutting and exposure to mineral soil during non-frozen ground conditions.
Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site.
The application of herbicide is prohibited.
Maintain shrub and herbaceous vegetation to the extent possible.
Refer to Clearing Management Plan for clearing prescription.

This season was a warmer and drier year for sampling of wetlands. Lower water levels were observed in some wetlands while others simply had moist ground conditions, as compared to previous monitoring years. Historical weather data for the Winnipeg Region identifies increases in mean monthly (June through July) temperature (19.9, 21.4 to 22.4°C) and fluctuations in total precipitation (70.1, 70.6 to 24.8 mm), for sampling seasons 2017, 2020 and 2021, respectively (Government of Canada 2021a). Roadside wetlands were easily accessible by foot due to reduced water levels. Eight sample sites were not accessible by road and were visited by helicopter. As it was a dry year, helicopter landings were possible at most sites; two sites were drop-offs due to wet or spongy ground.

Wetlands showed relatively low disturbance in 2021. At all wetland sites sampled, herb and shrub vegetation are well established after initial RoW disturbance from clearing and construction activities (Photograph 4-1a). Secondary succession continues to develop along the equipment path.

Occasionally ATV tracks are visible along the RoW, where local landowners may make use of the RoW for short travel (e.g., WET-197, -199, and -200). Low disturbance at wetland WET-197 appeared partially due to ATV use; a livestock fence line has been noted near this spot. The vegetation disturbance along the center line apparent at WET-197 is unchanged since 2020 (Photograph 4-1b and 4-1c).

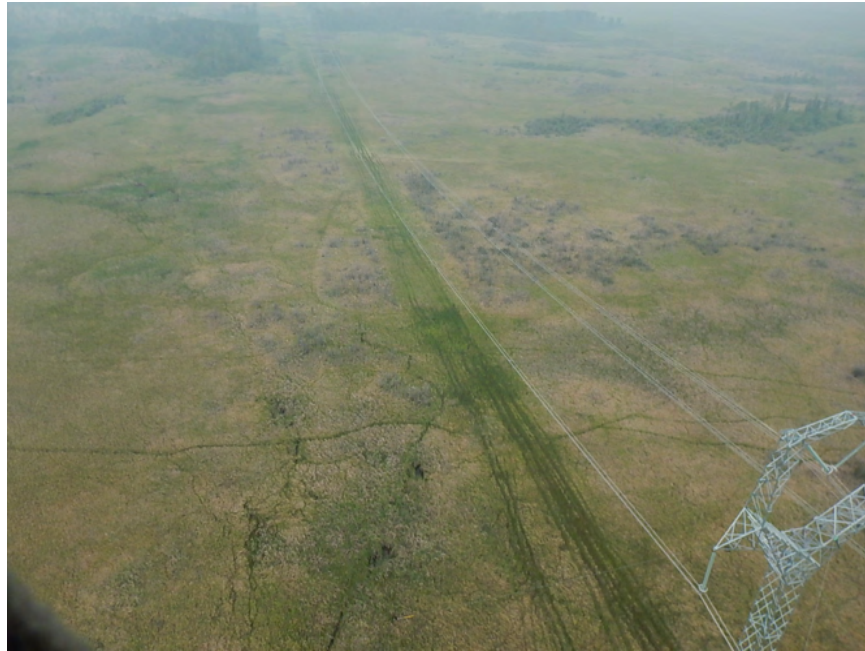


Photograph 4-1a. Wetland sample site WET-188, looking down RoW.



Photograph 4-1b and 4-1c. Continued local ATV use at WET-197. Wetland soils can be sensitive to disturbance. The same tracks remain visible in 2021 (b) that were observed in 2020 (c). Current season (2021) is very dry with water levels generally far lower in wetland sites compared to the previous year.

Photograph 4-1d shows tracks in vegetation at WET-199. Typical RoW conditions seen at other wetland sample sites (e.g., WET-141, -142, -186, -194, and -201) is shown in Photograph 4-1e. Section 4.6, identifies vegetation management at WET-123, where exposed ground was observed along the equipment path.



Photograph 4-1d. Tracks visible in vegetation on RoW, WET-199.



Photograph 4-1e. No visible disturbance to soil or vegetation in the RoW, WET-194.

Two Tier 2 noxious plant species were recorded on the RoW during surveys, ox-eye daisy (*Leucanthemum vulgare*) observed at wetland WET-139 and scentless false mayweed (*Tripleurospermum inodorum*) observed at WET-209. No noxious plants (Tier 1, 2 or 3) were observed at fly-in wetland sample sites.

The MMTP RoW was flown low level to view the wetlands (64 wetlands) and document disturbance (e.g., exposed soil, noxious species) or wetland loss. Wetlands were identified as AQUA sites in the Construction Environmental Protection Plan Mapbook (Manitoba Hydro 2020a). The flight (July 19) was completed from the eastern edge of the City of Winnipeg, to the United States border. The visibility was reduced due to the smoke from forest fires in the province and adjacent areas however all wetlands were flown and photographed (Photograph 4-1f). The presence of soil disturbance along the RoW continues to be infrequent in wetland sites. There was minimal evidence of damage to vegetation along the RoW as previously noted during sampling 2020.



Photograph 4-1f. Smoky skies from forest fires showing wetland AQUA-312 below.

During remaining surveys later in the growing season (August 8), one wetland site (WET-209) surrounding Tower 477 was observed to have been recently cultivated after vegetation sampling of the wetland three weeks prior. The adjacent land to the RoW was also recently cultivated. This area was previously identified as a swamp wetland. The change in wetland condition was a result of landowner actions and is not project related. The area of wetland loss on the RoW at this location was calculated to be approximately 2.8 ha (350 m length x 80 m width = 28,000 m²).

Remaining wetlands along the RoW appear to be in very good condition in Year II post-construction monitoring, with minimal disturbance observed. Excluding areas displaced by tower foundations, no project related wetland loss was observed along the RoW during monitoring in 2021. Wetland distribution and function remained unchanged (from pre-construction) after clearing and construction activities in Year II environmental monitoring. Minor disturbances (e.g, rutting, equipment path, etc.) in monitored wetlands are anticipated to naturally recover along the RoW, as seen in other transmission projects (Manitoba Hydro 2020b).

4.2 Traditional Use Plant Species

Eleven sites with abundant traditional use plants (ATK) were sampled for vegetation monitoring along the FPR RoW, from August 4 to 7 (Map 4-1, Appendix II) (Field Activity ID MMTP_CON_FA562). These sites supported traditional plant cover recorded from all strata (i.e., tree and tall shrub canopies, and the herb and low shrub understory) in 2017 pre-construction sampling. The total traditional plant cover in ATK sites is discussed in Section 4.2.2.

4.2.1 Data Analysis of Traditional Use Plant Species

All sites were originally forested, frequently dominated by trembling aspen (*Populus tremuloides*), with some sites variously dominated by one of balsam poplar (*Populus balsamifera*), black ash (*Fraxinus nigra*), tamarack (*Larix laricina*), eastern white cedar (*Thuja occidentalis*) or willows (*Salix* spp.). Site descriptions of species cover, richness and diversity measures for understory, and the upper canopies are found in Tables 4-2a and 4-2b, respectively.

Total mean species cover in the herb and low shrub layers from 11 ATK sites ranged widely from 23 to 116%. Sites were floristically diverse, with an average species richness of 33 species recorded in plots, ranging from 11 to 45 species. The diversity measure was relatively high for all sites, with an average of 2.7, (ranging from 2.1 to 3.4). The average evenness (0.76) was also high, (ranging from 0.63 to 0.89). The cover and richness in the lower vegetation canopies has increased between this year and last year's post-construction growth. A tall shrub canopy was present in five sites with sparse (5 to 22%) cover (ATK-165; -215; -216; -219; -220), while the remaining six sites had extremely sparse ($\leq 1\%$) to no tall shrub cover present. Occasional willow stems grew to tree canopy height (>2.5 m) in a single site, (ATK-179).

Table 4-2a. Vegetation measures in herb and low shrub layer: species cover, richness, diversity and evenness in traditional use sites, 2021.

Sites	Herb and Low shrub layer			
	Cover	Richness	Diversity	Even.
ATK-131	54.2	45	3.37	0.89
ATK-165	74.2	39	2.99	0.82
ATK-179	48.2	26	2.40	0.74
ATK-215	31.2	30	2.83	0.83
ATK-216	23.0	33	3.09	0.88
ATK-219	49.4	20	2.10	0.70
ATK-220	75.2	38	2.64	0.73
ATK-222	68.8	30	2.31	0.68
ATK-223	116.4	44	2.73	0.72
ATK-224	57.2	32	2.63	0.76
ATK-226	62.4	30	2.15	0.63
Mean 2021	60.0	33.4	2.66	0.76

Table 4-2b. Vegetation measures in tall shrub, and tree canopies: species cover, richness, diversity and evenness in traditional use sites, 2021.

Sites	Tall Shrub Canopy				Tree Canopy			
	Cover	Richness	Div.	Even.	Cover	Richness	Div.	Even.
ATK-131	0.8	2	0.07	0.10	-	-	-	-
ATK-165	6.6	4	0.33	0.24	-	-	-	-
ATK-179	1.2	1	0.09	-	1	1	0.08	-
ATK-215	10.0	3	0.50	0.45	-	-	-	-
ATK-216	12.4	1	0.33	-	-	-	-	-
ATK-219	5.0	1	0.23	-	-	-	-	-
ATK-220	22.4	3	0.57	0.52	-	-	-	-
ATK-222	0.2	1	0.02	-	-	-	-	-
ATK-223	0.0	-	-	-	-	-	-	-
ATK-224	0.4	1	0.03	-	-	-	-	-
ATK-226	0.8	2	0.06	0.09	-	-	-	-
Mean 2021	5.4	1.9	0.22	0.28	1.0	1.0	0.08	-

Total vegetation cover (all strata) was of course significantly reduced after clearing of the upper woody canopies. However, when only the understory layer is considered, vegetation cover and all diversity measures have remained comparable between pre-construction and monitoring years (all $p > 0.05$), Table 4-2c. While the tall shrub canopy is regenerating somewhat, it remains significantly reduced in cover ($p = 0.02$), richness ($p = 0.009$) and diversity ($p = 0.04$), as compared to baseline measures. Tree canopies in 2021 in the ATK sites are unchanged since the previous monitoring year, (data not shown).

Table 4-2c. Mean vegetation measures in herb and low shrub understory and tall shrub mid-canopy, in traditional use sites during pre-construction (2017) and monitoring (2020 and 2021).

	Pre-constr.	Monitoring	
	2017	2020	2021
UNDERSTORY			
Understory Cover (%)	47.6	43.2	60.0
Species Richness	27.0	31.0	33.4
Diversity	2.52	2.60	2.66
Evenness	0.77	0.76	0.76
MID-CANOPY Tall shrubs			
Tall Shrub Cover (%)	17.7	0.4	5.4
Species Richness	5.6	0.5	1.9
Diversity	0.40	0.07	0.22
Evenness	0.26	0.54	0.28
Number of Surveys	11	11	11

4.2.1.1 Cluster Analysis and Community Typing

Hierarchical cluster analyses were performed for 11 traditional use area surveys. The resulting two community types are separated based on vegetation structure and cover, and species assemblages at sites, (Table 4-2d). In the first year of post-construction monitoring, some sites were regenerated sufficiently to group into either of the two community groups.

Table 4-2d. Community types for traditional use sites, 2021.

Community Type	Surveys	Species, total	Species, mean
Willow and Dogwood seedlings – Mixed Grass and Sedge	7	132	37.8
Wild Red Raspberry— Trembling Aspen saplings / Trembling Aspen seedlings	4	76	33.3

Willow and Dogwood seedlings – Mixed Grass and Sedge

Seven sites are characterized by well-developed regeneration, with generally high vegetation cover overall (70%). The low canopy is co-dominated by graminoids, by herbaceous forbs, Canada thistle (*Cirsium arvense*), smooth wild strawberry (*Fragaria virginiana*), dewberry (*Rubus pubescens*), wood aster (*Symphyotrichum lateriflorum*) and common dandelion (*Taraxacum officinale*), as well as by shrub seedlings such as red osier dogwood (*Cornus sericea*), trembling aspen, willows and alder-leaved buckthorn (*Rhamnus alnifolia*). The graminoid cover is evenly split between various grasses and sedges, such as such creeping bentgrass, fowl manna grass (*Glyceria striata*), bluegrasses (*Poa* spp.) and mixed sedges (*Carex* spp.), but not dominated by any one species. Sites have a very sparse mid-canopy of tall shrubs, such as willows or trembling aspen or balsam poplar. On the ground, woody debris, bare soil and litter cover are moderate.

Trembling Aspen saplings—Wild Red Raspberry/ Trembling Aspen seedlings

Four sites are characterized by a well-developed woody understory largely dominated by wild red raspberry (*Rubus idaeus*), with *Rosa* spp and Saskatoon (*Amelanchier alnifolia*), and regenerating trembling aspen seedlings (<1 in height). Frequent herbaceous forbs include poison ivy (*Toxicodendron rydbergii*), veiny meadowrue (*Thalictrum venulosum*), smooth wild strawberry and Lindley's aster (*Symphyotrichum ciliolatum*). Mixed grasses are infrequent and very sparse, sedges are absent. Overall vegetation cover is high (57%). The mid-canopy is sparse and dominated by regenerating trembling aspen saplings, while the upper tree canopy is absent. On the ground, woody debris is high, bare soil cover is negligible low, and litter cover is low.

4.2.2 Accuracy of Effect Predictions and Effectiveness of Mitigation

For the project areas formerly cleared in 2019/2020, the effect predictions on traditional use plant species from the EIS (Appendix III) included the following:

- Change in native vegetation cover class abundance, distribution and structure
- Change in traditional use plant species abundance and distribution

The predicted change in vegetation cover and structure was accurate for traditional use plant species sites. Vegetation total mean cover decreased from pre-construction values (2017 surveys), 129.4 to 66.4% in 2021, and structure has been modified to accommodate the transmission line. Total mean cover however has increased this season compared to 2020 (43.7%). Past clearing on the RoW has temporarily reduced vegetation cover due to the removal of multiple vegetation strata, including the tree layer, tall shrub, and occasionally low shrub and ground vegetation.

Mitigation measures identified in the Construction Environmental Protection Plan for traditional use plant species (Manitoba Hydro 2020a) were previously assessed at each traditional use plant site sampled (Table 4-2e). Select invasive plant sites (INV) on the RoW were included with traditional use (in 2020) where pre-construction cover of species (in 2017) was considered high (>30% cover). Where required, construction matting appeared to be used along access trails to protect the area from rutting and soil exposure during saturated soil conditions. Existing access roads and trails were used to the extent possible, and vehicle traffic on the RoW was confined to the equipment path where possible. These types of disturbances were generally not noted at traditional use plant sites however some minor rutting of soils was previously documented within the RoW, generally on the equipment path. Environmental monitoring determined that the recommended mitigation was implemented and effective for traditional use plant species, which minimized the

ground disturbance from construction activities. Observations recorded in the field in 2021 are provided below.

Table 4-2e. Mitigation measures assessed at sites monitored for traditional use plant species on the RoW.

Mitigation Measure
Construction matting will be used along access trail to protect the area from rutting and exposure of soil during saturated soil conditions.
Use existing access roads and trails to the extent possible.
Refer to Clearing Management Plan for clearing prescription.
Confine vehicle traffic to established trails to the extent possible.
In the event of ground disturbance refer to Rehabilitation and Invasive Species Management Plan for mitigation.

Traditional use sites were sampled along the transmission RoW roughly between the vicinities of Ste Geneviève and Piney. Precipitation was extremely low this sampling season. Increased tall shrub cover was apparent in the RoW in 2021, after clearing of previous canopies during winter 2019/2020. Isolated patches of remaining tall shrub cover were recorded on the RoW after construction, in areas of ATK habitat. In some sites, abundant willows occur on the RoW (Photograph 4-2a). This season, several other sites had a well-developed woody understory growing into the tall shrub stratum. Cover in the tall shrub stratum occurs between 1 to 2.5 m height. Photograph 4-2b shows dense trembling aspen regeneration in the tall shrub layer at ATK-220. Other sites supported abundant native grass and forb growth on the RoW (e.g., ATK-223) or sparse sapling regeneration in previously forested sites (e.g., ATK-179, Photograph 4-2c).



Photograph 4-2a. Abundant willows, both regenerating and uncleared, ATK-165.



Photograph 4-2b. Dense trembling aspen regeneration in places, 2 to 2.5 m in height, ATK-220.



Photograph 4-2c. Sparse trembling aspen sapling regeneration, ATK-179.

