

**BIRTLE TRANSMISSION PROJECT
BOTANICAL AND VEGETATION ENVIRONMENTAL MONITORING
ANNUAL TECHNICAL REPORT**

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SUMMARY

Botanical and vegetation resources were assessed in 2022 for Year II environmental monitoring of the Birtle Transmission Project. Surveys were conducted in grassland and forest habitats, with monitoring occurring for traditional use plant species and invasive species, each with botanical summaries presented. The accuracy of effect predictions and the effectiveness of mitigation are discussed.

Twelve grassland sites were visited in the Spy Hill-Ellice Community Pasture. Ten sites are located on the final preferred route, with an additional two sites visited off-RoW. Prairie sites in the community pasture are dominated by native grasses, with a diversity of native forbs, few low shrubs, a general absence of trees and tall shrubs. Very few non-native species are observed in plots. All grassland survey sites are monitored for traditional use species, invasive species, and species of conservation concern. Herbaceous and low shrub cover averaged 67% on the RoW, with between 34 to 44 species recorded at sites. On the RoW, values for cover, richness, diversity and evenness had all significantly increased ($p < 0.05$) over values measured pre-construction. Hierarchical cluster analyses were conducted for all 12 grassland surveys sampled, where three community types were identified based on their vegetation structure, species assemblages and cover. The predicted effects on grassland habitat were minimal, with low disturbance to soils and vegetation. The grassland sites in the community pasture remain in excellent condition in Year II monitoring.

Twelve sites were visited to sample forest habitat in the Spy Hill-Ellice Community Pasture, with 10 located on the final preferred route and two monitoring sites off-RoW. All forested and previously forested sites consist of a young open trembling aspen canopy. Traditional use species, species of conservation concern, and invasive species are monitored at forest survey sites. The total understory vegetation cover for forested sites on the RoW averaged 65%, with regrowth noticeably greater compared to regeneration seen last season. Mean richness in previously forested sites on the RoW is 25 species. Diversity and evenness measures on the RoW were significantly higher ($p < 0.05$) this season than in pre-construction surveys. Three community types for forest surveys were identified based on species composition and structure of the understory. The predicted change in native vegetation cover as a result of the project was accurate for forest habitat. Very little soil disturbance was observed, with no outbreaks of noxious, invasive or non-native species. Coarse woody debris (mulch from clearing) is again a dominant ground cover throughout all RoW plots.

Invasive plant species were identified as an environmental indicator of both grassland and forest habitat. Seven non-native species were recorded within the community pasture, including those designated as noxious Tier 3 (four species) or invasive (two species). No Tier

1 or Tier 2 noxious species were observed at any time throughout fieldwork (2017 to 2022) within the community pasture. In forested sites, six species were recorded while, only two were noted in grassland sites. The most frequently observed noxious species is common dandelion (Tier 3). Notably, non-native species are virtually absent from grassland sites on the RoW and where present are very sparse in cleared forested sites.

Traditional use plant species were recorded from quantitative surveys in both grassland and forest habitats in the community pasture. A total of 22 traditional use plant species were observed during all surveys, and included two trees, nine shrubs, and 11 herbs. Traditional use plants are found throughout the pasture both in the understory of forested sites and in open grasslands. Thirteen traditional use species are found uniquely in forested sites. The mean cover of all traditional use species continues to be greatest in forested sites (42.5%), due to the greater presence of woody growth in the understory as low shrubs (roses, raspberry), tall shrub seedlings (Saskatoon, cherries, willows, and hazelnuts), and tree seedlings and saplings (trembling aspen). In grassland sites, there continues to be a lower mean abundance of traditional use plants in Year II monitoring (5.2%) due to the absence of woody seedlings. Grassland sites have a slight greater abundance of traditional use herbs (mean cover 2.7%) compared to forested sites, which consist primarily of sages and crocus, with onion and strawberry. In Year II monitoring, the mean total traditional use plant cover was comparable to pre-construction values for grassland sites while the understory cover of forest sites has been exceeded this season.

Species of conservation concern were recorded from surveys in grassland and forest habitats, and incidentally along the RoW. Thirty-eight species of conservation concern were observed along the RoW in 2022. Among these, eight are ranked Critically Imperilled or Imperilled (S1-S2). The remaining 30 species are ranked as Vulnerable (S3-S3S5). No species listed by the federal *Species at Risk Act*, the Manitoba *Endangered Species and Ecosystems Act* or listed by the Committee on the Status of Endangered Wildlife in Canada were observed during fieldwork.

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1.0 INTRODUCTION

Botanical and vegetation resources were monitored in 2022 as part of Manitoba Hydro's commitment to environmental protection for the Birtle Transmission Project (Map 1-1, Appendix II). On January 30, 2018, Manitoba Hydro submitted the Environmental Assessment Report to Manitoba Sustainable Development, for approval to construct and operate the Birtle Transmission Project, a 46.2 km 230 kV transmission line from Birtle Station to the Saskatchewan border. The Project is defined as a Class 2 Development (under the Classes of Development Regulation). Manitoba Conservation and Climate granted a licence for the Birtle Transmission Project (#3314) on January 14, 2020.

The purpose of the Project was to facilitate the sale of 100 MW of electricity from Manitoba to Saskatchewan, based on a 20-year power purchase agreement signed in January 2016 between Manitoba Hydro and the Saskatchewan Power Corporation (SaskPower).

The Birtle Transmission Project Regional Assessment Area occurs almost entirely within the Ecodistricts of Hamiota and St. Lazare in southwest Manitoba; a small portion of the Project occurs in the Melville Ecodistrict. The Project Right-of-Way (RoW) traverses developed land, agricultural land, and native vegetation including deciduous forest, wetlands and grasslands. The dominant land cover classes within the Project are agricultural cropland and grassland/rangeland. Particular attention was given to the 6.4 km length of transmission line passing through the Spy Hill-Ellice Community Pasture, one of the two largest intact areas of native mixed grass prairie remaining in Manitoba. Native prairie within the community pasture supports impressive botanical diversity including numerous imperilled, vulnerable and uncommon prairie plant species.