An abundant cover of traditional use plant species was recorded this season. A total of 58 traditional use plants were observed during all surveys in 2021, compared to 61 species recorded in 2017 (pre-construction). Appendix IX lists traditional use plant species identified from the Environmental Impact Statement and self-directed studies, with traditional plants observed in 2021. These included four trees, 20 shrub species and 34 herbs. Forty-seven of these species were recorded in surveys for traditional use plants (ATK plots). Two monitoring plots exceeded 30% total cover of traditional use plant species (ATK-165 and -220), while four other sites exceeded 20% total cover (ATK-219, -226, -131 and -215). Seven species had a frequency of occurrence of 45% or greater among traditional use plots. Shrubs included wild rose (*Rosa* sp.) red-osier dogwood (*Cornus sericea*), and wild red raspberry (*Rubus idaeus*), while herbs included common dandelion (*Taraxacum officinale*) smooth wild strawberry (*Fragaria virginiana*), trailing dewberry (*Rubus pubescens*), and two-leaved Solomon's-seal (*Maianthemum canadense*). Other traditional use species recorded in plots included plants such as hazelnuts (*Corylus* spp.), snakeroot (*Sanicula marilandica*) and berry plants including pin cherry (*Prunus pennsylvanica*), highbush-cranberry (*Viburnum opulus*), and velvet-leaf blueberry (*Vaccinium myrtilloides*). Total species cover of traditional use plants in ATK plots (i.e., all strata combined of tree, tall shrub, low shrub and herb) ranged from 1.4 to 55.4% (Table 4-2f.). In 2017, total species cover ranged from 11.8 to 98% at ATK sites prior to clearing and construction activities. Other sites sampled also supported traditional use plants (e.g., GWW plots). Sites sampled with highest traditional use plant cover in 2021 are seen in former Photographs 4-2a and b (i.e., ATK-165 and -220).

As with previous years, no outbreaks of noxious or invasive species were noted along the RoW at and adjacent to traditional use sites. A single common tansy (*Tanacetum vulgare*, Tier 2) plant, recorded as an incidental (not in plot), was pulled and removed from the RoW at site ATK-224. Hoary alyssum (*Berteroa incana*, Tier 2) was recorded on the RoW along an ATV track parallel to the roadside which crosses the RoW, in the vicinity of ATK-226 (near INV-203).

Site ATK-226 had been spread with a straw mulch in 2020, and volunteer barley (*Hordeum vulgare*) plants were observed along the straw. Previously, the equipment path was covered extensively with a wide swath (>20 m) and thick mat of straw mulch. This year, the straw has broken down, but continues to provide ground cover, and few to no exotics were observed, and very few instances of volunteer grain from straw mulch were observed at the site.

During sampling this year, bare ground was still apparent at some sites. Large areas of exposed soil observed along the RoW (e.g., 10 x 10 m of bare ground) in 2021 were broadcast seeded with a prescribed native seed mix to prevent colonization by non-native,

invasive or noxious weeds (e.g., ATK-216 and ATK-224). See Section 4.6 for Rehabilitation Monitoring and Vegetation Management.

Table 4-2f. Total species cover of traditional use plants in ATK plots, 2017 and 2021.			
Plot	Total Cover (%) , 2017	Total Cover (%) , 2021	Traditional Use Species Recorded in 2021
ATK-220	98.0	55.4	<i>Agastache foeniculum</i> , <i>Amelanchier alnifolia</i> , <i>Aquilegia</i> sp., <i>Aralia nudicaulis</i> , <i>Asarum canadense</i> , <i>Betula papyrifera</i> , <i>Fragaria virginiana</i> , <i>Geranium bicknellii</i> , <i>Maianthemum canadense</i> , <i>Prunus virginiana</i> , <i>Populus balsamifera</i> , <i>Quercus macrocarpa</i> , <i>Ribes oxyacanthoides</i> , <i>Rosa</i> sp., <i>Rubus idaeus</i> , <i>Sanicula marilandica</i> , <i>Symphoricarpos albus</i> , <i>Taraxacum officinale</i> , <i>Trifolium hybridum</i> , <i>Viburnum rafinesquianum</i>
ATK-165	78.2	32	<i>Cornus canadensis</i> , <i>Cornus sericea</i> , <i>Fragaria virginiana</i> , <i>Lycopus uniflorus</i> , <i>Pyrola</i> sp., <i>Ribes oxyacanthoides</i> , <i>Rubus pubescens</i> , <i>Solidago canadensis</i> , <i>Spiraea alba</i> , <i>Stachys pilosa</i> , <i>Taraxacum officinale</i> , <i>Populus balsamifera</i>
ATK-219	57.8	28.2	<i>Amelanchier alnifolia</i> , <i>Fragaria virginiana</i> , <i>Rosa</i> sp., <i>Rubus idaeus</i> , <i>Rubus pubescens</i> , <i>Spiraea alba</i> , <i>Vaccinium myrtilloides</i> , <i>Alnus incana</i>
ATK-226	63.2	22.6	<i>Alnus incana</i> , <i>Caltha palustris</i> , <i>Chamerion angustifolium</i> , <i>Cornus canadensis</i> , <i>Cornus sericea</i> , <i>Geum aleppicum</i> , <i>Larix laricina</i> , <i>Maianthemum canadense</i> , <i>Nabalus albus</i> , <i>Rubus idaeus</i> , <i>Rubus pubescens</i> , <i>Solidago gigantea</i> , <i>Taraxacum officinale</i>
ATK-131	31.6	21	<i>Amelanchier alnifolia</i> , <i>Cornus sericea</i> , <i>Corylus cornuta</i> , <i>Fragaria virginiana</i> , <i>Maianthemum canadense</i> , <i>Nabalus albus</i> , <i>Plantago major</i> , <i>Prunus pensylvanica</i> , <i>Quercus macrocarpa</i> , <i>Rosa</i> sp., <i>Rubus pubescens</i> , <i>Rubus idaeus</i> , <i>Sanicula marilandica</i> , <i>Solidago canadensis</i> , <i>Taraxacum officinale</i> , <i>Trifolium pratense</i> , <i>Viburnum opulus</i> , <i>Populus balsamifera</i> , <i>Crataegus chrysocarpa</i>
ATK-215	35.0	20.8	<i>Actaea rubra</i> , <i>Amelanchier alnifolia</i> , <i>Apocynum androsaemifolium</i> , <i>Aralia nudicaulis</i> , <i>Artemisia absinthium</i> , <i>Betula papyrifera</i> , <i>Cornus sericea</i> , <i>Corylus</i> sp., <i>Maianthemum canadense</i> , <i>Oenothera biennis</i> , <i>Prunus pensylvanica</i> , <i>Prunus virginiana</i> , <i>Quercus macrocarpa</i> , <i>Rosa</i> sp., <i>Rubus idaeus</i> , <i>Sanicula marilandica</i> , <i>Symphoricarpos occidentalis</i> , <i>Viburnum rafinesquianum</i>
ATK-223	77.2	18.6	<i>Dasiphora fruticosa</i> , <i>Fragaria virginiana</i> , <i>Larix laricina</i> , <i>Lycopus uniflorus</i> , <i>Populus balsamifera</i> , <i>Ribes oxyacanthoides</i> , <i>Stachys pilosa</i>
ATK-179	53.4	9	<i>Alnus incana</i> , <i>Cornus sericea</i> , <i>Ribes oxyacanthoides</i> , <i>Ribes triste</i> , <i>Rubus pubescens</i> , <i>Taraxacum officinale</i>
ATK-222	27.6	7.2	<i>Cornus sericea</i> , <i>Fragaria virginiana</i> , <i>Maianthemum canadense</i> , <i>Rosa</i> sp., <i>Rubus pubescens</i> , <i>Solidago canadensis</i> , <i>Taraxacum officinale</i> , <i>Trifolium hybridum</i>
ATK-216	23.4	6.2	<i>Cornus canadensis</i> , <i>Fragaria virginiana</i> , <i>Maianthemum canadense</i> , <i>Plantago major</i> , <i>Rosa</i> sp., <i>Rubus pubescens</i> , <i>Sanicula marilandica</i> , <i>Symphoricarpos occidentalis</i> , <i>Taraxacum officinale</i> , <i>Viburnum rafinesquianum</i>
ATK-224	11.8	1.4	<i>Stachys Pilosa</i> , <i>Taraxacum officinale</i> , <i>Trifolium hybridum</i>

4.3 Golden-winged Warbler Habitat

Thirteen sites were sampled for golden-winged warbler (*Vermivora chrysoptera*) habitat (GWW) from August 4 to 7, along the FPR RoW (Map 4-1, Appendix II) (Field Activity ID MMTP_CON_FA562). The FPR intersects areas of critical golden-winged warbler habitat, according to the EIS (Chapter 9; Manitoba Hydro 2015).

4.3.1 Data Analysis of Golden-winged Warbler Habitat

Diversity measures from GWW monitoring are presented in detail for the current year, and means are compared between pre-construction and subsequent monitoring years. Vegetation descriptions are provided for the lowest canopy (<1m) and the mid canopy (>1 to 2.5m, where present), Table 4-3a. During monitoring in 2021, the total mean species cover in sites ranged from 32 to 90% in the herb and low shrub layer. Sites were floristically diverse, with an average species richness of 34 species recorded in plots, (21 to 42 species). The diversity was relatively high for all sites, with an average of 2.8 and average evenness (0.8) was also high. Some very sparse to sparse cover of tall shrubs was present at all sites, as an average of 6% cover and ranging from 0.2 to 14% cover. Overall, there is a general increase in cover and richness in the lower vegetation canopies between this year and last year's post-construction growth. Tree canopy cover was generally absent from GWW sites. Three sites had very sparse growth reaching the tree canopy (>2.5 m in height); with cover either at 5% dominated by white spruce, with willow (GWW-019), or at 1% canopy cover by willows (GWW-16; -24), data not shown.

Table 4-3a. Golden-winged warbler habitat monitoring sites: vegetation measures for species cover, richness, diversity and evenness, 2021.

Sites	Herbs and low shrubs				Tall shrubs			
	Cover	Richness	Div.	Even.	Cover	Richness	Div.	Even.
GWW-001	65.2	39	3.12	0.85	3.4	1	0.15	-
GWW-004	88.0	35	2.46	0.69	8.2	4	0.25	0.18
GWW-006	61.2	24	2.26	0.71	4.8	3	0.27	0.25
GWW-008	56.0	32	2.95	0.85	4.0	3	0.24	0.22
GWW-009	51.4	41	3.13	0.84	9.8	2	0.33	0.48
GWW-010	50.8	42	3.24	0.87	1.2	3	0.11	0.10
GWW-013	46.0	41	3.15	0.85	0.2	1	0.02	-
GWW-015	32.0	27	2.77	0.84	11.6	4	0.51	0.37
GWW-016	55.0	36	2.65	0.74	3.2	1	0.17	-
GWW-018	88.8	38	3.03	0.83	14.2	6	0.51	0.29
GWW-019	75.2	21	2.11	0.69	7.0	3	0.29	0.26
GWW-022	90.2	31	2.39	0.70	1.8	1	0.08	-
GWW-024	58.2	37	2.72	0.75	8.6	2	0.32	0.46
Mean 2021	62.9	34.2	2.77	0.79	6.0	2.6	0.25	0.29

Pre-construction, golden-winged warbler habitat sites were open tree canopy sites with a moderately well-developed mid canopy layer of tall shrubs and tree saplings. Golden-winged warblers require early successional scrub environments. They tend to use forest edges and to thrive require habitat with heterogenous vegetation structure, with a blend of mature and immature trees and open shrub structure. While the tree canopy structure will be prevented from fully regenerating on a transmission line, the presence of a regenerating mid-canopy woody structure will also be important for the persistence of golden-winged warblers in this habitat.

After the second season of monitoring in GWW sites, the cover and diversity measures in the understory are comparable to or above their baseline values, showing little change to the lowest vegetation canopy. While the mid-canopy woody layer is regenerating post-construction, the cover, richness and diversity measures are still significantly lower ($p=0.006$, $p=0.008$ and $p=0.01$, respectively) than baseline measures, Table 4-3b.

Table 4-3b. Mean vegetation measures in each vegetation canopy in golden-winged warbler habitat sites during pre-construction (2019) and monitoring (2020 and 2021).

	Pre-constr.	Monitoring	
	2019	2020	2021
UNDERSTORY			
Understory Cover (%)	67.2	47.2	62.9
Species Richness	31.6	32.1	34.2
Diversity	1.94	2.79	2.77
Evenness	0.56	0.81	0.79
MID-CANOPY Tall shrubs			
Tall Shrub Cover (%)	17.7	1.8	6.0
Species Richness	5.6	2.1	2.6
Diversity	0.47	0.64	0.25
Evenness	0.29	0.73	0.29
TREE CANOPY			
Tree Cover (%)	22.4	0.4	0.8
Species Richness	2.7	1.0	1.3
Diversity	0.37	-	0.12
Evenness	0.36	-	0.34
Number of Surveys	13	13	13

4.3.1.1 Cluster Analysis and Community Typing

Community type groups within 13 sites of golden-winged warbler habitat on the RoW are described through hierarchical cluster analyses. Three community types were determined (Table 4-3c) based on emerging vegetation structure, and species assemblages and cover at sites, particularly within the understory. GWW community types share some commonalities. Trees >2.5 m are absent (with exception of a single site GWW-019; 5% white spruce); the tall

shrub canopy is generally poorly developed. Trembling aspen seedlings and saplings were found in nearly all sites. Among inanimate ground cover, bare ground is very low, litter is generally high, and woody debris is variable but moderate throughout sites.

Table 4-3c. Community types for golden-winged warbler habitat surveys on the RoW, 2021.

Community Type	Surveys	Species, total	Species, mean
Trembling Aspen Seedling– Tall Shrub Seedling – Herb Rich	4	77	42.5
Sparse Trembling Aspen Seedling- Herb and Grass Rich	3	62	33.7
Trembling Aspen, Balsam Poplar Seedling – Smooth Brome and Kentucky Bluegrass	6	100	35.2

Trembling Aspen Seedling– Tall Shrub Seedling – Herb Rich

The four sites in this group are distinguished by a richly diverse and well-developed understory with high overall vegetation cover (80%). Herbaceous and woody forbs dominate the understory, including tall shrub and tree seedlings, mainly beaked hazelnut (*Corylus cornuta*), trembling aspen, alder-leaved buckthorn and Saskatoon. A diverse mix of herbaceous forbs present with snakeroot (*Sanicula marilandica*), Lindley's aster, veiny meadow-rue, and poison-ivy among the most frequent. Grasses and sedges are a minor component of the understory, with grasses more prevalent. A sparse mid-canopy is made up primarily of trembling aspen saplings.

Sparse Trembling Aspen Seedling- Herb and Grass Rich

The three sites in this group are distinguished by a moderately well-developed understory, the vegetation cover overall measured 68% in sites. The understory is evenly divided between cover of grasses, herbaceous forbs, and woody forbs. Woody seedlings in the understory are dominated by trembling aspen, red-osier dogwood and willows. Herbaceous forbs are diverse and mixed, with Canada thistle, Canada goldenrod (*Solidago canadensis*), dewberry, and wood aster most frequently occurring. Dominant grasses are marsh reedgrass, creeping bentgrass, and fowl bluegrass (*Poa palustris*). Sedges occur as a minor component i.e., Bebb's sedge (*Carex bebbii*) and hay sedge (*Carex foenea*). The mid-canopy is extremely sparse, divided between trembling aspen saplings and willows.

Trembling Aspen Balsam Poplar Seedling – Smooth Brome and Kentucky Bluegrass

Six sites are distinguished by a moderately well-developed understory, the vegetation cover overall measured 62% in sites. The understory is dominated by a mix of herbaceous and woody forbs, the woody growth is primarily tree seedlings of trembling aspen, balsam poplar and occasional bur oak. Frequent herbaceous forbs include Canada goldenrod and

Canada thistle. Grasses and sedges are a minor component of the understory, with Kentucky bluegrass (*P. pratensis*) and smooth brome (*Bromus inermis*) most prominent. A sparse mid-canopy is made up primarily of trembling aspen and balsam poplar saplings.

4.4.2 Accuracy of Effect Predictions and Effectiveness of Mitigation

For the project areas previously cleared (2019/2020), the effect predictions from the EIS (Appendix III) included the following:

- Change in vegetation landscape intactness
- Change in native vegetation cover class abundance, distribution and structure
- Change in habitat availability

A change in landscape intactness was accurate for transmission RoW clearing. Previously, vegetation has been selectively cleared in areas to accommodate the transmission line and enhance suitability for GWW. Removal and long-term loss of forest cover from RoW clearing is an effect of transmission line development (Manitoba Hydro et al. 2003). Other studies have identified that fragmentation is frequently an inevitable consequence of large-scale corridor projects (Joro Consultants 2011). Year II post-construction monitoring shows continued recovery of vegetation with increasing cover and changing structure. In the previous monitoring season (2020), regenerating low shrub vegetation was approaching or beginning to exceed 1 m height in areas of the RoW after clearing activities. Mean vegetation cover decreased from pre-construction (2019) values (107.6 to 49.5%) due to the removal of tree and shrub vegetation structure and associated species from the RoW. This season, mean total species cover has risen to 69.7% as a result of species regeneration. Many low growing shrubs have now become part of the tall shrub stratum (1 to 2.5 m height), see Photograph 4-3a. These include species such as balsam poplar (*Populus balsamifera*), bur oak (*Quercus macrocarpa*), red-osier dogwood (*Cornus sericea*), trembling aspen (*Populus tremuloides*) and willows (*Salix* spp.) recorded at several monitoring sites (e.g., GWW-009; -010; -013; -015; -022; -024). Chokecherry (*Prunus virginiana*), beaked hazel (*Corylus cornuta*) and Saskatoon (*Amelanchier alnifolia*) were recorded in the tall shrub stratum this season at site GWW-004.



Photograph 4-3a. Increased cover of vegetation in the tall shrub stratum, GWW-015.

The Habitat Management Plan (Environment Canada IR EC/MH-003) provides information on RoW clearing activities for critical golden-winged warbler habitat. Mitigation measures identified in the Construction Environmental Protection Plan (Manitoba Hydro 2020a) were previously assessed at each golden-winged warbler site sampled, see Table 4-3d. Clearing and construction activities were previously carried out over the fall and winter months. Mitigation at GWW sites included whether shrubs and herbaceous vegetation <4 m tall were retained to the extent possible; and whether five to ten perch trees were retained per span where feasible. Perch sites are small groups of three to five trees within 10 m of the cleared edge of the RoW. As identified in 2020, perch trees on the RoW were often absent, however the linear RoW boundaries occasionally supported small clumps of trees or individual stems remaining just inside the RoW edges, which may also provide perch opportunities for GWW. Golden-winged warbler sites were primarily open hardwood canopies (pre-construction), dominated by trembling aspen, with occasional balsam poplar and/or bur oak. Clearing prescriptions for GWW sites were available for reference in the Clearing Management Plan prior to construction.

Table 4-3d. Mitigation measures assessed at sites monitored for golden-winged warbler habitat on the RoW.

Mitigation Measure

Refer to Clearing Management Plan for detailed clearing prescriptions.

Retain shrubs and herbaceous vegetation <4m tall to the extent possible.

Typically, 5-10 perch trees must be retained per span where feasible.

This season, regenerating vegetation in some sites was well-developed in Management Zone 2 of the Habitat Management Plan (Manitoba Hydro 2016; Environment Canada IR EC/MH-003). Zone 2 boundaries include 12 to 50 m on either side of the centreline of the RoW between tower footprints, where management involved selective removal of woody vegetation. In the vicinity of several monitoring sites (e.g., GWW-001; -009; -016; -018; -022), increased cover of trembling aspen seedlings and other shrubs (e.g., willows) were observed in the tall shrub (1 to 2.5m) stratum (Photograph 4-3b). At site GWW-009, aspen cover increased in the tall shrub layer from 0.2 to 9.6% over one growing season. A well-developed low shrub and herb stratum (<1 m) was apparent this season, despite the high ground cover of mulched wood previously recorded at many sites. According to the Habitat Management Plan (Manitoba Hydro 2016; Environment Canada IR EC/MH-003), higher quality GWW habitat along the transmission line RoW was observed at GWW-006 with the presence of graminoids, forbs, and a low and tall shrub layer, with patches of remaining shrub vegetation (Photograph 4-3c). In other areas (GWW-019), regenerating aspen was heavily browsed by cattle, based on vegetation disturbance and presence of abundant cattle droppings observed along the RoW.



Photograph 4-3b. Increased trembling aspen cover in the vicinity of site GWW-009.



Photograph 4-3c. Higher quality habitat observed along the RoW, GWW-006.

During Year II post-construction monitoring, bare ground was still noticeable in the vicinity of some GWW sites. Larger areas of soil disturbance observed along the RoW (e.g., 10 x 10 m of bare ground) were broadcast seeded with a prescribed native seed mix to prevent colonization by non-native, invasive or noxious weeds (e.g., GWW-019 access trail; GWW-006 equipment path), see Rehabilitation Monitoring and Vegetation Management, Section 4.6.

An old-growth oak tree (>100 years) remains unaffected at an environmentally sensitive site (HERT-201) on the RoW, approximately 12 m from the centerline, near monitoring plot GWW-008 (Photograph 4-3d). Slow growing old growth trees could remain in their habitat, where they do not interfere with vegetation clearance requirements for safe operation of the transmission line.



Photograph 4-3d. An old-growth bur oak remaining on the RoW in GWW habitat.

4.4 Invasive Plant Species

Noxious, invasive, and non-native (ranked SNA) species observations were recorded in and incidental to all quantitative surveys (i.e., ATK, GWW and WET) in 2021, (Field Activity ID MMTP_CON-FA561 and 562) (Map 4-1, Appendix II).

Project-wide, 42 noxious, invasive or non-invasive SNA species were recorded along the RoW throughout vegetation monitoring (ATK, GWW, WET, Tower sites and incidentally at a single INV site). This is about half the number of such species found in previous years, as two monitoring components (INV and Roadside invasives) were completed in 2020. Many of the species listed as noxious, invasive or non-native, were found uniquely in the Roadside Invasive surveys (2020).

Of 42 species recorded, 18 species are listed in the Manitoba Noxious Weed Act as noxious weeds harmful to livestock or agricultural crops. Noxious weeds may include species that are invasive, non-invasive, or native species. For example, milkweeds (*Asclepias* spp.) and water hemlocks (*Cicuta* spp.) are native species that may be harmful to livestock if ingested. Tier 1 and 2 designations provide the most severe listing for noxious species; no Tier 1 species were observed on the MMTP RoW in 2021. Four notable Tier 2 noxious species recorded are hoary alyssum (*Berteroa incana*), ox-eye daisy (*Leucanthemum vulgare*), common tansy (*Tanacetum vulgare*), and scentless false mayweed (*Tripleurospermum inodorum*). The remaining 14 noxious species are listed as Tier 3.

While not considered noxious, at least 11 species are invasive (ranked SNA or S5) due to their tendency to outcompete native species, and dominate habitats once introduced (Canadian Food Inspection Agency 2008; Invasive Species Council of Manitoba 2020). An additional 13 are non-native species (ranked SNA), but considered neither noxious nor invasive. The establishment and persistence of non-native species in an environment may still lead to the exclusion of native plants.

Together, the noxious, invasive and non-invasive SNA species recorded along the RoW in 2021 include 13 families, most prominently represented are Asteraceae (13 species), Poaceae (9 spp.), Fabaceae (5 spp.) and Brassicaceae (4 spp.). All noxious weed, invasive and non-native (non-invasive) species are listed in Table 4-4a, along with the surveys where they occur, i.e., ATK, GWW, WET, and other sites (tower sites and adjacent to an INV site).

Table 4-4a. Noxious, invasive and non-invasive non-native (SNA) species observation counts recorded project wide, from components monitored in 2021.

Species	Rank	Noxious Weed	Invasive Status	ATK	GWW	WET	Other
<i>Agrostis stolonifera</i>	SNA			5	9	4	
<i>Ambrosia artemisiifolia</i>	S5	Tier 3				1	
<i>Artemisia absinthium</i>	SNA	Tier 3	CFIA	1	1		
<i>Berteroa incana</i>	SNA	Tier 2	CFIA				1
<i>Brassica rapa</i>	SNA			1			
<i>Bromus inermis</i>	SNA		CFIA	1	6	2	3
<i>Chenopodium album</i>	SNA	Tier 3	CFIA	3			
<i>Cicuta maculata</i>	S4S5	Tier 3		2	2	1	
<i>Cirsium arvense</i>	SNA	Tier 3	CFIA, ISCM	8	11	5	3
<i>Cirsium vulgare</i>	SNA	Tier 3		4	5		1
<i>Convolvulus arvensis</i>	SNA			1			
<i>Echinochloa crus-galli</i>	SNA					1	1
<i>Elymus repens</i>	SNA		CFIA		1	2	3
<i>Erigeron canadensis</i>	S5	Tier 3		2			1
<i>Erucastrum galicum</i>	SNA			1			
<i>Galeopsis tetrahit</i>	SNA	Tier 3		1			
<i>Hordeum jubatum</i>	S5	Tier 3		2		2	1
<i>Hordeum vulgare</i>	S5		CFIA	1			1
<i>Leucanthemum vulgare</i>	SNA	Tier 2	CFIA, ISCM			1	
<i>Medicago lupulina</i>	SNA			1	2		
<i>Melilotus albus</i>	SNA		CFIA	6	2	2	2
<i>Melilotus officinalis</i>	SNA		CFIA	1			1
<i>Myosotis scorpioides</i>	SNA			1		1	
<i>Petasites frigidus</i> var. <i>x vitifolius</i>	SNA			1			
<i>Phalaris arundinacea</i>	S5		CFIA	3	1	4	2
<i>Phleum pratense</i>	SNA			5	5		1

<i>Plantago major</i>	SNA		CFIA	2	1	3	3
<i>Polygonum aviculare</i>	SU		CFIA			1	
<i>Rumex crispus</i>	SNA			1		2	
<i>Setaria viridis</i>	SNA		CFIA			1	1
<i>Silene csereii</i>	SNA		CFIA				2
<i>Silene latifolia</i>	SNA	Tier 3	CFIA	1			1
<i>Solanum dulcamara</i>	SNA			1			
<i>Sonchus arvensis</i>	SNA	Tier 3	CFIA, ISCM	5	5	5	1
<i>Sonchus asper</i>	SNA	Tier 3		3			
<i>Tanacetum vulgare</i>	SNA	Tier 2	CFIA, ISCM	1			
<i>Taraxacum officinale</i>	SNA	Tier 3	CFIA	8	8	2	
<i>Thlaspi arvense</i>	SNA	Tier 3	CFIA				1
<i>Tragopogon dubius</i>	SNA				1		1
<i>Trifolium hybridum</i>	SNA			3		1	1
<i>Trifolium pratense</i>	SNA		CFIA	1	2		
<i>Tripleurospermum inodorum</i>	SNA	Tier 2	CFIA, ISCM			1	1
2021				ATK	GWW	WET	Other
Noxious species only: Tier 2				1	0	2	2
Total Species: Noxious, invasive, non-native				31	16	20	22
Total Observations: Noxious, invasive, non-native				77	62	42	33

There is a general increase in noxious, invasive and non-native species over time recorded in surveys from pre-construction through Year I and II of monitoring. The comparison of the number of noxious, invasive and non-native species recorded in or incidental to plots in pre-construction and monitoring years is shown in Table 4-4b.

Table 4-4b. Number of noxious, invasive and non-native species in monitoring plots from pre-construction, and two years of monitoring.

	WET			ATK			GWW		
	Pre-con	2020	2021	Pre-con	2020	2021	Pre-con	2020	2021
Noxious Tier 2	-	-	2	-	-	1	-	-	-
Noxious Tier 3	5	6	6	5	8	12	2	6	4
Invasive	4	4	5	5	8	7	5	6	5
Non-native	-	2	4	-	6	11	-	4	4
Total	9	13	17	10	22	31	7	16	16

4.5 Species of Conservation Concern

Quantitative (in plots) and qualitative (incidental) observations of species of conservation concern (SCC) were recorded project wide for components monitored in 2021, including in and incidental to all vegetation monitoring surveys (i.e., WET, ATK, GWW; Map 4-1, Appendix II) (Field Activity ID MMTP_CON_FA561 and 562). Post-construction

environmental monitoring for species of conservation concern at rare plant sites was completed in 2020.

Twenty-eight species of conservation concern were recorded throughout the RoW, in and incidental to 25 monitoring plots (ATK, WET, GWW) project wide in 2021, Table 4-5a. Among the species of conservation concern, seven species are ranked Critically Imperilled (S1-S1S2) or Imperilled (S2-S2S3), the remaining 21 species are ranked Vulnerable (S3 to S3S5), Table 4-5b. Species of conservation concern are observed from across a diversity of habitats, including from sandy soils, open grassland, wetlands, coniferous bogs and fens, and previously deciduous and coniferous forested sites.

Table 4-5a. Counts of species of conservation concern (SCC) and number of observations by survey type, 2021.

	WET	ATK	GWW
Critically Imperilled and Imperilled (S1-S2S3)	1	6	1
Vulnerable (S3-S3S5)	10	12	4
Total number of all SCC	11	18	5
Total # of observations of all SCC	27	24	6

Table 4-5b. Species of conservation concern recorded in 2021.

Species	Common Name	Rank	Family
Critically Imperilled and Imperilled species (S1 to S2S3)			
<i>Agrimonia gryposepala</i>	Common Agrimony	S1S2	Rosaceae
<i>Chelone glabra</i>	White Turtlehead	S2	Scrophulariaceae
<i>Corispermum villosum</i>	Hairy Bugseed	S1S2	Chenopodiaceae
<i>Cyperus houghtonii</i>	Houghton's Flatsedge	S2S3	Cyperaceae
<i>Fraxinus nigra</i>	Black Ash	S2	Oleaceae
<i>Ostrya virginiana</i>	Hop-hornbeam	S2	Betulaceae
<i>Solidago riddellii</i>	Riddell's Goldenrod	S2S3	Asteraceae
Vulnerable species (S3 to S3S5)			
<i>Agalinis tenuifolia</i>	Narrow-leaved Agalinis	S3	Scrophulariaceae
<i>Amphicarpaea bracteata</i>	Hog-peanut	S3S5	Fabaceae
<i>Asarum canadense</i>	Wild Ginger	S3S4	Aristolochiaceae
<i>Asclepias incarnata</i>	Swamp Milkweed	S3S4	Asclepiadaceae
<i>Bromus pumpellianus</i>	Pumpelly's Brome	S3S4	Poaceae
<i>Carex prairea</i>	Prairie Sedge	S3S4	Cyperaceae
<i>Corispermum americanum</i>	American Bugseed	S3	Chenopodiaceae
<i>Dryopteris cristata</i>	Crested Shield Fern	S3S4	Dryopteridaceae
<i>Gentiana rubricaulis</i>	Closed Gentian	S3	Gentianaceae
<i>Geum rivale</i>	Water or Purple Avens	S3S4	Rosaceae
<i>Iris versicolor</i>	Blue Flag	S3S4	Iridaceae
<i>Muhlenbergia racemosa</i>	Marsh Muhly	S3S4	Poaceae

<i>Pedicularis canadensis</i>	Wood-betony	S3S4	Scrophulariaceae
<i>Pedicularis lanceolata</i>	Swamp Lousewort	S3S4	Scrophulariaceae
<i>Pteridium aquilinum</i>	Bracken Fern	S3S4	Dennstaedtiaceae
<i>Salix pellita</i>	Satin Willow	S3S4	Salicaceae
<i>Schizachyrium scoparium</i>	Little Bluestem	S3S4	Poaceae
<i>Scirpus pallidus</i>	Green Bulrush	S3S4	Cyperaceae
<i>Solidago uliginosa</i>	Bog Goldenrod	S3	Asteraceae
<i>Stellaria crassifolia</i>	Fleshy Stitchwort	S3S4	Caryophyllaceae
<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4	Typhaceae

One species at risk was observed during project monitoring, listed under the Manitoba's *Endangered Species and Ecosystems Act* (ESEA) and the federal *Species at Risk Act* (SARA). Riddell's goldenrod (*Solidago riddellii*, S2S3) is listed as Threatened by ESEA and Special Concern by SARA. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) also lists this species as Special Concern. Riddell's goldenrod was incidentally observed during sampling *REDACTED* where two patches were documented, with approximately a total of 45 plants recorded (Photograph 4-5a). Black ash (*Fraxinus nigra*, S2), also designated by COSEWIC (Threatened) was observed in two sites (ATK-216 and ATK-222).



Photograph 4-5a. Riddell's goldenrod observed near sampling plot *REDACTED*.