This assessment involved pre-construction botanical and vegetation surveys (prior to environmental monitoring) along the final preferred route. Potential environmental effects as a result of the Project are listed in Appendix III, which were identified in Chapter 7.0 of the Environmental Assessment Report (Manitoba Hydro 2018a) and the Biophysical Existing Environment Technical Report (Manitoba Hydro 2018b). Project commitments for pre-construction and environmental monitoring of terrestrial ecosystems and vegetation are identified in Appendix IV. The specific objectives established for this study, based on the Environmental Monitoring Plan (Manitoba Hydro 2020a) and review of the Environment Act Licence (Manitoba Conservation and Climate 2020) were as follows:

- Conduct environmental monitoring for invasive plant species in grassland and forest habitats; and
- Conduct environmental monitoring for traditional use plant species in grassland and forest habitats.

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

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 plant species of conservation concern, invasive plant species and traditional use plant species, in both grassland and forest habitats.

2.1 Plant Species of Conservation Concern

Based on records from the Manitoba Conservation Data Centre (MBCDC) and existing information sources, approximately 46 species of conservation concern are known to occur in the Regional Assessment Area (RAA) and surroundings, with increased concentrations located in the vicinity of St. Lazare, including the Ellice Archie and Spy Hill-Ellice Community Pastures. The uplands and river valleys in this region support a number of species considered provincially rare in the province (Hamel and Reimer 2004). According to provincial sources and existing literature, there are about 172 species of conservation concern that can be expected to range within the greater Aspen Parkland Ecoregion. Of these, there are eight species at risk listed in the ecoregion. These include rough purple false-foxglove (*Agalinis aspera*), buffalograss (*Bouteloua dactyloides*), hackberry (*Celtis occidentalis*), smooth goosefoot (*Chenopodium subglabrum*), small white lady's-slipper (*Cypripedium candidum*), hairy prairie-clover (*Dalea villosa*), Geyer's monkeyflower (*Erythranthe geyeri*) and western spiderwort (*Tradescantia occidentalis*). Only one of these species, Geyer's monkeyflower, is known to occur in the RAA setting (Reimer and Hamel 2003) and was recently recorded in the project area (Szwaluk Environmental Consulting and Newman 2021).

Baseline surveys conducted in 2017 have helped identify locations of species of conservation concern, while continued monitoring has built up a more comprehensive list of species that occur in the Pasture. Pre-construction surveys in 2019 provided further details for where to apply mitigation measures. 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. Excessive soil disturbance from clearing activities can also lead to introduction of alien species. Herbicide use during maintenance activities can also negatively affect non-target, desirable plants. To validate the Environmental Assessment (EA) predictions, verify implementation of mitigation measures, and to allow for adaptive management, pre-construction and post-construction monitoring will identify any impact to vegetation species of conservation concern in the Spy Hill-Ellice Community Pasture. Monitoring activities for species of conservation concern are identified in Table 2-1.

Mitigation measures identified in the Construction Environmental Protection Plan

- Carry out construction activities on frozen ground to minimize surface damage, rutting and erosion.
- Use existing access roads and trails to the extent possible.
- Remove trees by low ground disturbance methods that protect shrubs and understory.
- Confine vehicle traffic to established trails to the extent possible.
- In the event of ground disturbance refer to Rehabilitation and Invasive Species Management Plan and for mitigation measures.
- Marshalling yards and/or worker accommodations will not be developed within in Spy Hill-Ellice Community Pasture.
- Tower foundations that limit disturbance of soil will be utilized within grassland habitat areas within the Spy Hill-Ellice Community Pasture.

Table 2-1. Monitoring activities for plant species of conservation concern, grassland and forest habitats.

Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/ Observations
Baseline Information	Desktop, key person interviews, and field surveys	Species names and locations	Grassland and forest habitat sites in Spy Hill- Ellice Community Pasture PFA, LAA	1 field season	Once	2017	Species presence/ absence
Pre-construction	Ground surveys to record species of concern and protection measures	Species occurrence	PFA in Spy Hill-Ellice Community Pasture	1 field season	Once	2019	Species presence/ absence
Post-construction	Ground surveys to monitor species of concern and protection measures	Species occurrence	PFA in Spy Hill-Ellice Community Pasture	1 field season	Once	2021	Species presence/ absence

2.2 Invasive Plant Species

As outlined in the Environmental Assessment, 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 plants can spread rapidly and are designated by regulation, *The Noxious Weed Act* (Manitoba).

Construction equipment and vehicles can introduce non-native and invasive plants during construction activities. During the field assessments in 2017, three non-native or invasive species were recorded from the Spy Hill-Ellice Community Pasture, while eight species were observed at sites on private lands, most of which are under agricultural cultivation or grazing. In 2019 pre-construction surveys, 11 non-native species were recorded, with both noxious (four species) and invasive (five species) designation, on the pasture and river crossings.

Non-native and invasive species are problematic for a number of reasons: these plants are capable of growing under a wide range of climatic and soil conditions; they produce abundant seeds that are easily disseminated and seeds that are long lived or can remain dormant through the winter season; they can continue to persist even after the removal of vegetative portions of the plant, and they often have vigorous growth and produce seeds under conditions adverse for other plants, and can therefore out compete native species. To validate EA predictions, verify implementation of mitigation measures, and to allow for adaptive management, pre-construction and post-construction monitoring will identify changes in baseline composition and abundance of invasive species. Monitoring activities for invasive plant species are identified in Table 2-2.

Mitigation measures identified in the Construction Environmental Protection Plan

- Carry out construction activities on frozen ground to minimize surface damage, rutting and erosion.
- Use existing access roads and trails to the extent possible.
- Remove trees by low ground disturbance methods that protect shrubs and understory.
- Confine vehicle traffic to established trails to the extent possible.
- In the event of ground disturbance refer to Rehabilitation and Invasive Species Management Plan and for mitigation measures.

- Marshalling yards and/or worker accommodations will not be developed within in Spy Hill-Ellice Community Pasture.
- Tower foundations that limit disturbance of soil will be utilized within grassland habitat areas within the Spy Hill-Ellice Community Pasture.

Table 2-2. Monitoring activities for invasive plant species, grassland and forest habitats.

Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurable Parameter(s)
Baseline Information	Desktop and field surveys	Species names and locations	Sites surveyed in PFA, LAA	1 field season	Once	2017	Species composition and abundance
Pre-construction	Ground surveys to record non-native and invasive species and monitor protection measures	Species occurrence	PFA in Spy Hill-Ellice Community Pasture	2 field seasons (grassland); 1 field season (forest)	Once	2019, 2020	Species composition and abundance
Post-construction	Ground surveys to identify and measure occurrence of invasive species on ROW and monitor protection measures	Species occurrence	PFA in Spy Hill-Ellice Community Pasture	2 field seasons	Annual	2021, 2022	Species composition and abundance

2.3 Traditional Use Plant Species

As outlined in the EA, Project effects to traditional plant species is a concern for Indigenous communities and organizations. These areas are valued for their provision of resources used by Indigenous communities and organizations, including gathering of food and medicines and harvesting plants and trees, particularly in Spy Hill-Ellice Community Pasture. Self-directed studies by Indigenous communities, and baseline vegetation surveys conducted in 2017 identified traditional use plant species and locations where they are found in grassland, forest and wetland habitats. Approximately 20 traditional use plants were recorded from community pasture surveys along the final preferred route, combined in 2017 and 2019.

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

Mitigation measures identified in the Construction Environmental Protection Plan

- Carry out construction activities on frozen ground to minimize surface damage, rutting and erosion.
- Use existing access roads and trails to the extent possible.
- Remove trees by low ground disturbance methods that protect shrubs and understory.
- Confine vehicle traffic to established trails to the extent possible.
- In the event of ground disturbance refer to Rehabilitation and Invasive Species Management Plan and for mitigation measures.
- Marshalling yards and/or worker accommodations will not be developed within in Spy Hill-Ellice Community Pasture.
- Tower foundations that limit disturbance of soil will be utilized within grassland habitat areas within the Spy Hill-Ellice Community Pasture.

Table 2-3. Monitoring activities for traditional use plant species, grassland and forest habitats.

Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurable Parameter(s)
Baseline Information	Desktop, field surveys and reports from Indigenous communities	Species names and locations	Sites identified in PFA, LAA. RAA	1 field season	Once	2017	Species composition and abundance
Pre-construction	Ground surveys to identify traditional use plant species and monitor protection measures	Species occurrence	PFA in Spy Hill-Ellice Community Pasture	1 field season	Once	2019	Species composition and abundance
Post-construction	Ground surveys to confirm traditional use plant species presence and monitor protection measures	Species occurrence	PFA in Spy Hill-Ellice Community Pasture	2 field seasons	Annual	2021, 2022	Species composition and abundance

3.0 METHODS

The methods used to assess the botanical and vegetation resources are 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 Birtle Transmission Project with relevance to pre-construction surveys and subsequent environmental monitoring was reviewed prior to fieldwork. Available documents included the Birtle Transmission Project Environmental Assessment Report (Manitoba Hydro 2018a), Biophysical Existing Environment Technical Report (Manitoba Hydro 2018b), Environmental Monitoring Plan (Manitoba Hydro 2020a), Construction Environmental Protection Plan Mapbook (Manitoba Hydro 2020b), Botanical and Vegetation Pre-construction Survey (Szwaluk Environmental Consulting and Newman 2019), Pre-construction Invasive Plant Survey (Szwaluk Environmental Consulting 2020), and the Botanical and Vegetation Environmental Monitoring Report (Szwaluk Environmental Consulting and Newman 2021). The Environmental Monitoring Plan provides information on pre-construction and environmental monitoring requirements for vegetation (see also Appendix IV).

To select preliminary pre-construction and environmental monitoring sites for the Project, Manitoba Hydro's Environmental Protection Information Management System (EPIMS) Map Viewer was used to view proposed project footprint imagery (pre-clearing digital orthorectified imagery). EPIMS Map Viewer imagery includes information on land use, environmentally sensitive sites, and vegetation cover from 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 in the Spy Hill-Ellice Community Pasture (e.g., grassland and forest). In 2022, previously surveyed sites (2017, 2019 and 2021) were reviewed to determine their location with reference to the final preferred route (FPR) RoW. Four sites previously sampled off-RoW (2017) were used for control sites during monitoring of the transmission line in the community pasture. Field maps (1:5,000) were provided by Manitoba Hydro prior to fieldwork (Construction Environmental Protection Plan Mapbook; Manitoba Hydro 2020b). The Community Pasture manager was contacted for permission to access sites.

Valued components of the biophysical environment to survey and monitor for the Birtle Transmission Project included grassland and forest habitat. 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 species of conservation concern, invasive plant species, and traditional use plant species.

3.2 Environmental Monitoring

This season (2022) represents Year II of post-construction monitoring. Pre-construction surveys for the project were conducted in 2017 and 2019. All surveys occurred on the final preferred route (with the exception of four off-RoW sites), and focused on collecting detailed vegetation information for the components identified important through the environmental assessment process.

Environmental monitoring involved native vegetation surveys (quantitative) in selected habitats along the final preferred route in the community pasture. In 2022, environmental monitoring included surveys for grassland habitat (PRA) and forest habitat (TER). The monitoring schedule for plant species of conservation concern from pre-construction through one-year post-construction was completed in 2021. No specific sampling for species of conservation concern (SCC) was undertaken this season, but all observations of species of conservation concern were recorded during surveys.

3.2.1 Native Vegetation Surveys

Sites previously selected for native vegetation surveys were used for continued monitoring of grassland and forest 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.

3.2.2 Species of Conservation Concern

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 2021, 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 2022).

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 Birtle Transmission Project identified two valued components for vegetation, including grassland habitat and forest habitat. Within each valued component, three environmental indicators were identified: invasive plant species; traditional use plant species; and species of conservation concern. Although the monitoring commitment for species of conservation concern has been completed in 2021, species of conservation concern were noted in grassland and forest habitat monitoring plots.

This section discusses the results for the valued components and environmental indicators as follows: grassland (prairie habitat, PRA), forest (terrestrial habitat, TER), invasive plant species, traditional use plant species, and species of conservation concern. The botanical summary for grassland and forest sites includes total species cover, species richness, and species diversity measures. Approximately 171 plant species, across 45 families were recorded during sampling in 2022. The complete project flora is listed in the Appendix VII.

4.1 Grassland Habitat

Twelve grassland sites (PRA) were visited between July 18 to 23, 2022 within the Spy Hill-Ellice Community Pasture. Ten sites are located on the RoW. An additional two sites, initially sampled in 2017, were visited off the RoW (Map 4-1, Appendix II) (Field Activity ID BTP_LTM_FA606). The initial surveys (2017, 2019) on the RoW represent baseline data collected prior to construction activities.

Prairie sites in the community pasture are dominated by native grasses, with a diversity of native forbs, few low shrubs, and a general absence of trees and tall shrubs. Very few non-native species are observed in plots. Photograph 4-1a shows the grassland on the RoW in Year II monitoring, at PRA-54.