4.6 Rehabilitation Monitoring and Vegetation Management

In 2021, three additional sites (Tower locations 39, 323 and 483) were identified by Manitoba Hydro to investigate the presence of invasive plant species. Tower 39 is located in an agricultural field just south of the Assiniboine River. Few weed species were observed at the tower site, mainly Canada thistle (*Cirsium arvense*), field pennycress (*Thlaspi arvense*) and smooth brome (*Bromus inermis*). Along the roadside (in the vicinity of Tower 39), scentless false mayweed plants (*Tripleurospermum inodorum*, Tier 2 noxious weed) were observed (Photograph 4-6a). Several sporadically occurring plants (15 individuals) were counted along the width of the RoW (2 x 80 m), adjacent to the road (Appendix V, Adams et al., 2009). Plants were hand-pulled, bagged and removed from the site. Species abundance slightly decreased this season from monitoring in 2020, where 20 individuals were previously observed over a similar swath of land (5 x 80 m).



Photograph 4-6a. Scentless false mayweed (white flower) observed near Tower 39.

At Tower 323, an infestation of white cockle (*Silene latifolia*, Tier 3 noxious weed) was pervasive on the RoW, mainly south of the tower, about 150 m in length by 80 m width (Photograph 4-6b). White cockle at this location had a continuous occurrence of plants with a few gaps in the distribution (Appendix V, Adams et al., 2009). Vegetation management for this infestation consisted of using weed whackers to cut the plants at this location and control further spread by maturing plants. The distribution of white cockle remained unchanged at this location (INV-640-R) when monitoring vegetation in 2020. A native seed mix was broadcast on bare ground on the RoW at this site. A custom native

reclamation mix was prepared by Brett Young in 2021 for RoW disturbances. The species mix included Canada wildrye (*Elymus canadensis*, 30%), little bluestem (*Schizachyrium scoparium*, 20%), June grass (*Koeleria macrantha*, 10%), slender wheatgrass (*Elymus trachycaulus*, 20%), tufted hairgrass (*Deschamsia cespitosa*, 15%), and American vetch (*Vicia americana*, 5%).



Photograph 4-6b. Infestation of white cockle at Tower 323.

Last season, Tower 483 was spread with topsoil and seeded down by Manitoba Hydro with a native species mix. The disturbance area at this site was approximately 60 x 60 m. The site was re-seeded by Manitoba Hydro in the spring of 2021 to promote revegetation at the tower site (Manitoba Hydro 2021). During follow-up monitoring this summer, the results of the re-seeding was noted as abundant cover of Canada wildrye, and the appearance of little bluestem and June grass seedlings. This site (ATK-224) has the highest degree of bare ground (78% cover) and continues to be dominated by non-native species. Sixteen species present are ranked SNA –more than twice that of any other ATK site, including Canada thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*), common hemp-nettle (*Galeopsis tetrahit*), common dandelion (*Taraxacum officinale*), white cockle (*Silene latifolia*) and field sow-thistle (*Sonchus arvensis*) (Photograph 4-6c). A single common tansy plant (*Tanacetum vulgare*, Tier 2 noxious weed) was observed on the RoW and was removed from the site. Additional seed was broadcast on bare ground after sampling in 2021 at this site, in the vicinity of the tower and nearby monitoring plot (ATK-224). Incidental to the ground disturbance, mounds of earth were observed near Tower 483 as a

result of the landowner moving access material to facilitate drainage and water flow around their land.



Photograph 4-6c. Bare ground observed amongst regenerating species, Tower 483.

Other locations that required vegetation management this season included ATK-216, INV-203, GWW-019 access trail, and GWW-006 equipment path. Site ATK-216 is in a cattle pasture, and portions of the RoW overlap forested areas with a higher water table, as a small stream or seep appears to run through in wet years. Clearing and subsequent cattle have likely contributed to the ground disturbance in this spot, where increased bare ground cover was observed (10 m width x 20 m length). The native seed mix was broadcast on patches of bare ground on the RoW at this site.

Near site ATK-226 and adjacent to INV-203, hoary alyssum (*Berteroa incana*, Tier 2 noxious weed) was recorded on the RoW along an ATV track parallel to the roadside which crosses the MMTP RoW (Photograph 4-6d). Approximately 50 sporadically occurring plants were recorded with distribution reduced from a more continuous cover recorded in 2020 (Appendix V, Adams et al., 2009). Plants were not seen to have spread beyond the ATV track, nor into the adjacent INV site. Plants were hand-pulled, bagged and removed from the site.

During sampling this season, bare ground was apparent along the access trail entering the RoW, near monitoring site GWW-019 (Photograph 4-6e). The disturbance area, in the vicinity of Tower 235, was approximately 20 m in length by 50 m width. Non-native and invasive species included Canada thistle, foxtail barley (*Hordeum jubatum*), common

plantain (*Plantago major*), quack-grass (*Elymus repens*), bull thistle (*Cirsium vulgare*) and barnyard grass (*Echinochloa crus-galli*). The native seed mix was broadcast at this site on patches of bare ground and seed was lightly raked into the dry ground.



Photograph 4-6d. Hoary alyssum observed near previous monitoring site INV-203.



Photograph 4-6e. Exposed ground near Tower 235.

Near sampling site GWW-006 (vicinity of Tower 277), an area of bare ground was observed along the equipment path, approximately 5 m width by 50 m length. Creeping bentgrass (*Agrostis stolonifera*) and meadow timothy (*Phleum pratense*) were colonizing the equipment path with sporadically occurring plants and few patches of Canada thistle. The native seed mix was broadcast at this site.

This season, low disturbance was observed in wetlands. The equipment path however was visible in some areas of the RoW from ground surveys and the aerial flight. At site WET-123, patches of exposed soil remaining along the equipment path were seeded to help promote revegetation (near Tower 230). Open areas along a swath measuring approximately 5 m width by 60 m length were broadcast seeded with the prescribed native species blend (Photograph 4-6f). The soil was lightly harrowed and tampered to ensure greater seed contact with the ground. Both native and non-native species were colonizing the equipment path including swamp horsetail (*Equisetum fluviatile*), sedges (*Carex* spp.), foxtail barley, Canada thistle, field sow-thistle (*Sonchus arvensis*), and common plantain. Rig matting was previously used along this equipment path where vegetation growth was suppressed in Year I monitoring. Two remaining stacks of rig matting were present near the RoW access point that were purchased by the landowner from the contractor. The landowner has now assumed ownership and responsibility for the rig mats which are no longer a result of the project or responsibility of Manitoba Hydro.



Photograph 4-6f. Bare ground along the equipment path, near Tower 230.

4.7 Hypothesis Testing

Two hypotheses were proposed for environmental monitoring of botanical and vegetation resources for the Project, with the intent to focus on the relationship between vegetation growth and clearing and construction activities.

Hypothesis 1 (*There are observed differences in species composition within sites being monitored over successive years along the transmission line right-of-way*) proved to be true in Year II post-construction monitoring. All environmental monitoring indicators showed increases in mean species richness within vegetation strata over successive years of monitoring. In the herb and low shrub stratum, average species richness in wetlands (WET) increased to 20.1 this season from 18.6, in 2020. Both the herb and low shrub stratum and tall shrub stratum of traditional use plant sites (ATK) showed increases in total species richness over Year I and Year II monitoring, with values of 31 to 33.4 and 0.5 to 1.9, respectively. Mean species richness at golden-winged warbler habitat sites (GWW) showed increases in all strata over successive monitoring seasons, with 32.1 to 34.2 in the herb and low shrub layer, 2.1 to 2.6 in the tall shrub layer, and 1.0 to 1.3 in the tree canopy.

Hypothesis 2 (*Invasive and non-native species abundance is related to transmission line clearing and construction activities along the right-of-way*) appears to be true in Year II post-construction monitoring. Although the monitoring schedule for invasive plant species from pre-construction through one-year post-construction was completed in 2020, other monitoring sites continue to show the presence of these species. Surveys in 2021 revealed that cover values in quantitative sampling sites (e.g., WET, ATK and GWW) or incidental species observations were still recorded on the RoW, project wide. Forty-two noxious, invasive or non-invasive SNA species were recorded throughout vegetation monitoring this season. One major outbreak of white cockle (*Silene latifolia*) was observed at Tower 323, where vegetation management was conducted (See Recommendations Section 5.0).

5.0 RECOMMENDATIONS

Based on post-construction vegetation monitoring in 2021, the following are recommendations for the project:

1. Follow-up monitoring and vegetation management is recommended for noxious plant species observed at select sites along the final preferred route. Plant species should be managed to reduce further species spread, according to responsibilities under the current Regulation of The Noxious Weeds Act. Sites include Tower 39 vicinity for scentless false mayweed (*Tripleurospermum inodorum*, Tier 2), INV-203 vicinity for hoary alyssum (*Berteroa incana*, Tier 2), and an infestation of white cockle (*Silene latifolia*, Tier 3) at Tower 323. Management at Tower 323 may require future mowing or possibly herbicide treatment as plants may persist due to the size of the infestation (approximately 1 ha). Manual and mechanical weed management is recommended, with continued monitoring. Invasive plant species have the ability to spread rapidly on disturbed ground and the risk of spread along the RoW or into adjacent sites may increase with each season. All regulatory requirements and license commitments should be met. For invasive species management and site rehabilitation, refer to the Rehabilitation and Invasive Species Management Plan (Manitoba Hydro 2019d).
2. Where possible, attempt to avoid the locations recorded for Riddell's goldenrod (*Solidago riddellii*) (near REDACTED) during future vegetation management activities of the RoW. Riddell's goldenrod is listed as as Threatened by ESEA, and Special Concern by SARA and COSEWIC. Extreme care should be taken at these locations.

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APPENDIX I. Definitions of selected technical terms. Taken from Cauboue et al. (1996), unless otherwise noted.

Abundance-Dominance – This term expresses the number of individuals of a plant species and their coverage in a phytosociological survey; it is based on the coverage of individuals for classes with a coverage higher than 5% and on the abundance for classes with a lower percentage.

Angiosperm – A seed borne in a vessel (carpel); thus one of a group of plants whose seeds are borne within a mature ovary or fruit (Raven et al. 1992).

Bog – Ombrotrophic peatlands generally unaffected by nutrient-rich groundwater that are acidic and often dominated by heath shrubs and Sphagnum mosses and that may include open-growing, stunted trees.

Canopy – The more or less continuous cover of branches and foliage formed by the crowns of trees.

Canopy Closure – The degree of canopy cover relative to openings.

Classification – The systematic grouping and organization of objects, usually in a hierarchical manner.

Cluster Analysis – A multidimensional statistical technique used to group samples according to their degree of similarity.

Community-Type – A group of vegetation stands that share common characteristics, an abstract plant community.

Coniferous – A cone-bearing plant belonging to the taxonomic group Gymnospermae.

Cover – The area of ground covered with plants of one or more species, usually expressed as a percentage.

Deciduous – Refers to perennial plants from which the leaves abscise and fall off at the end of the growing season.

Dicotyledon – One of the two divisions of the Angiosperms; the embryo has two cotyledons, the leaves are usually net-veined, the stems have open bundles, and the flower parts are usually in fours or fives (Usher 1996).

Ecoregion – An area characterized by a distinctive regional climate as expressed by vegetation.

Endangered Species - A species that is facing imminent extirpation or extinction (Government of Canada 2021b).

Extirpated Species - A species that no longer exists in the wild in Canada, but exists elsewhere in the wild (Government of Canada 2021b).

Fen - Wetland with a peat substrate, nutrient-rich waters, and primarily vegetated by shrubs and graminoids.

Flora - A list of the plant species present in an area.

Forb - A broad-leaved, non-woody plant that dies back to the ground after each growing season (Johnson et al. 1995).

Forest - A relatively large assemblage of tree-dominated stands.

Graminoid - A narrow-leaved plant that is grass-like; the term refers to grasses and plants that look like grasses.

Grassland - Vegetation consisting primarily of grass species occurring on sites that are arid or at least well drained.

Gymnosperm - A seed plant with seeds not enclosed in the ovary; the conifers are the most familiar group (Raven et al. 1992).

Habitat - The place in which an animal or plant lives; the sum of environmental circumstances in the place inhabited by an organism, population or community.

Herb (Herbaceous) - A plant without woody above-ground parts, the stems dying back to the ground each year (Johnson et al. 1995).

Invasive - Invasive species are plants that are growing outside of their country or region of origin and are out-competing or even replacing native plants (Invasive Species Council of Manitoba 2020).

Mitigation - Often the process or act of minimizing the negative effects of a proposed action.

Mixedwood - Forest stands composed of conifers and angiosperms each representing between 25 and 75% of the cover.

Monocotyledon - A class of the Angiosperms; the seeds have a single cotyledon, the floral parts are in three or multiples of three, and the leaves have parallel veins (Usher 1996).

Non-vascular Plant – A plant without a vascular system (e.g., mosses and lichens).

Noxious Weed – A plant that is designated as a Tier 1, Tier 2 or Tier 3 noxious weed in the regulations and includes the seed of a noxious weed, whether it is still attached to the noxious weed or is separate from it (Manitoba Government 2020c).

Plot – A vegetation sampling unit used to delineate a fixed amount of area for the purpose of estimating plant cover, biomass, or density.

Pteridophyte – A division of the plant kingdom including ferns and their allies (horsetails and clubmosses).

Rare Species – Any indigenous species of flora that, because of its biological characteristics, or because it occurs at the fringe of its range, or for some other reasons, exists in low numbers or in very restricted areas of Canada but is not a threatened species.

Shrub – A perennial plant usually with a woody stem, shorter than a tree, often with a multi-stemmed base.

Site – The place or category of places, considered from an environmental perspective, that determines the type and quality of plants that can grow there.

Species – A group of organisms having a common ancestry that are able to reproduce only among themselves; a general definition that does not account for hybridization.

Species of Special Concern – A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats (Government of Canada 2021b).

Stand – A collection of plants having a relatively uniform composition and structure, and age in the case of forests.

Stratum – A distinct layer within a plant community, a component of structure.

Terrestrial – Pertaining to land as opposed to water.

Threatened Species – A species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction (Government of Canada 2021b).

Understory – Vegetation growing beneath taller plants such as trees or tall shrubs.

Vascular Plant – A plant having a vascular system (Usher 1996).

Vegetation – The general cover of plants growing on a landscape.




Vegetation Type – In phytosociology, the lowest possible level to be described.

Wetland – Land that is saturated with water long enough to promote hydric soils or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation, and various kinds of biological activity that are adapted to wet environments.



APPENDIX II. Report maps.