Photograph 4-1a. Community pasture grassland at monitoring site PRA-54.

4.1.1 Data Analysis of Grassland Habitat

All grassland survey sites are monitored for traditional use species, species of conservation concern, and invasive species. Incidental searches (adjacent to sites but on the RoW) are also undertaken throughout monitoring. As an indication of the diversity of these grasslands, species cover, richness, diversity and evenness are provided in Table 4-1a.

Grassland sites on the RoW averaged 67% herbaceous and low shrub cover, (from 59% to 74%), with between 34 to 44 species recorded at sites. On the RoW, values for cover ($p<0.05$), richness ($p<0.03$), diversity ($p<0.002$) and evenness ($p<0.008$) had all increased over values measured pre-construction, Table 4-1a. A similar pattern was noted in the off-RoW grassland sites, where diversity values increased in Year II, compared to pre-construction.

Table 4-1a. Year II Vegetation measures in the herb and low shrub layer in grassland (PRA) sites on-RoW: mean species cover (%), species richness, diversity and evenness, with mean values for pre-construction and off-RoW sites.

Sites	Cover	Richness	Diversity	Evenness
PRA-26	58.8	38	3.00	0.82
PRA-51	72.6	38	2.96	0.81
PRA-52	68.6	34	2.84	0.80
PRA-53	74.0	34	2.58	0.73
PRA-54	59.0	38	2.99	0.82
PRA-55	70.0	37	2.72	0.75
PRA-56	60.6	34	2.67	0.76
PRA-57	65.4	39	2.89	0.79
PRA-58	66.4	44	3.02	0.80
PRA-59	71.8	40	3.05	0.83
Year II on-RoW	66.7 ^a	37.6 ^a	2.87 ^a	0.79 ^a
Year II off-RoW	86.1	44.0	2.92	0.77
Pre-Constr RoW (2019)	49.3 ^a	34.0 ^a	2.17 ^a	0.61 ^a

Note: a= measures in Year II have significantly increased over preconstruction values.

4.1.1.1 Grassland Cluster Analysis and Community Typing

Hierarchical cluster analyses were conducted for all twelve grassland surveys sampled (ten sites on-RoW, and two off-RoW), to determine whether sites were distinguished based on their vegetation structure, species assemblages and cover. As the inclusion of off-RoW sites did not alter the group clustering during analysis, they are retained in the analysis of all grassland sites. Sites surveyed were diverse communities made up of a balanced mix of native forbs and grasses, with virtually no non-native or invasive species found in plots. All grassland sites are dominated by a diversity of native grasses and sedge, particularly

western porcupine grass (*Hesperostipa curtiseta*) found throughout, and including blunt sedge (*Carex obtusata*), blue grama grass (*Bouteloua gracilis*), with little bluestem (*Schizachyrium scoparium*), sand reedgrass (*Sporobolus rigidus*), plains rough and rocky mountain fescues (*Festuca hallii* and *F. saximontana*, respectively) and others. Widespread or abundant forbs include three-flowered avens (*Geum triflorum*), purple prairie clover (*Dalea purpurea*), prairie spikemoss (*Selaginella densa*), and pasture sage (*Artemisia frigida*). A non-vascular cryptogamic ground cover was observed in all sites, with abundant cover (>25%) in seven sites. This tightly enmeshed assemblage of lichens and mosses increases nutrient and moisture availability to plants and protects against erosion, particularly on sandy soils (Bellnap et al. 2001). Along with the vascular prairie spikemoss, the cryptogams effectively reduce the availability of bare ground. Low woody growth is patchy, most commonly prairie rose (*Rosa arkansana*) or creeping juniper (*Juniperus horizontalis*). Tall shrubs and trees are absent from grassland plots.

While grassland sites on RoW in the community pasture are all categorized as native mixed grass on sandy soils, there are subtle differences among sites. Three community types are identified below (Table 4-1b), based on vegetation composition and structure. The community types assigned in Year II are generally consistent with those described previously in Year I.

Table 4-1b. Community types for 12 grassland surveys, 2022.

Grassland Community	Surveys	Species, total	Species, mean (range)
Blue Grama–Little Bluestem/ Cryptogam	3	58	38.7 (34-43)
Creeping Juniper–Plains Rough Fescue	3	57	38.7 (34-45)
Three-flowered Avens– Prairie Rose	6	72	38.7 (34-44)

Blue Grama –Little Bluestem/ Cryptogam Grassland

Three sites (BTP-PRA-32, 56, -57) are dominated by western porcupine grass, blue grama grass and little bluestem. Relatively frequent or abundant forbs include tufted fleabane (*Erigeron caespitosus*), purple prairie clover, pasture sage and prairie crocus (*Pulsatilla nuttalliana*). Overall, this group of sites has a moderate representation of low woody growth (12.2%), compared to other groups. The ground litter cover (48%) is low, relative to other sites. A dense cryptogamic mat of non-vascular plants lichens and mosses has an elevated cover (47.5%) in this group particularly, which keeps bare ground levels very low (1.1%) in these sites.

Creeping Juniper –Plains Rough Fescue Grassland

Three grassland sites (BTP-PRA-28, -53, -55) are grouped together based on an abundant cover of the low-growing shrub creeping juniper, which drives the relatively elevated cover

(30%) of low-growing woody vegetation in these sites, along with prairie rose. Needle-and-thread grasses are dominant (14%), primarily western porcupine grass. Plains rough fescue is recorded from each site, with the greatest overall cover within this group (3%). Frequently occurring forbs include purple prairie clover, hoary puccoon (*Lithospermum canescens*), beautiful sunflower (*Helianthus pauciflorus* ssp. *subrhomboideus*) and showy locoweed (*Oxytropis campestris* var. *spicata*). Overall, these sites have relatively less grass cover than forb cover (33:67). Cryptogamic ground cover is relatively low in these sites (7.2%), while bare ground cover is negligible (0.4%), generally due to the dense cover of creeping juniper.

Three-flowered Avens—Prairie Rose Grassland

Six sites (BTP-PRA-26, -51, 52, -54, -58, -59) are dominated by blunt sedge and western porcupine grass, and frequently occurring sand reedgrass and June grass (*Koeleria macrantha*). Common and relatively abundant forbs are three-flowered avens, prairie rose and prairie spikemoss. Overall, these sites are most balanced between grass and forb cover (46:54) and have relatively reduced cover of low woody growth overall (3.8%). Cryptogamic ground cover on average is moderate relative to other groups (27.6%), while bare ground cover is highest in this group (4.8%).