Manitoba-Minnesota Transmission Project

Project Infrastructure

-  Converter Station (Existing)
-  Final Preferred Route (FPR)
-  Local Study Area

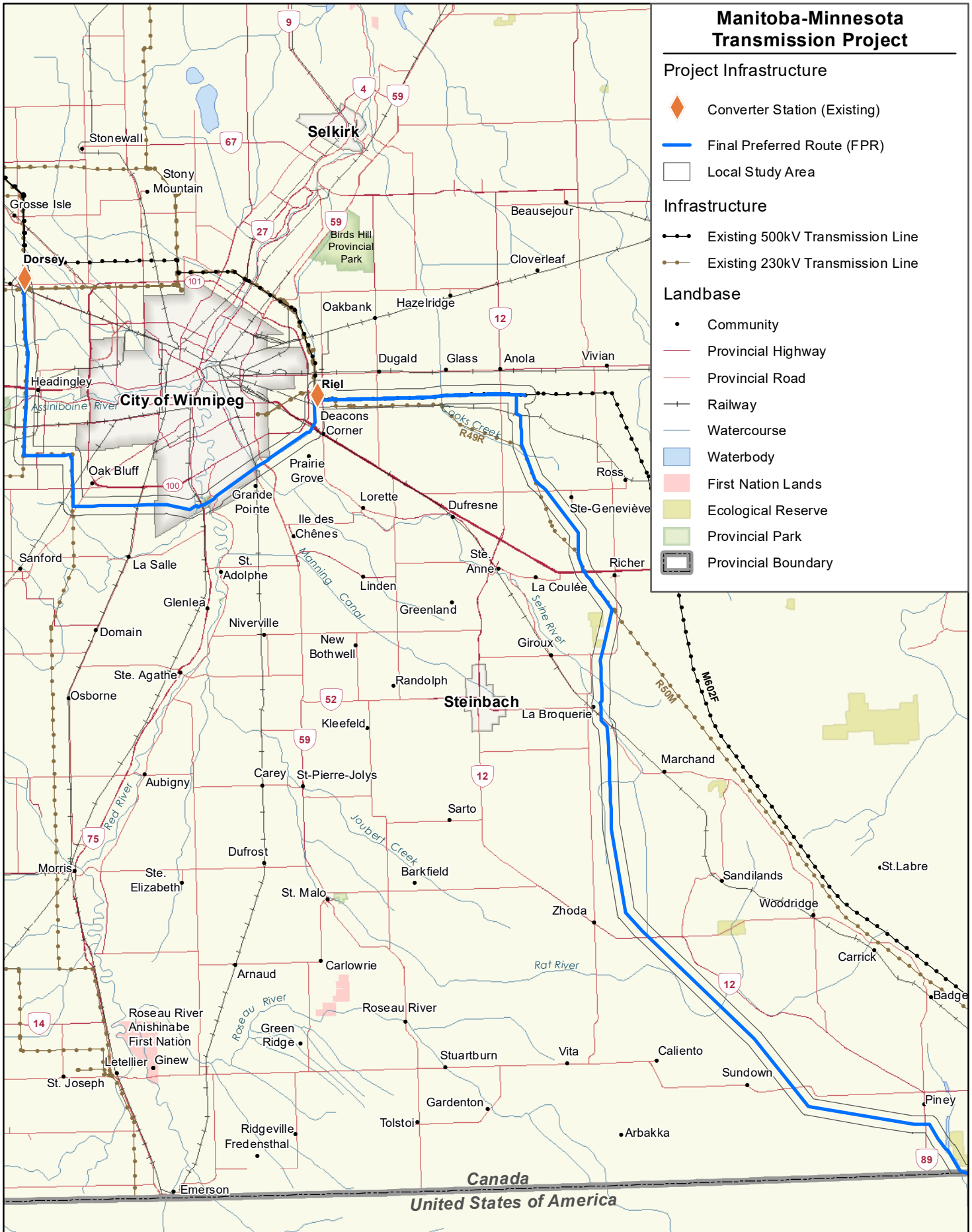
Infrastructure

-  Existing 500kV Transmission Line
-  Existing 230kV Transmission Line

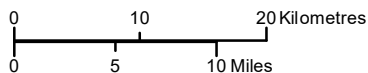
Landbase

-  Community
-  Provincial Highway
-  Provincial Road
-  Railway
-  Watercourse
-  Waterbody
-  First Nation Lands
-  Ecological Reserve
-  Provincial Park
-  Provincial Boundary

File Location: I:\CLIENTS\MANITOBA_HYDRO\115102\Map\Products\Vegetation\Szwaliuk\Environmental\Consulting\Kevin\Szwaliuk\2021\0916\MMTP_TECHREF_ProjectArea_600K_A_20210916.mxd



Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, MMM, Stantec, ProvMB, NRCAN, SEC
Date Created: September 16, 2021



**MMTP
Project Area**

Manitoba-Minnesota Transmission Project

Project Infrastructure

- ◆ Converter Station (Existing)
- Final Preferred Route (FPR)
- Local Study Area

Infrastructure

- Existing 500kV Transmission Line
- Existing 230kV Transmission Line

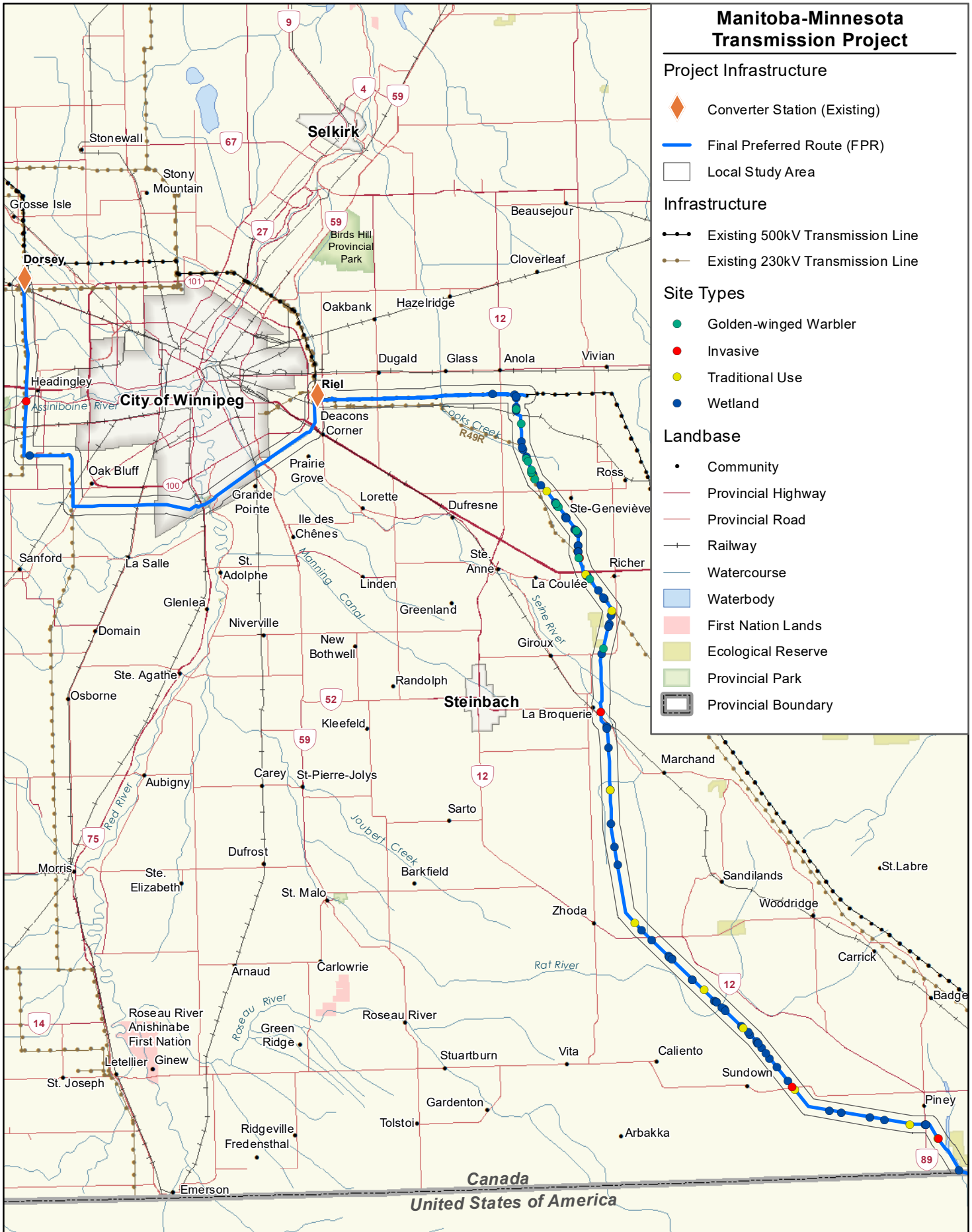
Site Types

- Golden-winged Warbler
- Invasive
- Traditional Use
- Wetland

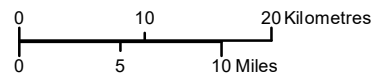
Landbase

- Community
- Provincial Highway
- Provincial Road
- Railway
- Watercourse
- Waterbody
- First Nation Lands
- Ecological Reserve
- Provincial Park
- Provincial Boundary

File Location: I:\CLIENTS\MANITOBA_HYDRO\15102\Mapping\Products\Vegetation\Site\Environmental\Sites_600k_A_20210917.mxd



Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, MMM, Stantec, ProvMB, NRCAN, SEC
Date Created: September 17, 2021



MMTP
Distribution of
Vegetation Sites

APPENDIX III. Potential environmental effects on botanical and vegetation resources as a result of the Project. Effects were identified from the Environmental Impact Statement, Chapter 9 and 10 (Manitoba Hydro 2015).

Number	Potential Environmental Effect
1	Change in vegetation landscape intactness.
2	Change in native vegetation cover class abundance, distribution and structure.
3	Change in wetland cover class abundance, distribution, structure and function.
4	Change in invasive plant species abundance and distribution.
5	Change in rare plant species abundance and distribution.
6	Change in traditional use plant species abundance and distribution.
7	Change in habitat availability.

APPENDIX IV. Project commitments for botanical and vegetation pre-construction surveys and environmental monitoring. Reference documents include the Environment Act Licence (Sustainable Development 2019), the Report on Public Hearing (Manitoba Clean Environment Commission 2017), the National Energy Board Certificate (National Energy Board 2019), and Environmental Impact Statement (Manitoba Hydro 2015).

Commitment Document	Page/Section or Clause	Environmental Component	Commitment Description Summary	Objectives to meet intent of Commitment
Licence	Clause 1	Future sampling, analysis and reporting	1. The Licencee shall, in addition to any of the specifications, limits, terms and conditions specified in this Licence, upon the request of the Director: a) sample, monitor, analyse or investigate specific areas of concern regarding any segment, component or aspect of the Development for such duration and at such frequencies as may be specified; b) determine the environmental impact associated from the Development; c) conduct specific investigations in response to the data gathered during environmental monitoring programs; and d) provide the Director, within such time as may be specified, with such reports, drawings, specifications, analytical data, descriptions of sampling and other information as may from time to time be requested.	Monitor the transmission line as specified; submit annual technical report detailing results and analysis of sampling program and recommendations for improvements where required.
Licence	Clause 10	Environmental Protection Plan	10. The Licencee shall submit, for approval of the Director of the Environmental Approvals Branch, a construction Environmental Protection Plan prior to construction, and an operations Environmental Protection Plan at least 90 days prior to in-service of the Development. The plans shall describe the approach to be used by the Licencee to ensure that mitigative measures are applied systematically, and in a manner consistent with the commitments made in the EIS and supporting information,	Manitoba Hydro to develop and submit Environmental Protection Plan.

			<p>during construction or operation of the Development. The plans shall:</p> <p>a) include information obtained from Indigenous communities prior to and during construction and operation of the Development regarding the locations of specifically identified sites used for the exercise of Indigenous rights-based activities in the vicinity of the project (such as plant harvesting, ceremonial practices, hunting, and trapping);</p> <p>b) include mitigation measures and/or buffer zones for the specific sites identified to minimize impacts to the sites from construction and operation activities;</p> <p>c) for specifically identified plant harvesting sites, identify measures to minimize impacts to the sites by implementing mitigation measure such as flagging of the area, buffers zones, selective clearing, construction matting, and non-chemical vegetation management; and</p> <p>d) include mitigation measures to reduce adverse effects on wildlife and wildlife habitat (e.g., timing windows, setbacks, and buffers).</p>	
Licence	Clause 12	Invasive species management plan	<p>The Licencee shall, prior to construction of the Development, submit management plans addressing the following topics for review by the Eastern Region IRMT and approval by the Director of the Environmental Approvals Branch:</p> <p>a) erosion protection and sediment control;</p> <p>b) rehabilitation and invasive species management, and</p> <p>c) waste and recycling.</p>	Manitoba Hydro to develop and submit rehabilitation and invasive species management plan.

Licence	Clause 28	ROW clearing plan	<p>The Licencee shall, prior to construction of the Development, submit a plan for clearing of the transmission line right-of-way for approval of the Director of the Environmental Approvals Branch. The plan shall:</p> <ul style="list-style-type: none"> a) describe the clearing methods to be used; and b) describe opportunities for retention of low-growth vegetation along the transmission line right-of-way, to the extent possible, without impeding maintenance activities or vegetation clearance requirements. 	Manitoba Hydro to develop and submit ROW clearing plan.
Licence	Clause 29	Timber Harvesting	<p>The Licencee shall, prior to construction of the Development, consult with the Regional Forester of the Forestry and Peatlands Branch related to the clearing of timber in association with the Development. Where an opportunity exists, a plan for timber operations may be established and timber shall be harvested and delivered to an approved destination identified by a scaling plan. In the event that no market exists, a timber valuation (Timber Damage Appraisal) shall be applied.</p>	Manitoba Hydro to consult with Regional Forester regarding timber clearing.
Licence	Clause 35	Wetlands	<p>The Licencee shall carry out activities associated with the Development that may disturb wetlands in the Caliento, Sundown, and Piney Bogs only under frozen ground conditions. Maintenance activities within these bogs shall be conducted under frozen ground conditions unless required to ensure the safe and reliable operation of the Development, in which case mitigation measures to reduce impacts to the bogs shall be implemented.</p>	Visual observations during monitoring of the transmission line RoW wetlands.

Licence	Clause 36	Wetlands	The Licencee shall, within three months of the completion of construction of the Development, submit a plan for approval of the Director of the Environmental Approvals Branch to ensure that there is no net loss of wetland benefits related to Class 3, 4, and 5 wetlands (as defined by the Stewart & Kantrud Classification System) that are altered or destroyed during construction of the Development.	Monitor wetlands, visual observations during monitoring of the transmission line RoW wetlands.
Licence	Clause 37	Golden Winged Warbler Habitat Management	The Licencee shall implement the plan titled "Right-of-Way Habitat Management Plan for Managing Critical Golden-winged Warbler Habitat during Construction and Operation of the Manitoba-Minnesota Transmission Project" submitted as supporting information on April 29, 2016, or any subsequent versions approved by the Director of the Environmental Approvals Branch.	Manitoba Hydro to develop and implement habitat management plan for golden winged warbler.
Licence	Clause 38	Invasive Species	The Licencee shall, prior to construction of the Development, submit a detailed biosecurity plan for approval of the Director of the Environmental Approvals Branch. The plan shall describe measures to be implemented to control the spread of invasive species as well as the spread of soil borne diseases from field to field in agricultural areas during construction of the Development.	Manitoba Hydro to develop and submit biosecurity plan. Follow biosecurity plan when accessing ROW. Monitor transmission line RoW for invasive species.

Licence	Clause 49	Vegetation Management Plan	The Licencee shall, within six months of the completion of construction of the Development, submit for review by the Eastern Region IRMT and approval of the Director of the Environmental Approvals Branch, a plan for the management of vegetation along the Dorsey international power line right-of-way. The plan shall describe the methods to be used for vegetation control and for communication to the public and Indigenous communities during operation of the Development.	Manitoba Hydro to develop vegetation management plan.
Licence	Clause 50	Integrated vegetation management review and reporting	The Licencee shall conduct reviews, and report to the Director of the Environmental Approvals Branch, on the results of integrated vegetation management practices implemented on the Dorsey international power line right-of-way of the Development 5 and 10 years after; the completion of construction and as determined by the Director thereafter.	Manitoba Hydro to conduct reviews and report on integrated vegetation management.
Licence	Clause 52	Herbicide Use	The Licencee shall provide notification to local Indigenous communities a minimum of 30 days prior to the application of herbicides within the transmission right-of-way of the Development.	Manitoba Hydro to provide notification to Indigenous communities.
Licence	Clause 53	Monitoring	The Licencee shall, prior to construction, submit a monitoring plan for the Development for the approval of the Director of the Environmental Approvals Manitoba Hydro - Manitoba-Minnesota Transmission Project Branch. The plan shall describe monitoring programs to be undertaken in relation to the Development, including proposed programs for: a) collection of baseline information; b) pre-construction surveys of the eastern tiger salamander and mottled duskywing butterfly obligate plant host, in areas of	Manitoba Hydro to conduct pre-construction surveys.

			likely habitat; c) inclusion of the least bittern and the short-eared owl in surveys; d) pre-construction surveys for traditional use plant species and invasive plant species in areas of the Development where information on these plant species is insufficient.	
Licence	Clause 56	Reporting	<p>The Licencee shall submit annual reports to the Director of the Environmental Approvals Branch, on the results of monitoring programs approved pursuant to Clause 53 of this Licence for the duration of the monitoring programs. The reports shall:</p> <ul style="list-style-type: none"> a) report on the accuracy of predictions made in the EIS and supporting information, b) report on the success of the mitigation measures employed during construction and operation, c) provide a description of the adaptive management measures undertaken to address issues, and commitments for future mitigation; d) identify any unexpected environmental effects of the Development; e) identify additional mitigation measures to address unanticipated environmental effects, if required; f) report on how input from the monitoring advisory group, formed pursuant to Clause 55 of this licence, was incorporated into the monitoring program; and g) propose changes to the monitoring programs based on the results of the annual assessments. 	Manitoba Hydro to submit annual monitoring report.














NEB Certificate	Condition 10	Construction Environmental Protection Plan	<p>Manitoba Hydro must file with the Board for approval, at least ninety (90) days prior to commencing construction, an updated Project-specific Construction Environmental Protection Plan (CEPP) which includes:</p> <ul style="list-style-type: none"> a) all environmental protection, mitigation and monitoring measures and commitments, as set out in its Application, draft CEPP, or otherwise agreed to in its subsequent filings during both the Manitoba Clean Environment Commission hearing process and the Board's EH-001-2017 proceeding, and including any criteria that will be used to implement those measures; b) any updates from outstanding pre-construction surveys; c) the following plans: <ul style="list-style-type: none"> i) clearing management plan ii) blasting plan iii) erosion protection and sediment control plan iv) golden-winged warbler habitat management plan v) cultural and resource heritage protection plan vi) navigation and navigation safety plan (see Condition 9) vii) waste and recycling management plan viii) emergency preparedness and response plan (see Condition 14) ix) rehabilitation and invasive species management plan x) biosecurity management plan xi) access management plan xii) environmental monitoring plan xiii) integrated vegetation management plan; d) orthophoto maps of the Project footprint, which include the identification of environmental features, Manitoba Hydro's Environmentally Sensitive Sites, and mitigation measures to be applied. 	Manitoba Hydro to develop and file CEPP.
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NEB Certificate	Condition 23	Post-construction Monitoring Reports	<p>Manitoba Hydro must file with the Board, on or before 31 January following the first year of Project operations and for a period of at least ten (10) years after commencing operations, annual post-construction monitoring reports. These reports must include:</p> <ul style="list-style-type: none"> a) a description of monitoring methods used; b) identification, including on a map or diagram, of any reclamation or other environmental issues which arose during construction or in the course of the previous year; c) a description of the valued components or issues that were assessed or monitored, as outlined in Manitoba Hydro's Environmental Monitoring Plan (see Condition 10); d) the monitoring results, including a comparison to measurable goals; e) an assessment of the effectiveness of the mitigation measures implemented and the accuracy the environmental assessment predictions; f) a description of any corrective actions taken, their observed success and current status; and, g) a schedule outlining when further corrective actions will be implemented or monitoring conducted to address any unresolved issues. 	Manitoba Hydro to complete post-construction monitoring and submit reports.
NEB Certificate	Condition 26	Wetland Offset Measures	<p>Manitoba Hydro must file with the Board for approval, within ninety (90) days of commencing operation of the Project, a Wetland Offset Measures Plan which outlines how permanent loss to wetlands resulting from the Project will be offset or compensated for. This plan must include:</p> <ul style="list-style-type: none"> a) a description of site-specific details and maps showing the locations of permanent wetland loss as a result of Project activities at Dorsey Converter 	Manitoba Hydro to develop and file wetland offset measures plan.

			<p>Station and the transmission tower locations, as well as any other locations where wetlands were affected by the Project;</p> <p>b) an explanation of how wetland function will be measured during the post-construction monitoring program, and any resulting accidental permanent loss to wetlands quantified and reported to the Board as part of Condition 23;</p> <p>c) a list of the offset or compensation measures that will be implemented to address permanent loss of wetlands as identified in a) and b) above;</p> <p>d) an explanation of the expected effectiveness of each offset measure described in c) and the relative value of each offset measure towards achieving the offset;</p> <p>e) the decision-making criteria for selecting specific offset measures and offset ratios that would be used under what circumstances;</p> <p>f) a schedule indicating when measures will be implemented and estimated completion date(s);</p> <p>g) evidence and summary of consultation with provincial and federal authorities, any non-governmental expert bodies, and any impacted Indigenous communities regarding the plan; and,</p> <p>h) this summary must include a description of any issues or concerns raised regarding the plan by Indigenous communities, and how Manitoba Hydro has addressed or responded to them.</p>	
CEC Report	Page 77	Vegetation and Wetlands	Manitoba Hydro expand traditional-use and invasive-plant surveys, with input from Indigenous and local knowledge holders, prior to construction, to include areas within the Local Assessment Area on Crown and private land that were not	Manitoba Hydro to conduct pre-construction surveys along transmission line ROW for invasive species, and traditional use

			sampled or that were insufficiently sampled in preparation for the EIS. An example would be the area affected by the change to the Piney border crossing.	plants and in areas that were insufficiently sampled during EIS preparation.
CEC Report	Page 143	Integrated Vegetation Management	Manitoba Hydro submit to Manitoba Sustainable Development a review of integrated vegetation-management practices for the ROW on an annual basis for the first 10 years of operations and as determined by the department after 10 years.	Manitoba Hydro to develop and implement vegetation control plan.
EIS, Chapter 10	10-116	Rare Plants	Survey for SCC and SAR plant species in areas not previously surveyed that have the potential to provide habitat for SCC; monitor changes in rare plant species occurrences in areas along the PDA.	Pre-construction surveys and environmental monitoring.
EIS, Chapter 10	10-116	Invasive Plants Species	Monitor existing invasive plant species at construction sites and equipment clearing sites, if construction occurs during the growing season; monitor compliance for clean equipment.	Environmental monitoring.

APPENDIX V. Weed density distribution classes.

Class	Description of Abundance In Polygon	Distribution
0	None	
1	Rare	
2	A few sporadically occurring individual plants	
3	A single patch	
4	A single patch plus a few sporadically occurring plants	
5	Several sporadically occurring plants	
6	A single patch plus several sporadically occurring plants	
7	A few patches	
8	A few patches plus several sporadically occurring plants	
9	Several well-spaced patches	
10	Continuous uniform occurrences of well-spaced plants	
11	Continuous occurrence of plants with a few gaps in the distribution	
12	Continuous dense occurrence of plants	
13	Continuous occurrence of plants with a distinct linear edge in the polygon	

Source: Adams et al. (2009).

APPENDIX VI. Location of vegetation sample plots and sites visited.

Site	Easting	Northing	Datum	UTM Zone	Date
MM-WET-120	671723	5525049	NAD83	14 U	20-07-2021
MM-WET-121	671704	5523672	NAD83	14 U	20-07-2021
MM-WET-123	671762	5523477	NAD83	14 U	20-07-2021
MM-WET-125	672565	5518845	NAD83	14 U	20-07-2021
MM-WET-137	677764	5510671	NAD83	14 U	20-07-2021
MM-WET-139	680270	5503621	NAD83	14 U	18-07-2021
MM-WET-141	682278	5500965	NAD83	14 U	21-07-2021
MM-WET-142	682881	5497929	NAD83	14 U	21-07-2021
MM-WET-186	690378	5457772	NAD83	14 U	21-07-2021
MM-WET-188	692901	5455286	NAD83	14 U	18-07-2021
MM-WET-194	696741	5451633	NAD83	14 U	21-07-2021
MM-WET-197	699737	5448678	NAD83	14 U	20-07-2021
MM-WET-199	701235	5447052	NAD83	14 U	20-07-2021
MM-WET-200	702132	5445798	NAD83	14 U	20-07-2021
MM-WET-201	704300	5443083	NAD83	14 U	20-07-2021
MM-WET-209	282507	5437749	NAD83	15 U	18-07-2021
MM-GWW-001	682148	5494993	NAD83	14 U	05-08-2021
MM-GWW-004	680541	5503310	NAD83	14 U	05-08-2021
MM-GWW-006	679262	5505807	NAD83	14 U	05-08-2021
MM-GWW-008	678933	5509103	NAD83	14 U	06-08-2021
MM-GWW-009	676776	5511944	NAD83	14 U	06-08-2021
MM-GWW-010	676474	5512327	NAD83	14 U	06-08-2021
MM-GWW-013	673975	5515270	NAD83	14 U	07-08-2021
MM-GWW-015	673596	5516107	NAD83	14 U	07-08-2021
MM-GWW-016	673532	5516435	NAD83	14 U	07-08-2021
MM-GWW-018	672979	5517754	NAD83	14 U	04-08-2021
MM-GWW-019	672298	5521970	NAD83	14 U	04-08-2021
MM-GWW-022	671699	5523733	NAD83	14 U	04-08-2021
MM-GWW-024	673133	5517451	NAD83	14 U	04-08-2021
MM-ATK-131	673864	5515469	NAD83	14 U	04-08-2021
MM-ATK-165	682972	5478040	NAD83	14 U	05-08-2021
MM-ATK-179	685974	5462026	NAD83	14 U	05-08-2021
MM-ATK-215	675366	5513828	NAD83	14 U	04-08-2021
MM-ATK-216	683219	5499542	NAD83	14 U	05-08-2021
MM-ATK-219	694299	5453976	NAD83	14 U	06-08-2021
MM-ATK-220	698968	5449447	NAD83	14 U	06-08-2021
MM-ATK-222	680089	5503874	NAD83	14 U	04-08-2021
MM-ATK-223	719019	5437895	NAD83	14 U	07-08-2021
MM-ATK-224	283879	5435907	NAD83	15 U	07-08-2021
MM-ATK-226	705165	5442028	NAD83	14 U	06-08-2021
MM-INV-203	704883	5442319	NAD83	14 U	15-08-2021
MM-Tower-39	612870	5524675	NAD83	14 U	08-08-2021
MM-Tower-277	679305	5505803	NAD83	14 U	05-08-2021

Site	Easting	Northing	Datum	UTM Zone	Date
MM-Tower-323	681875	5487368	NAD83	14 U	05-08-2021
MM-Tower-477	282507	5437749	NAD83	15 U	08-08-2021
MM-Tower-483	283899	5435897	NAD83	15 U	08-08-2021
MM-AQUA-300A	613281	5518098	NAD83	14 U	19-07-2021
MM-AQUA-300	668871	5525511	NAD83	14 U	19-07-2021
MM-AQUA-301	671537	5525458	NAD83	14 U	19-07-2021
MM-AQUA-302	671692	5525252	NAD83	14 U	19-07-2021
MM-AQUA-303	671718	5523877	NAD83	14 U	19-07-2021
MM-AQUA-304	671723	5523620	NAD83	14 U	19-07-2021
MM-AQUA-305	672335	5519905	NAD83	14 U	19-07-2021
MM-AQUA-308	672460	5519162	NAD83	14 U	19-07-2021
MM-AQUA-308A	672909	5517984	NAD83	14 U	19-07-2021
MM-AQUA-309	673665	5516003	NAD83	14 U	19-07-2021
MM-AQUA-309A	673720	5515859	NAD83	14 U	19-07-2021
MM-AQUA-310	674635	5514541	NAD83	14 U	19-07-2021
MM-AQUA-310A	676367	5512506	NAD83	14 U	19-07-2021
MM-AQUA-310B	676624	5512169	NAD83	14 U	19-07-2021
MM-AQUA-310C	676759	5511993	NAD83	14 U	19-07-2021
MM-AQUA-311	677626	5510857	NAD83	14 U	19-07-2021
MM-AQUA-312	677776	5510660	NAD83	14 U	19-07-2021
MM-AQUA-313	678789	5509333	NAD83	14 U	19-07-2021
MM-AQUA-314	678873	5509223	NAD83	14 U	19-07-2021
MM-AQUA-316	679025	5509024	NAD83	14 U	19-07-2021
MM-AQUA-317	679141	5508793	NAD83	14 U	19-07-2021
MM-AQUA-318	679124	5507379	NAD83	14 U	19-07-2021
MM-AQUA-319	679123	5507297	NAD83	14 U	19-07-2021
MM-AQUA-320	679115	5506655	NAD83	14 U	19-07-2021
MM-AQUA-321	679114	5506595	NAD83	14 U	19-07-2021
MM-AQUA-322	679113	5506519	NAD83	14 U	19-07-2021
MM-AQUA-322B	680196	5503729	NAD83	14 U	19-07-2021
MM-AQUA-322A	680234	5503678	NAD83	14 U	19-07-2021
MM-AQUA-323	681539	5501939	NAD83	14 U	19-07-2021
MM-AQUA-324	682161	5501110	NAD83	14 U	19-07-2021
MM-AQUA-325	683104	5498969	NAD83	14 U	19-07-2021
MM-AQUA-326	682795	5497649	NAD83	14 U	19-07-2021
MM-AQUA-327	682032	5494396	NAD83	14 U	19-07-2021
MM-AQUA-328	682627	5485629	NAD83	14 U	19-07-2021
MM-AQUA-329	682643	5485426	NAD83	14 U	19-07-2021
MM-AQUA-329A	682818	5483116	NAD83	14 U	19-07-2021
MM-AQUA-330	682986	5478047	NAD83	14 U	19-07-2021
MM-AQUA-331	683128	5473917	NAD83	14 U	19-07-2021
MM-AQUA-332	683527	5471154	NAD83	14 U	19-07-2021
MM-AQUA-333	683886	5469050	NAD83	14 U	19-07-2021
MM-AQUA-333B	686806	5461150	NAD83	14 U	19-07-2021
MM-AQUA-333A	687975	5460018	NAD83	14 U	19-07-2021

Site	Easting	Northing	Datum	UTM Zone	Date
MM-AQUA-334	689988	5458083	NAD83	14 U	19-07-2021
MM-AQUA-335	690160	5457917	NAD83	14 U	19-07-2021
MM-AQUA-336	690438	5457650	NAD83	14 U	19-07-2021
MM-AQUA-337	692904	5455280	NAD83	14 U	19-07-2021
MM-AQUA-338	695558	5452729	NAD83	14 U	19-07-2021
MM-AQUA-339	695679	5452612	NAD83	14 U	19-07-2021
MM-AQUA-340	695850	5452448	NAD83	14 U	19-07-2021
MM-AQUA-341	696418	5451901	NAD83	14 U	19-07-2021
MM-AQUA-342	696866	5451471	NAD83	14 U	19-07-2021
MM-AQUA-343	698710	5449699	NAD83	14 U	19-07-2021
MM-AQUA-344	699525	5448915	NAD83	14 U	19-07-2021
MM-AQUA-345	700614	5447775	NAD83	14 U	19-07-2021
MM-AQUA-346	700700	5447665	NAD83	14 U	19-07-2021
MM-AQUA-347	700772	5447574	NAD83	14 U	19-07-2021
MM-AQUA-348	701732	5446358	NAD83	14 U	19-07-2021
MM-AQUA-349	702982	5444774	NAD83	14 U	19-07-2021
MM-AQUA-350	709334	5439532	NAD83	14 U	19-07-2021
MM-AQUA-351	710726	5439297	NAD83	14 U	19-07-2021
MM-AQUA-351A	714209	5438707	NAD83	14 U	19-07-2021
MM-AQUA-352	715915	5438419	NAD83	14 U	19-07-2021
MM-AQUA-352A	720756	5437879	NAD83	14 U	19-07-2021
MM-AQUA-353	724876	5432377	NAD83	14 U	19-07-2021

APPENDIX VII. Species of conservation concern recorded at or near surveys.

Site	Species	Common Name	Rank
MM-ATK-219	<i>Agalinis tenuifolia</i>	Narrow-leaved Agalinis	S3
MM-GWW-018	<i>Agalinis tenuifolia</i>	Narrow-leaved Agalinis	S3
MM-ATK-131	<i>Agrimonia gryposepala</i>	Common Agrimony	S1S2
MM-ATK-216	<i>Amphicarpaea bracteata</i>	Hog-peanut	S3S5
MM-ATK-222	<i>Amphicarpaea bracteata</i>	Hog-peanut	S3S5
MM-ATK-220	<i>Asarum canadense</i>	Wild Ginger	S3S4
MM-WET-137	<i>Asclepias incarnata</i>	Swamp Milkweed	S3S4
MM-WET-200	<i>Asclepias incarnata</i>	Swamp Milkweed	S3S4
MM-WET-209	<i>Bromus pumpellianus</i>	Pumpelly's Brome	S3S4
MM-GWW-004	<i>Bromus pumpellianus</i>	Pumpelly's Brome	S3S4
MM-GWW-018	<i>Bromus pumpellianus</i>	Pumpelly's Brome	S3S4
MM-WET-201	<i>Carex prairea</i>	Prairie Sedge	S3S4
MM-WET-201	<i>Chelone glabra</i>	White Turtlehead	S2
MM-ATK-223	<i>Chelone glabra</i>	White Turtlehead	S2
MM-ATK-165	<i>Corispermum americanum</i>	American Bugseed	S3
MM-ATK-219	<i>Corispermum americanum</i>	American Bugseed	S3
MM-ATK-219	<i>Corispermum villosum</i>	Hairy Bugseed	S1S2
MM-ATK-219	<i>Cyperus houghtonii</i>	Houghton's Flatsedge	S2S3
MM-ATK-223	<i>Dryopteris cristata</i>	Crested Shield Fern	S3S4
MM-ATK-216	<i>Fraxinus nigra</i>	Black Ash	S2
MM-ATK-222	<i>Fraxinus nigra</i>	Black Ash	S2
MM-ATK-165	<i>Gentiana rubricaulis</i>	Closed Gentian	S3
MM-WET-209	<i>Geum rivale</i>	Water or Purple Avens	S3S4
MM-WET-142	<i>Iris versicolor</i>	Blue Flag	S3S4
MM-WET-197	<i>Iris versicolor</i>	Blue Flag	S3S4
MM-WET-200	<i>Iris versicolor</i>	Blue Flag	S3S4
MM-WET-201	<i>Iris versicolor</i>	Blue Flag	S3S4
MM-ATK-179	<i>Iris versicolor</i>	Blue Flag	S3S4
MM-ATK-216	<i>Iris versicolor</i>	Blue Flag	S3S4
MM-ATK-223	<i>Iris versicolor</i>	Blue Flag	S3S4
MM-WET-200	<i>Muhlenbergia racemosa</i>	Marsh Muhly	S3S4
MM-ATK-220	<i>Ostrya virginiana</i>	Hop-hornbeam	S2
MM-WET-200	<i>Pedicularis lanceolata</i>	Swamp Lousewort	S3S4
MM-WET-201	<i>Pedicularis lanceolata</i>	Swamp Lousewort	S3S4
MM-ATK-165	<i>Pedicularis lanceolata</i>	Swamp Lousewort	S3S4
MM-ATK-216	<i>Pedicularis lanceolata</i>	Swamp Lousewort	S3S4
MM-WET-201	<i>Salix pellita</i>	Satin Willow	S3S4
MM-ATK-224	<i>Schizachyrium scoparium</i>	Little Bluestem	S3S4
MM-GWW-013	<i>Scirpus pallidus</i>	Green Bulrush	S3S4
MM-GWW-018	<i>Solidago riddellii</i>	Riddell's Goldenrod	S2S3
MM-WET-201	<i>Solidago uliginosa</i>	Bog Goldenrod	S3
MM-ATK-223	<i>Stellaria crassifolia</i>	Fleshy Stitchwort	S3S4
MM-WET-120	<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4
MM-WET-123	<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4

MM-WET-137	<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4
MM-WET-139	<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4
MM-WET-141	<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4
MM-WET-142	<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4
MM-WET-194	<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4
MM-WET-199	<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4
MM-WET-209	<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4
MM-ATK-224	<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4

APPENDIX VIII. List of flora recorded in MMTP surveys and sampling, 2021.