4.1.2 Accuracy of Effect Predictions and Effectiveness of Mitigation

For the previous project clearing and construction activities (2020/2021), the effect predictions on grassland habitat (Appendix III) included the following:

- Disturbance to native grasslands and a reduction in floristic diversity from construction and maintenance activities.
- Introduction and spread of non-native and invasive species during construction and maintenance activities.
- Disturbance or removal of traditional use plants during clearing and construction activities.
- Loss of plant species of conservation concern during construction and maintenance activities.
- Loss or impairment of desirable plant species from herbicide application during maintenance activities.
- Loss or impairment of vegetation from the accidental release of fuels or hazardous substances from construction and maintenance activities.

The predicted effects on grassland habitat were minimal or did not occur as a result of the project. After clearing and construction activities in 2020/2021, the grassland sites in the community pasture remain in excellent condition in Year II monitoring (Photograph 4-1b). The presence of bare ground along the RoW in the vicinity of PRA sites continues to be

infrequent, and where present is due generally to animal activity (i.e., cattle watering areas, small mammal burrows). The equipment path (apparent in 2021 as some bare ground, minor rutting and sparse vegetation) was less apparent in 2022. Bare ground also noted previously in 2021 at Tower 122 was not observed this year (Photographs 4-1c and 4-1d).



Photograph 4-1b. Grassland on the RoW at PRA-58.



Photographs 4-1c and 4-1d. Tower 122 near PRA-53 with vegetation cover in the current season (2022) compared to areas of bare ground in the previous year (2021).

Pre-construction, there was a remarkable absence of non-native and invasive species throughout grassland sites. Each year throughout monitoring, this continues to be the case, with a near absence of non-native and invasive species noted in sampling PRA plots in 2022 (Photograph 4-1e). A single Tier 3 species (flixweed, *Descurainia sophia*) and a non-native species (goat's-beard, *Tragopogon dubius*) were recorded from grassland sites in the pasture. A patch of crested wheatgrass (*Agropyron cristatum*) along with smooth brome (*Bromus inermis*) was noted along main pasture trail (near PRA-26) and into an opening in nearby trees and shrubs. No Tier 1 or Tier 2 noxious species were noted during PRA sampling on the RoW or vicinity, at any time during pre-construction surveys (2017, 2019) or monitoring (2021, 2022), see Section 4.3.



Photograph 4-1e. Grassy regrowth at Tower 127 near PRA-57.

Floristic diversity in grassland sites after construction activities was again slightly higher in the community pasture (similar to 2021). Mean on-RoW diversity increased from 2.2 during pre-construction to 2.9 this season, both on and off RoW.

Indigenous communities use a variety of plant species that were identified from Indigenous engagement and land use studies. In grassland sites, minimal disturbance of traditional use plants was observed after construction activities. Section 4.4 discusses vegetation cover for traditional use plants on the RoW. As a result of project construction activities, a potential loss of plant species of conservation concern was identified in the environmental assessment. In 2022, species of conservation concern were again observed within every grassland monitoring site. Of the Critically Imperilled and Imperilled species, sand millet

(*Dichanthelium wilcoxianum*, S2?) was recorded in nine PRA sites and both off-RoW sites (see Section 4.5).

No loss or impairment of vegetation occurred from the accidental release of fuels or hazardous substances from construction activities, and no herbicide application occurred in PRA sites along the RoW.

Mitigation measures identified in the Construction Environmental Protection Plan Mapbook (Manitoba Hydro 2020b) were previously assessed at each grassland site sampled, see Table 4-1c. Construction activities occurred on frozen ground conditions minimizing surface damage, rutting and erosion; existing access roads were used and vehicle traffic followed established trails to the extent possible; minimal disturbance occurred at tower foundations; and marshalling yards were not established in the community pasture. Environmental monitoring determined that the recommended mitigation was implemented and effective for grassland habitat, which minimized disturbance from clearing and construction activities. In particular, the mitigation techniques used to address soil and vegetation disturbance though surface damage, rutting and erosion, and the mitigation around tower erection and foundations were highly successful in reducing or eliminating instances of grassland habitat disturbance.

Table 4-1c. Mitigation measures assessed at sites monitored for grassland habitat on the RoW.

Mitigation Measure
Carry out construction activities on frozen ground to minimize surface damage, rutting and erosion.
Use existing access roads and trails to the extent possible.
Remove trees by low ground disturbance methods that protect shrubs and understory.
Confine vehicle traffic to established trails to the extent possible.
In the event of ground disturbance refer to Rehabilitation and Invasive Species Management Plan and for mitigation measures.
Marshalling yards and/or worker accommodations will not be developed within in Spy Hill-Ellice Community Pasture.
Tower foundations that limit disturbance of soil will be utilized within grassland habitat areas within the Spy Hill-Ellice Community Pasture.

4.2 Forest Habitat

Twelve sites were visited to sample forest habitat (TER) in 2022 (August 3 to 7) in the Spy Hill-Ellice Community Pasture (Map 4-1, Appendix II) (Field Activity ID BTP_LTM_FA607). Of these sites, 10 are located on the final preferred route while two sites were selected for monitoring off-RoW. Sample sites were previously established in 2017 and 2019, and represent baseline data collected prior to construction activities. All forested and previously forested sites consist of a young open trembling aspen (*Populus tremuloides*) canopy.

4.2.1 Data Analysis of Forest Habitat

All forested survey sites are monitored for traditional use species, species of conservation concern, and invasive species. Incidental searches (adjacent to sites but on the RoW) are also undertaken throughout monitoring. Vegetation descriptions are shown below for species cover, richness, diversity and evenness, provided in Table 4-2a.

The total understory vegetation cover for forested sites on the RoW has increased to 65%, (ranging from 44 to 83%), Table 4-2a, with noticeably increased regrowth compared to the early and sparse regeneration seen last season (43%, 2021). Mean richness in previously forested sites on the RoW is 25 species, ranging from 18 to 31 species per site. Both understory vegetation cover ($p=0.6$) and species richness ($p=0.1$) on the RoW in Year II monitoring are not significantly different than these understory measures recorded pre-construction. Diversity and evenness measures on the RoW were higher in the current year ($p<0.006$ and $p<0.002$, respectively) than in pre-construction surveys, although sites off-RoW followed this same pattern.