Family/Species	Common Name	MBCDC Rank
VASCULAR SPECIES		
Pteridophytes – Ferns and Allies		
DENNSTAEDTIACEAE	BRACKEN FAMILY	
<i>Pteridium aquilinum</i>	Bracken Fern	S3S4
DRYOPTERIDACEAE	WOOD FERN FAMILY	
<i>Athyrium filix-femina</i>	Lady Fern	S5
<i>Dryopteris cristata</i>	Crested Shield Fern	S3S4
EQUISETACEAE	HORSETAIL FAMILY	
<i>Equisetum arvense</i>	Common Horsetail	S5
<i>Equisetum fluviatile</i>	Swamp Horsetail	S5
<i>Equisetum hyemale</i>	Common Scouring-rush	S5
<i>Equisetum palustre</i>	Marsh Horsetail	S4S5
<i>Equisetum pratense</i>	Meadow Horsetail	S4S5
<i>Equisetum sylvaticum</i>	Wood Horsetail	S5
Gymnosperms		
PINACEAE	PINE FAMILY	
<i>Larix laricina</i>	Tamarack	S5
<i>Picea glauca</i>	White Spruce	S5
Angiosperms - Monocotyledons		
ALISMATACEAE	ARROWHEAD FAMILY	
<i>Alisma triviale</i>	Common Water Plantain	S5
CYPERACEAE	SEDGE FAMILY	
<i>Carex aquatilis</i>	Water Sedge	S5
<i>Carex aurea</i>	Golden Sedge	S5
<i>Carex bebbii</i>	Bebb's Sedge	S5
<i>Carex buxbaumii</i>	Brown Sedge	S4S5
<i>Carex capillaris</i>	Hair-like Sedge	S5
<i>Carex foenea</i>	Hay Sedge	S5
<i>Carex granularis</i>	Granular Sedge	S4?
<i>Carex lacustris</i>	Lakeshore Sedge	S5
<i>Carex lasiocarpa</i>	Hairy-fruited Sedge	S5
<i>Carex leptalea</i>	Bristle-stalked Sedge	S5

<i>Carex limosa</i>	Mud Sedge	S5
<i>Carex pellita</i>	Woolly Sedge	S5
<i>Carex prairea</i>	Prairie Sedge	S3S4
<i>Carex pseudocyperus</i>	Cyperus-like Sedge	S4
<i>Carex rossii</i>	Ross' Sedge	S4S5
<i>Carex stipata</i>	Awl-fruited Sedge	S4?
<i>Carex trisperma</i>	Three-seeded Sedge	S4S5
<i>Carex utriculata</i>	Beaked Sedge	S5
<i>Carex vaginata</i>	Sheathed Sedge	S5
<i>Carex</i> spp.	Sedge	
<i>Cyperus houghtonii</i>	Houghton's Flatsedge	S2S3
<i>Eleocharis elliptica</i>	Elliptic Spikerush	SU
<i>Eleocharis</i> sp.	A Spike-rush	
<i>Eriophorum</i> sp.	Cotton-grass	S5
<i>Schoenoplectus acutus</i>	Hard-stemmed Bulrush	S4
<i>Schoenoplectus tabernaemontani</i>	Soft-stem Bulrush	S5
<i>Scirpus atrovirens</i>	Dark-green Bulrush	SU
<i>Scirpus cyperinus</i>	Woolly Bulrush	S4S5
<i>Scirpus pallidus</i>	Green Bulrush	S3S4
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IRIDACEAE	IRIS FAMILY	
<i>Iris versicolor</i>	Blue Flag	S3S4
<i>Sisyrinchium montanum</i>	Blue-eyed Grass	S5
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JUNCACEAE	RUSH FAMILY	
<i>Juncus arcticus</i> var. <i>balticus</i>	Baltic Rush	S5
<i>Juncus nodosus</i>	Knotted Rush	S5
<i>Juncus tenuis</i>	Slender Rush	S4S5
<i>Juncus</i> sp.	A Rush	
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JUNCAGINACEAE	ARROW-GRASS FAMILY	
<i>Triglochin palustris</i>	Marsh Arrow-grass	S4S5
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LEMNACEAE	DUCKWEED FAMILY	
<i>Lemna turionifera</i>	Turion Duckweed	SU
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LILIACEAE	LILY FAMILY	
<i>Maianthemum canadense</i>	Canada May Flower	S5
<i>Maianthemum stellatum</i>	Solomon's Seal	S5
<i>Maianthemum trifolium</i>	Three-leaved Solomon's-seal	S5
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POACEAE	GRASS FAMILY	

<i>Agrostis scabra</i>	Ticklegrass	S5
<i>Agrostis stolonifera</i>	Creeping Bentgrass	SNA
<i>Andropogon gerardii</i>	Big Bluestem	S5
<i>Beckmannia syzigachne</i>	Slough Grass	S5
<i>Bromus ciliatus</i>	Fringed Brome	S5
<i>Bromus inermis</i>	Smooth Brome	SNA
<i>Bromus pumpellianus</i>	Pumpelly's Brome	S3S4
<i>Bromus</i> sp.	A Brome grass	
<i>Calamagrostis canadensis</i>	Bluejoint Reedgrass	S5
<i>Calamagrostis</i> spp.	A Reedgrass	
<i>Cinna latifolia</i>	Slender Woodreed	S5
<i>Danthonia spicata</i>	Poverty Oat Grass	S4S5
<i>Deschampsia cespitosa</i>	Tufted Hairgrass	S4S5
<i>Echinochloa crus-galli</i>	Barnyard Grass	SNA
<i>Elymus canadensis</i>	Great Plains Wild Rye	S4S5
<i>Elymus repens</i>	Quackgrass	SNA
<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	Slender Wildrye	S5
<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>	One-sided Wildrye	SNR
<i>Glyceria grandis</i>	Tall Mannagrass	S5
<i>Glyceria striata</i>	Fowl Manna Grass	S5
<i>Hordeum jubatum</i>	Wild Barley	S5
<i>Hordeum vulgare</i>	Common Barley	SNA
<i>Koeleria macrantha</i>	Prairie Junegrass	S5
<i>Muhlenbergia glomerata</i>	Bog Muhly	S4
<i>Muhlenbergia racemosa</i>	Marsh Muhly	S3S4
<i>Muhlenbergia</i> sp.	A Muhly grass	
<i>Oryzopsis asperifolia</i>	Rice Grass	S5
<i>Panicum capillare</i>	Common Panicgrass	S4S5
<i>Phalaris arundinacea</i>	Reed Canarygrass	S5
<i>Phleum pratense</i>	Timothy	SNA
<i>Phragmites australis</i>	Common Reed	S5
<i>Poa palustris</i>	Fowl Bluegrass	S5
<i>Poa pratensis</i>	Kentucky Bluegrass	S5
<i>Poa</i> spp.	Bluegrass	
<i>Schizachne purpurascens</i>	Purple Oat Grass	S5
<i>Schizachyrium scoparium</i>	Little Bluestem	S3S4
<i>Scolochloa festucacea</i>	Common Rivergrass	S4S5
<i>Setaria viridis</i>	Green Foxtail	SNA

POTAMOGETONACEAE

Potamogeton gramineus

PONDWEED FAMILY

Various-leaved Pondweed

S5

SMILACACEAE

GREENBRIAR FAMILY

<i>Smilax lasioneura</i>	Carrion Flower	S4S5
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SPARGANIACEAE		
<i>Sparganium eurycarpum</i>	Broad-fruited Bur-reed	S4S5
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TYPHACEAE	CAT-TAIL FAMILY	
<i>Typha angustifolia</i>	Narrow-leaved Cattail	S3S4
<i>Typha latifolia</i>	Common Cat-tail	S4S5
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Angiosperms – Dicotyledons		
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ACERACEAE	MAPLE FAMILY	
<i>Acer negundo</i>	Manitoba Maple	S5
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ACORACEAE	SWEET-FLAG FAMILY	
<i>Acorus americanus</i>	Sweet Flag	S4S5
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ANACARDIACEAE	SUMAC FAMILY	
<i>Toxicodendron rydbergii</i>	Poison Ivy	S5
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APIACEAE	CARROT FAMILY	
<i>Cicuta maculata</i>	Spotted Water Hemlock	S4S5
<i>Sanicula marilandica</i>	Seneca Snakeroot	S5
<i>Sium suave</i>	Water Parsnip	S5
<i>Zizia aptera</i>	Heart-leaved Alexander	S5
<i>Zizia aurea</i>	Golden Alexanders	S4S5
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APOCYNACEAE	DOGBANE FAMILY	
<i>Apocynum androsaemifolium</i>	Spreading Dogbane	S5
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ARALIACEAE	GINSENG FAMILY	
<i>Aralia hispida</i>	Bristly Sarsaparilla	S4S5
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	S5
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ARISTOLOCHIACEAE	BIRTHWORT FAMILY	
<i>Asarum canadense</i>	Wild Ginger	S3S4
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ASCLEPIADACEAE	MILKWEED FAMILY	
<i>Asclepias incarnata</i>	Swamp Milkweed	S3S4
<i>Asclepias</i> sp	A Milkweed	
<hr/>		
ASTERACEAE	ASTER FAMILY	
<i>Achillea millefolium</i>	Yarrow	S5

<i>Ambrosia artemisiifolia</i>	Common Ragweed	S5
<i>Artemisia absinthium</i>	Wormwood	SNA
<i>Artemisia ludoviciana</i>	Prairie Sage	S5
<i>Bidens cernua</i>	Nodding Beggarticks	S5
<i>Cirsium arvense</i>	Canada Thistle	SNA
<i>Cirsium vulgare</i>	Bull Thistle	SNA
<i>Cirsium</i> sp.	A Thistle	
<i>Doellingeria umbellata</i>	Flat-topped White Aster	S5
<i>Erigeron canadensis</i>	Canada Horse-weed	S5
<i>Erigeron philadelphicus</i>	Philadelphia Fleabane	S5
<i>Euthamia graminifolia</i>	Flat-topped Goldenrod	S5
<i>Eutrochium maculatum</i>	Spotted Joe Pye Weed	S5
<i>Helianthus maximiliani</i>	Narrow-leaved Sunflower	S5
<i>Heliopsis helianthoides</i>	False Sunflower	S5
<i>Hieracium umbellatum</i>	Northern Hawkweed	S5
<i>Lactuca biennis</i>	Tall Blue Lettuce	S4
<i>Leucanthemum vulgare</i>	Ox-eye Daisy	SNA
<i>Liatris ligulistylis</i>	Meadow Blazing Star	S4
<i>Nabalus albus</i>	White Rattlesnake-root	S5
<i>Packera paupercula</i>	Balsam Groundsel	S5
<i>Petasites frigidus</i> var. <i>palmatus</i>	Palmate-leaved Coltsfoot	S5
<i>Petasites frigidus</i> var. <i>sagittatus</i>	Arrow-leaved Coltsfoot	S5
<i>Petasites frigidus</i> var. <i>x vitifolius</i>	Vine-leaved Coltsfoot	SNA
<i>Rudbeckia hirta</i>	Black-eyed Susan	S5
<i>Solidago canadensis</i>	Canada Goldenrod	S5
<i>Solidago gigantea</i>	Giant Goldenrod	S5
<i>Solidago hispida</i>	Hairy Goldenrod	S5
<i>Solidago riddellii</i>	Riddell's Goldenrod	S2S3
<i>Solidago rigida</i>	Stiff Goldenrod	S5
<i>Solidago uliginosa</i>	Bog Goldenrod	S3
<i>Solidago</i> spp.	Goldenrod	
<i>Sonchus arvensis</i>	Field Sow-thistle	SNA
<i>Sonchus asper</i>	Spiny-leaved Sow-thistle	SNA
<i>Symphyotrichum boreale</i>	Northern Bog Aster	S4S5
<i>Symphyotrichum ciliolatum</i>	Lindley's Aster	S5
<i>Symphyotrichum ericoides</i>	Many-flowered Aster	S4
<i>Symphyotrichum laeve</i>	Smooth Aster	S5
<i>Symphyotrichum lateriflorum</i>	Calico Aster	S4
<i>Symphyotrichum puniceum</i>	Purple-stemmed Aster	S5
<i>Symphyotrichum</i> spp.	An Aster	
<i>Tanacetum vulgare</i>	Common Tansy	SNA

<i>Taraxacum officinale</i>	Common Dandelion	SNA
<i>Tragopogon dubius</i>	Goat's-beard	SNA
<i>Tripleurospermum inodorum</i>	Scentless False Mayweed	SNA
<hr/>		
BALSAMINACEAE	TOUCH-ME-NOT FAMILY	
<i>Impatiens capensis</i>	Jewelweed	S5
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BETULACEAE	BIRCH FAMILY	
<i>Alnus alnobetula</i>	Green Alder	S5
<i>Alnus incana</i>	Speckled Alder	S5
<i>Betula papyrifera</i>	Paper Birch	S5
<i>Betula pumila</i>	Dwarf Birch	S5
<i>Corylus cornuta</i>	Beaked Hazelnut	S5
<i>Corylus</i> sp.	A Hazelnut	
<i>Ostrya virginiana</i>	Hop-hornbeam	S2
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BORAGINACEAE	BORAGE FAMILY	
<i>Lithospermum canescens</i>	Hoary Puccoon	S5
<i>Myosotis scirpoides</i>	Marsh Forget-me-not	SNA
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BRASSICACEAE	MUSTARD FAMILY	
<i>Berteroa incana</i>	Hoary Alyssum	SNA
<i>Brassica rapa</i>	Bird's Rape	SNA
<i>Erucastrum galicum</i>	Dog-mustard	SNA
<i>Thlaspi arvense</i>	Field Pennycress	SNA
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CAMPANULACEAE	BELLFLOWER FAMILY	
<i>Campanula aparinoides</i>	Marsh Bellflower	S5
<i>Campanula rotundifolia</i>	Harebells	S5
<i>Lobelia kalmii</i>	Kalm's Lobelia	S5
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CAPRIFOLIACEAE	HONEYSUCKLE FAMILY	
<i>Lonicera dioica</i>	Twining Honeysuckle	S5
<i>Lonicera villosa</i>	Mountain-fly-honeysuckle	S5
<i>Symphoricarpos albus</i>	Snowberry	S4S5
<i>Symphoricarpos occidentalis</i>	Western Snowberry	S5
<i>Viburnum lentago</i>	Nannyberry	S4
<i>Viburnum opulus</i>	High-bush Cranberry	S5
<i>Viburnum rafinesquianum</i>	Downy Arrowwood	S4S5
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CARYOPHYLLACEAE	PINK FAMILY	
<i>Cerastium nutans</i>	Long-stalked Chickweed	S4S5
<i>Silene csereii</i>	Smooth Catchfly	SNA
<i>Silene latifolia</i>	White Cockle	SNA
<i>Stellaria crassifolia</i>	Fleshy Stitchwort	S3S4
CHENOPODIACEAE	GOOSEFOOT FAMILY	
<i>Chenopodium simplex</i>	Maple-leaved Goosefoot	S5
<i>Chenopodium album</i>	Lamb's-quarters	SNA
<i>Corispermum americanum</i>	American Bugseed	S3
<i>Corispermum villosum</i>	Hairy Bugseed	S1S2
CONVOLVULACEAE	MORNING GLORY FAMILY	
<i>Convolvulus arvensis</i>	Field Bindweed	SNA
CORNACEAE	DOGWOOD FAMILY	
<i>Cornus canadensis</i>	Bunchberry	S5
<i>Cornus sericea</i>	Red-osier Dogwood	S5
CUCURBITACEAE	GOURD FAMILY	
<i>Echinocystis lobata</i>	Wild Cucumber	S4S5
ELAEAGNACEAE		
<i>Shepherdia canadensis</i>	Soapberry	S5
ERICACEAE	HEATH FAMILY	
<i>Andromeda polifolia</i>	Bog rosemary	S5
<i>Arctostaphylos uva-ursi</i>	Common Bearberry	S5
<i>Vaccinium myrtilloides</i>	Velvet-leaf Blueberry	S5
FABACEAE	PEA FAMILY	
<i>Amphicarpaea bracteata</i>	Hog-peanut	S3S5
<i>Lathyrus ochroleucus</i>	Cream-coloured Vetchling	S4S5
<i>Lathyrus palustris</i>	Marsh Vetchling	S5
<i>Lathyrus venosus</i>	Wild Peavine	S5
<i>Medicago lupulina</i>	Black Medic	SNA
<i>Melilotus albus</i>	White Sweetclover	SNA
<i>Melilotus officinalis</i>	Yellow Sweet Clover	SNA
<i>Trifolium hybridum</i>	Alsike Clover	SNA
<i>Trifolium pratense</i>	Red Clover	SNA
<i>Vicia americana</i>	American Vetch	S5