Table 4-2a. Year II Vegetation measures in the herb and low shrub layer in forested (TER) sites on-RoW: mean species cover (%), species richness, diversity and evenness, with mean values for pre-construction and off-RoW sites.

Sites	Cover	Richness	Diversity	Evenness
TER-25	44.4	29	2.67	0.79
TER-61	55.6	29	2.29	0.68
TER-62	61.6	31	2.92	0.85
TER-63	59.8	25	2.55	0.79
TER-64	68.2	22	2.18	0.71
TER-65	71.8	24	2.10	0.66
TER-66	65.8	28	2.64	0.79
TER-67	76	20	2.32	0.78
TER-68	67.6	18	1.97	0.68
TER-69	83	20	1.98	0.66
Year II on-RoW	65.4 ^a	24.6 ^a	2.36 ^b	0.74 ^b
Year II off-RoW	60.1	30.0	2.66	0.79
Pre-Constr (2019)	66.6 ^a	26.2 ^a	1.74 ^b	0.54 ^b

Notes: a= no significant difference between measures Year II and pre-construction.

b= measures in Year II have significantly increased over pre-construction.

4.2.1.1 Forest Cluster Analysis and Community Typing

Hierarchical cluster analysis of the understory vegetation was conducted for all forest surveys sampled on the RoW and off the RoW. The understory includes all vegetation growth

to a height of one meter, and includes graminoids (grass and sedge), herbaceous forbs and woody plants. Woody vegetation includes low growing shrubs (that do not exceed 1m of growth), tall shrub seedlings (woody species that attain heights >1m, but are regenerating or have not yet grown to full height) and aspen seedlings <1m. In the analysis of understory only vegetation, control sites were retained, particularly as the clustering of sites based on understory was strong, and not altered by the inclusion of the sites off-RoW. All sites are previous (or current, for controls) open canopies of aspen, with an understory dominated by forb cover (56%) and very sparse cover of grasses and sedges (8%). Vegetation cover was notably greater this second season of regeneration after clearing. The current understory (<1m) vegetation structure is similar to that measured pre-construction, although currently on the RoW there is a greater abundance of tree seedlings than recorded in pre-construction surveys. Also currently on the RoW, in the mid-canopy layer (>1m), tree saplings are more abundant and there is an absence of tall shrubs, as compared to pre-construction. All cleared sites on the RoW have abundant woody debris (86%) ground cover, and negligible to no bare soil exposed. Differences in the composition and structure of the understory among sites, as well as other possible physical factors, resulted in three forest community types, (Table 4-2b). These groups are generally consistent with last years monitoring results.

Table 4-2b. Community types for 12 forest surveys, 2022.

Forest Community	Surveys	Species, total	Species, mean
Herb and Graminoid Rich- Sparse Woody	5	67	29.8
Herb and Low Shrub	5	44	23.8
Herb Poor- Graminoid Rich- Low Shrub and Tree Seedling	2	25	19.0

Herb and Graminoid Rich –Sparse Woody

This group consists of three sites on the RoW (TER-25, -61-, -62) and both controls (TER-27, -43), off the RoW. The understory is diverse, with an average of 30 species recorded from plots, and dominated by herbaceous forbs (18% cover; 18 species), with sparse graminoids (10% cover). Woody growth is also sparse, particularly the low shrubs e.g. western snowberry (*Symphoricarpos occidentalis*), with moderate cover of tall shrub and tree seedlings e.g. chokecherry (*Prunus virginiana*) and Saskatoon (*Amelanchier alnifolia*). Trembling aspen sapling regeneration (>1m) is at 5% cover on the RoW. Commonly occurring and relatively abundant herbs include smooth wild strawberry (*Fragaria virginiana*), twining honeysuckle (*Lonicera dioica*), fringed loosestrife (*Lysimachia ciliata*), smooth aster (*Symphyotrichum laeve*) and goldenrods (*Solidago* spp.). Graminoids are very sparse and consist of dry-spike sedge (*Carex siccata*), Kentucky bluegrass (*Poa pratensis*) and white-grained mountain rice grass (*Oryzopsis asperifolia*), although a variety of other native grasses occasionally may co-occur. The average vegetation cover is 60%, which is slightly

lower than other sites but noticeably greater than the early regeneration noted last year. The three sites on the RoW were originally part of a much larger patch of forest, with fewer openings and less edge habitat than the control forest patches, or other TER sites.

Herb-Low Shrub: Raspberry and Rose

Five sites (BTP-TER-63, -64, -65, -66, -69) are characterized by a predominant understory cover of low shrubs (36%) consisting of wild red raspberry (*Rubus idaeus*) and roses, and diverse forest herbs (12% mean cover; 14 species, none dominant). Trembling aspen seedlings have moderate cover in sites (12%), and graminoid cover remains very sparse (4%). Vegetation regeneration is apparent with 72% total vegetation cover in this group. Aspen sapling regeneration is very sparse in this group (2% cover). Three of these sites (-64 to -66) are located adjacent to a ridge, originally within the same patch of forest, while -63 and -69 are from separate but originally similar sized forest patches.

Herb Poor –Graminoid Rich –Low Shrub and Tree Seedling: Raspberry, Snowberry and Trembling Aspen

The understory in two sites (BTP-TER-67, -68) is distinguished by abundant low growing shrubs (33% cover) consisting of wild red raspberry and western snowberry, and aspen seedling (<1m; 16% cover) and sapling (>1m; 5%) regeneration. Relative to other groups, the herbaceous forb cover and diversity is low (8%; 9 species), and the graminoid cover is relatively high (13%; 5 species), most abundant are dry-spike sedge and Kentucky bluegrass. The mean total vegetation cover is highest in this group at 77%. Both sites are grouped on the RoW at the west end of the pasture, where relief is quite flat, and sites represent previous small forest patches that were originally open and fragmented. During Year I, the western sites all grouped together and had lower diversity measures than other sites, a pattern that was not noted this year.

4.2.2 Accuracy of Effect Predictions and Effectiveness of Mitigation

For the project areas formerly cleared (2020/2021), the effect predictions on forest habitat (Appendix III) included the following:

- Loss of native vegetation during construction and maintenance activities.
- Modification of vegetation composition and structure adjacent to the project footprint from clearing activities.
- Introduction and spread of non-native and invasive species during construction and maintenance activities.
- Disturbance or removal of traditional use plants during clearing and construction activities.

- Loss of plant species of conservation concern during construction and maintenance activities.
- Loss or impairment of desirable plant species from herbicide application during maintenance activities.
- Loss or impairment of vegetation from the accidental release of fuels or hazardous substances from construction and maintenance activities.

The predicted change in native vegetation cover as a result of the project was accurate for forest habitat. For safe operation of the transmission line, tree cover in the RoW is required to be removed during clearing and construction activities. This season, regeneration growth of trembling aspen (*Populus tremuloides*) is at or slightly above 1 m in height, patchy in places to moderate in distribution (Photographs 4-2a and 4-2b). Although less common, other regenerating tree species include bur oak (*Quercus macrocarpa*) and paper birch (*Betula papyrifera*). Removal and long-term loss of RoW forest cover is an effect of transmission line development (Manitoba Hydro et al. 2003). Fragmentation from large-scale corridor projects is frequently an unavoidable consequence. Windfall (blow-down) of susceptible trees along the newly created forest edges was observed in one instance into the RoW at site TER-65. With the exception of a patch of crested wheatgrass (*Agropyron cristatum*) and smooth brome (*Bromus inermis*) transitioning into nearby trees and shrubs, vegetation composition and structure adjacent to the Project footprint appeared unmodified.



Photograph 4-2a. Typical regrowth around 1 m in height, with moderately dense cover at TER-63.



Photograph 4-2b. Regrowth at <2 m in height at TER-66.

On the RoW, very little soil disturbance was observed, with no major outbreaks of noxious, invasive or non-native species. No Tier 1 or Tier 2 noxious species were noted during sampling in 2022. Occasional non-native or invasive species (Tier 3 and/or SNA) were noted in cleared TER sites, see Section 4.3.

In the previously forested habitat, coarse woody debris (mulch from clearing) is again a dominant ground cover throughout all RoW plots. The dense mulch cover favours the regrowth of woody species such as trembling aspen saplings and tall shrubs including rose (*Rosa* sp.), wild red raspberry (*Rubus idaeus*), western snowberry (*Symphoricarpos occidentalis*) and red-osier dogwood (*Cornus sericea*), while forb and grass cover is generally sparse (Photograph 4-2c). Chokecherry (*Prunus virginiana*) and occasional pin cherry (*Prunus pensylvanica*) were observed on the RoW and Section 4.4 discusses vegetation cover for traditional use plants. Species of conservation concern were present in forest habitat after clearing and construction activities. A total of thirteen species of conservation concern were recorded during TER sampling, six of which occurred uniquely in the off-RoW control plots (see Section 4.5). Species were recorded from grassy openings in cleared areas or from near forest edges.

Regenerating woody species from three cleared sites at the west end of the pasture (BTP-TER-67 through 69) had slight foliar damage, possibly due to herbicide application. Leaders on regenerating aspen were crooked, with some blackened leaves. Low shrubs were affected as well, with yellow leaves on snowberry and rose, and curled leaves on raspberry plants.



Photograph 4-2c. Angle Tower 124 with taller woody regrowth near TER-66, <2 m height.

Mitigation measures identified in the Construction Environmental Protection Plan Mapbook (Manitoba Hydro 2020b) were assessed previously at each forest site sampled, see Table 4-2c. Construction activities occurred on frozen ground conditions minimizing surface damage, rutting and erosion; existing access roads were used and vehicle traffic followed established trails to the extent possible; trees were removed by low ground disturbance and minor soil disturbance (i.e., bare ground or rutting) was observed; and marshalling yards were not established in the community pasture. Through environmental monitoring, it was determined that the recommended mitigation was implemented and effective for forest habitat, according to the minimal ground disturbance observed from clearing and construction activities. Photograph 4-2d shows previously cleared forest vegetation. In particular, the mitigation techniques used to address soil and vegetation disturbance through rutting and erosion, and tree removal techniques were highly successful in reducing or eliminating instances of ground surface damage in previously forested habitat.

Table 4-2c. Mitigation measures assessed at sites monitored for forest habitat on the RoW.

Mitigation Measure
Carry out construction activities on frozen ground to minimize surface damage, rutting and erosion.
Use existing access roads and trails to the extent possible.
Remove trees by low ground disturbance methods that protect shrubs and understory.
Confine vehicle traffic to established trails to the extent possible.
In the event of ground disturbance refer to Rehabilitation and Invasive Species Management Plan and for mitigation measures.
Marshalling yards and/or worker accommodations will not be developed within in Spy Hill-Ellice Community Pasture.



Photograph 4-2d. Previous forest clearing in the RoW.

4.3 Invasive Plant Species

Invasive plant species were identified as an environmental indicator of both grassland and forest habitat. Surveys for all invasive species were included in quantitative surveys (PRA and TER), as well as incidentally along the RoW within the community pasture, and in the vicinity of Tower 114, immediately east of the pasture (Map 4-1, Appendix II) (Field Activity ID BTP_LTM_FA606 and 607). Sampling occurred July 18 to 23 and August 3 to 7.

In Manitoba, the Noxious Weeds Regulation lists 89 plant species as noxious under the Noxious Weeds Act (Manitoba Agriculture and Resource Development 2022). The Regulation categorizes noxious weeds into three tiers of severity. Tier 1 noxious weeds are the most threatening species, harmful to livestock or agricultural crops. Responsibilities under the current Regulation include the following:

- Destroy all Tier 1 noxious weeds that are on land that a person owns or occupies;
- Destroy all Tier 2 noxious weeds that are on land that a person owns or occupies if the area colonized by weeds is less than 20 acres;
- Control all Tier 2 noxious weeds that are on land that a person owns or occupies if the area colonized by weeds is 20 acres or more; and
- Control a Tier 3 noxious weed that is on land that a person owns or occupies if the weed's uncontrolled growth or spread is likely to negatively impact an aspect of

Manitoba's economy or environment of the land, or the well-being of residents in proximity to the land.

4.3.1 Data Analysis of Invasive Vegetation

Seven non-native species were recorded within the community pasture, including those designated as noxious Tier 3 (four species) or invasive (two species), either with cover recorded in plot surveys (PRA, TER) or as incidental observations on the pasture. All species are ranked exotic (SNA; MB CDC 2020). No Tier 1 or Tier 2 noxious species were observed at any time throughout fieldwork (2017 to 2022) within the community pasture.