FAGACEAE	BEECH FAMILY	
<i>Quercus macrocarpa</i>	Bur Oak	S5
GENTIANACEAE	GENTIAN FAMILY	
<i>Gentiana rubricaulis</i>	Closed Gentian	S3
<i>Gentianopsis virgata</i>	Fringed Gentian	S4
<i>Halenia deflexa</i>	Spurred Gentian	S5
GERANIACEAE	GERANIUM FAMILY	
<i>Geranium bicknellii</i>	Bicknell's Geranium	S5
GROSSULARIACEAE	CURRENT FAMILY	
<i>Ribes lacustre</i>	Swamp Gooseberry	S4
<i>Ribes oxycanthoides</i>	Northern Gooseberry	S5
<i>Ribes triste</i>	Swamp Red Currant	S5
HIPPURIDACEAE	MARE'S-TAIL FAMILY	
<i>Hippuris vulgaris</i>	Common Mare's-tail	S5
LAMIACEAE	MINT FAMILY	
<i>Agastache foeniculum</i>	Giant Hyssop	S5
<i>Dracocephalum parviflorum</i>	American Dragon-head	S5
<i>Galeopsis tetrahit</i>	Common Hemp-nettle	SNA
<i>Lycopus americanus</i>	Water Hore-hound	S5
<i>Lycopus asper</i>	Western Water-horehound	S4
<i>Lycopus uniflorus</i>	Northern Bugleweed	S4S5
<i>Mentha arvensis</i>	Mint	S5
<i>Prunella vulgaris</i>	Heal-all	S4
<i>Scutellaria galericulata</i>	Marsh Skullcap	S5
<i>Stachys pilosa</i>	Marsh Hedge-nettle	S5
LENTIBULARIACEAE	BLADDERWORT FAMILY	
<i>Utricularia intermedia</i>	Flat-leaved Bladderwort	S4S5
MENYANTHACEAE	BOGBean FAMILY	
<i>Menyanthes trifoliata</i>	Bogbean	S5
OLEACEAE	OLIVE FAMILY	
<i>Fraxinus nigra</i>	Black Ash	S2
<i>Fraxinus pennsylvanica</i>	GreenAsh	S4S5

ONAGRACEAE	EVENING PRIMROSE FAMILY	
<i>Chamerion angustifolium</i>	Fireweed	S5
<i>Epilobium ciliatum</i> ssp. <i>glandulosum</i>	Northern Willowherb	S5
<i>Epilobium leptophyllum</i>	Linear-leaf Willowherb	S4S5
<i>Epilobium palustre</i>	Marsh Willowherb	S5
<i>Epilobium</i> sp.	A Willowherb	
<i>Oenothera biennis</i>	Evening-primrose	S5
PLANTAGINACEAE	PLANTAIN FAMILY	
<i>Plantago major</i>	Common Plantain	SNA
POLYGALACEAE	MILKWORT FAMILY	
<i>Polygala senega</i>	Seneca Root	S4
POLYGONACEAE	SMARTWEED FAMILY	
<i>Persicaria amphibia</i>	Water Smartweed	S5
<i>Persicaria lapathifolia</i>	Pale Smartweed	S5
<i>Polygonum aviculare</i>	Prostrate Knotweed	SU
<i>Rumex crispus</i>	Curly Dock	SNA
<i>Rumex</i> sp.	A Dock	
PRIMULACEAE	PRIMROSE FAMILY	
<i>Lysimachia borealis</i>	Northern Starflower	S5
<i>Lysimachia ciliata</i>	Fringed Loosestrife	S5
<i>Lysimachia thyrsiflora</i>	Tufted Loosestrife	S5
PYROLACEAE	WINTERGREEN FAMILY	
<i>Pyrola</i> sp.	A Wintergreen	
RANUNCULACEAE	CROWFOOT FAMILY	
<i>Actaea rubra</i>	Baneberry	S5
<i>Anemone canadensis</i>	Canada Anemone	S5
<i>Aquilegia</i> sp.	A Columbine	
<i>Caltha palustris</i>	Marsh Marigold	S5
<i>Ranunculus</i> sp.	A Buttercup	
<i>Thalictrum dasycarpum</i>	Hairy Meadowrue	S5
<i>Thalictrum venulosum</i>	Veiny Meadowrue	S5
RHAMNACEAE	BUCKTHORN FAMILY	
<i>Rhamnus alnifolia</i>	Alder-leaved Buckthorn	S5
ROSACEAE	ROSE FAMILY	

<i>Agrimonia gryposepala</i>	Common Agrimony	S1S2
<i>Amelanchier alnifolia</i>	Saskatoon	S5
<i>Comarum palustre</i>	Marsh Cinquefoil	S5
<i>Crataegus chrysocarpa</i>	Fireberry Hawthorn	S4S5
<i>Dasiphora fruticosa</i>	Shrubby cinquefoil	S5
<i>Fragaria virginiana</i>	Smooth Wild Strawberry	S5
<i>Geum aleppicum</i>	Yellow Avens	S5
<i>Geum macrophyllum</i>	Large-leaved Avens	S4S5
<i>Geum rivale</i>	Water or Purple Avens	S3S4
<i>Potentilla anserina</i> ssp. <i>anserina</i>	Silverweed	S5
<i>Potentilla norvegica</i>	Rough Cinquefoil	S5
<i>Prunus pensylvanica</i>	Pin Cherry	S5
<i>Prunus virginiana</i>	Chokecherry	S5
<i>Rosa acicularis</i>	Prickly Rose	S5
<i>Rosa</i> sp.	A Rose	
<i>Rubus arcticus</i> ssp. <i>acaulis</i>	Stemless Raspberry	S5
<i>Rubus idaeus</i>	Raspberry	S5
<i>Rubus pubescens</i>	Trailing Dewberry	S5
<i>Spiraea alba</i>	Meadowsweet	S5

RUBIACEAE	MADDER FAMILY	
<i>Galium boreale</i>	Northern Bedstraw	S5
<i>Galium labradoricum</i>	Northern Bog Bedstraw	S4S5
<i>Galium trifidum</i>	Three-petal Bedstraw	S5
<i>Galium triflorum</i>	Sweet-scented Bedstraw	S5

SALICACEAE	WILLOW FAMILY	
<i>Populus balsamifera</i>	Balsam Poplar	S5
<i>Populus tremuloides</i>	Trembling Aspen	S5
<i>Salix bebbiana</i>	Bebb's Willow	S5
<i>Salix candida</i>	Hoary Willow	S5
<i>Salix discolor</i>	Pussy Willow	S5
<i>Salix interior</i>	Sandbar Willow	S5
<i>Salix lucida</i>	Shining Willow	S5
<i>Salix pedicellaris</i>	Bog Willow	S5
<i>Salix pellita</i>	Satin Willow	S3S4
<i>Salix planifolia</i>	Flat-leaved Willow	S5
<i>Salix pseudomonticola</i>	False Mountain Willow	S4S5
<i>Salix</i> spp.	Willow	

SANTALACEAE	SANDALWOOD FAMILY	
<i>Comandra umbellata</i>	Bastard Toadflax	S5

SAXIFRAGACEAE	SAXIFRAGE FAMILY	
<i>Mitella nuda</i>	Mitrewort	S5
<i>Parnassia palustris</i>	Grass of Parnassus	S5
SCROPHULARIACEAE	FIGWORT FAMILY	
<i>Agalinis tenuifolia</i>	Narrow-leaved Agalinis	S3
<i>Castilleja coccinea</i>	Scarlet Paintbrush	S4S5
<i>Chelone glabra</i>	White Turtlehead	S2
<i>Mimulus ringens</i>	Blue Monkeyflower	S4
<i>Pedicularis canadensis</i>	Wood-betony	S3S4
<i>Pedicularis lanceolata</i>	Swamp Lousewort	S3S4
SOLANACEAE	POTATO FAMILY	
<i>Solanum dulcamara</i>	Bittersweet	SNA
URTICACEAE	NETTLE FAMILY	
<i>Urtica dioica</i>	Stinging Nettle	S5
VIOLACEAE	VIOLET FAMILY	
<i>Viola canadensis</i> var. <i>rugulosa</i>	Canada Violet	S5
<i>Viola nephrophylla</i>	Northern Bog Violet	S5
<i>Viola</i> spp.	Violet	

APPENDIX IX. Traditional use plant species identified from the Environmental Impact Statement and self-directed studies, with observations in 2017 and 2021.

Form	Scientific Name	Common Name ¹	Observations	
			2017	2021
Tree	<i>Abies balsamea</i>	Balsam Fir		
Tree	<i>Betula papyrifera</i>	Paper Birch	X	X
Tree	<i>Larix laricina</i>	Tamarack	X	X
Tree	<i>Populus balsamifera</i>	Balsam Poplar	X	X
Tree	<i>Quercus macrocarpa</i>	Bur Oak	X	X
Tree	<i>Thuja occidentalis</i>	Cedar	X	
Shrub	<i>Alnus incana</i>	Speckled Alder	X	X
Shrub	<i>Amelanchier alnifolia</i>	Saskatoon	X	X
Shrub	<i>Apocynum androsaemifolium</i>	Dogbane	X	X
Shrub	<i>Arctostaphylos uva-ursi</i>	Common Bearberry	X	X
Shrub	<i>Cornus sericea</i>	Red-osier Dogwood	X	X
Shrub	<i>Corylus americana</i>	American Hazelnut	X	X
Shrub	<i>Corylus cornuta</i>	Beaked Hazelnut	X	X
Shrub	<i>Crataegus</i> sp.	Hawthorn	X	X
Shrub	<i>Dasiphora fruticosa</i>	Shrubby Cinquefoil	X	X
Shrub	<i>Potentilla arguta</i>	Tall Cinquefoil		
Shrub	<i>Prunus nigra</i>	Canada Wild Plum, Plum, Prune	X	
Shrub	<i>Prunus pensylvanica</i>	Pin Cherry	X	X
Shrub	<i>Prunus pumila</i>	Sand Cherry	X	
Shrub	<i>Prunus virginiana</i>	Chokecherry	X	X
Shrub	<i>Rhododendron groenlandicum</i>	Labrador Tea	X	
Shrub	<i>Ribes americanum</i>	Wild Black Currant, Blackberry	X	
Shrub	<i>Ribes oxycanthoides</i>	Northern Gooseberry	X	X
Shrub	<i>Ribes</i> sp.	Black Currant	X	X
Shrub	<i>Rosa arkansana</i>	Prairie Rose		
Shrub	<i>Rosa</i> sp.	Wild Rose	X	X
Shrub	<i>Rubus idaeus</i>	Raspberry, Wild Raspberry	X	X
Shrub	<i>Sibbaldiopsis tridentata</i>	Three-toothed Cinquefoil		
Shrub	<i>Spiraea alba</i>	Meadowsweet	X	X
Shrub	<i>Symphoricarpos</i> spp.	Snowberry	X	X
Shrub	<i>Vaccinium</i> spp.	Blueberry	X	X
Shrub	<i>Viburnum opulus</i>	Highbush Cranberry	X	X
Shrub	<i>Viburnum rafinesquianum</i>	Downy Arrow-wood	X	X
Shrub	<i>Vitis riparia</i>	Wild Grapes		
Herb	<i>Achillea millefolium</i>	Yarrow	X	X
Herb	<i>Acorus americanus</i>	Weke	X	X
Herb	<i>Actaea rubra</i>	Baneberry	X	X
Herb	<i>Agastache foeniculum</i>	Giant Hyssop	X	X

Form	Scientific Name	Common Name ¹	Observations	
			2017	2021
Herb	<i>Aquilegia</i> sp.	Columbine	X	X
Herb	<i>Aralia nudicaulis</i>	Wild Sarsaparilla	X	X
Herb	<i>Artemisia</i> sp.	Sage	X	X
Herb	<i>Asarum canadense</i>	Wild Ginger	X	X
Herb	<i>Asclepias incarnata</i>	Swamp Milkweed	X	X
Herb	<i>Asclepias syriaca</i>	Common Milkweed	X	X
Herb	<i>Asparagus officinalis</i>	Asparagus		
Herb	<i>Caltha palustris</i>	Marsh Marigold	X	X
Herb	<i>Campanula rotundifolia</i>	Harebell	X	X
Herb	<i>Cannabis sativa</i>	Hemp		
Herb	<i>Chamerion angustifolium</i>	Fireweed	X	X
Herb	<i>Cornus canadensis</i>	Bunchberry	X	X
Herb	<i>Erigeron canadensis</i>	Canada Fleabane		X
Herb	<i>Fragaria virginiana</i>	Wild Strawberry	X	X
Herb	<i>Geranium bicknellii</i>	Bicknell's Geranium		X
Herb	<i>Geum aleppicum</i>	Yellow Avens	X	X
Herb	<i>Heuchera richardsonii</i>	Alumroot		
Herb	<i>Hierochloa odorata</i>	Sweet Grass	X	
Herb	<i>Hypericum perforatum</i>	St. John's Wort		
Herb	<i>Lilium philadelphicum</i>	Wood Lily	X	
Herb	<i>Lycopus uniflorus</i>	Northern Bugle-weed	X	X
Herb	<i>Maianthemum canadense</i>	Canada Mayflower	X	X
Herb	<i>Matricaria chamomilla</i>	Sweet Chamomile		
Herb	<i>Matricaria discoidea</i>	Pineapple weed	X	
Herb	<i>Mentha arvensis</i>	Wild Mint	X	X
Herb	<i>Nabalus</i> sp.	Rattlesnake Root		X
Herb	<i>Oenothera biennis</i>	Yellow Evening Primrose		X
Herb	<i>Pedimelum esculentum</i>	Prairie Turnip		
Herb	<i>Plantago</i> sp.	Plantain	X	X
Herb	<i>Polygala senega</i>	Seneca	X	X
Herb	<i>Prunella vulgaris</i>	Self-heal	X	X
Herb	<i>Pyrola</i> sp.	Wintergreen	X	X
Herb	<i>Rheum rhabarbarum</i>	Rhubarb		
Herb	<i>Rubus pubescens</i>	Dewberry	X	X
Herb	<i>Sanicula marilandica</i>	Black Snakeroot	X	X
Herb	<i>Solidago canadensis</i>	Canada Goldenrod	X	X
Herb	<i>Solidago gigantea</i>	Smooth Goldenrod		X
Herb	<i>Stachys palustris</i>	Marsh Hedge-Nettle	X	X
Herb	<i>Taraxacum officinale</i>	Dandelion	X	X
Herb	<i>Trifolium pratense</i>	Red Clover	X	X
Herb	<i>Zizania palustris</i>	Wild Rice		

Form	Scientific Name	Common Name ¹	Observations	
			2017	2021
Fungus	<i>Agaricus arvensis</i>	Horse Mushroom		
Fungus	<i>Coprinus</i> spp.	Ink Capped Mushroom		

Note: ¹Common names remain unchanged from the Environmental Impact Statement and self-directed studies.