Within plots, six species were recorded in forested sites and two species were recorded from grassland sites. Together, the noxious, invasive and non-native species recorded in the community pasture on the RoW include five plant families, most prominent are Asteraceae (three species). The number of species and observations of noxious, invasive and non-native plants recorded in the community pasture and Tower 114 are shown in Table 4-3. The most frequently observed noxious species is common dandelion (*Taraxacum officinale*, Tier 3), followed by smooth brome (*Bromus inermis*, invasive). Notably, non-native species are virtually absent from grassland sites on the RoW and where present are very sparse in cleared forested sites. In PRA and TER sites, just three species were recorded quantitatively with negligible cover (<1% on average) in plots, with remaining four species recorded incidentally in the RoW. Invasive species occur elsewhere in pasture. Off the RoW a large patch of crested wheatgrass (*Agropyron cristatum*) and smooth brome was noted in an opening on a vehicle trail. At least five non-native species were observed at Tower 114, however these are mostly showy wildflowers that did not appear to have an invasive growth habit, apart from a single small patch of yellow sweet clover plants, see Section 4.6.

Table 4-3. The noxious (Tier 3), Invasive (Inv) and non-native (Nn) species recorded on the RoW, in the Community Pasture and at Tower 114, 2022.

Species	Common Name	PRA	TER	T114	Status	Family
<i>Bromus inermis</i>	Smooth Brome	-	3	-	Inv	Poaceae
<i>Chenopodium album</i>	Common Lamb's-quarters	-	1	-	Tier 3	Chenopodiaceae
<i>Coreopsis</i> sp.	A tickseed	-	-	x	Nn	Asteraceae
<i>Descurainia sophia</i>	Flixweed	1	-	-	Tier 3	Brassicaceae
<i>Iberis amara</i>	Rocket Candytuft	-	-	x	Nn	Brassicaceae
<i>Melilotus albus</i>	White Sweet Clover	-	1	-	Inv	Fabaceae
<i>Melilotus officinalis</i>	Yellow Sweet Clover	-	-	x	Inv	Fabaceae
<i>Eschscholzia</i> sp.	A poppy	-	-	x	Nn	Papaveraceae
<i>Papaver</i> sp.	A poppy	-	-	x	Nn	Papaveraceae
<i>Sonchus arvensis</i>	Field Sow-thistle	-	1	-	Tier 3	Asteraceae
<i>Taraxacum officinale</i>	Common Dandelion	-	9	-	Tier 3	Asteraceae

<i>Tragopogon</i> sp.	A goat's-beard	1	1	-	Nn	Asteraceae
Number of species		2	6	5		
Number of observations		2	16	-		

4.4 Traditional Use Plant Species

Traditional use plant species were identified as an environmental indicator in both grassland and forest habitat. Traditional use plants were recorded from quantitative surveys (PRA, TER) in the community pasture between July 18 to 23 and August 3 to 7, 2022 (Map 4-1, Appendix II) (Field Activity ID BTP_LTM_FA606 and 607).

Indigenous engagement for the Project included values and interest workshops from Canupawakpa Dakota Nation (Manitoba Hydro 2017a), Gambler First Nation (Manitoba Hydro 2017b) and Waywayseecappo First Nation (Manitoba Hydro 2017c), in part to identify traditionally important plant species. Plant and tree species currently used for traditional purposes in the RAA are also identified in the Metis land use and occupancy study (MNP 2017). Traditional plant species important for sustenance, medicinal and cultural practices include at least 29 species (two trees, nine shrubs, 18 herbs) (Table 4-4a), compiled and summarized in the Biophysical Existing Environment Technical Report (Manitoba Hydro 2018b). Some activities such as berry picking and medicinal plant gathering do not necessarily specify a single plant species, e.g., 'Cranberry' may include several *Viburnum* species. Vegetation or community types identified as important to participants included trees, forests and pastures. Plant names from workshop reports and the land use and occupancy study are preserved here.

4.4.1 Data Analysis of Traditional Use Plant Species

In 2022, a total of 22 traditional use plant species were observed, comparable to pre-construction surveys in 2017 and 2019 (21 species) and Year I monitoring (23 species). Species this season included two trees, nine shrubs, and 11 herbs (Table 4-4a). Of the traditional use species recorded this season in the pasture, 13 are found uniquely in forested sites, two are found uniquely in grassland sites, while four species are found in both habitats. In comparison to Year I monitoring, 12 species were found uniquely in forested sites and six in grassland sites, while two were found in both habitats.

Table 4-4a. Traditional use plants identified from Indigenous engagement and land use studies, and those recorded in pasture sites in 2022.

Traditional Plants	Scientific Name	2022 Survey
Trees		
Trembling Aspen	<i>Populus tremuloides</i>	TER
Bur Oak	<i>Quercus macrocarpa</i>	TER
Shrubs		
Saskatoon	<i>Amelanchier alnifolia</i>	TER
Hazelnut	<i>Corylus</i> spp.	TER
Pin Cherry	<i>Prunus pensylvanica</i>	TER
Plum	<i>Prunus</i> spp.	-
Chokecherry	<i>Prunus virginiana</i>	TER
Roses*	<i>Rosa</i> spp.	PRA, TER
Raspberry	<i>Rubus idaeus</i>	TER
Red Willow*	<i>Salix</i> spp.	TER
Cranberry	<i>Viburnum</i> spp.	TER
Herbs and grass		
Weke/Rat Root	<i>Acorus americanus</i>	-
Wild Onion	<i>Allium</i> spp.	PRA, TER
Sweetgrass	<i>Anthoxanthum hirtum</i>	-
Sage*	<i>Artemisia</i> spp.	PRA, TER
Prairie Turnip	<i>Brassica napus</i>	-
Lamb's Quarter	<i>Chenopodium album</i>	TER
Thistle	<i>Cirsium</i> spp.	-
Purple Coneflower	<i>Echinacea angustifolia</i>	-
Strawberry	<i>Fragaria virginiana</i>	PRA, TER
Tiger Lily	<i>Lilium philadelphicum</i>	PRA
Common Sweet Clover	<i>Melilotus</i> spp.	TER
Wild Mint	<i>Mentha arvensis</i>	-
Seneca Root	<i>Polygala senega</i>	TER
Crocus	<i>Pulsatilla</i> sp.	PRA
Bulrush	<i>Schoenoplectus</i> spp.	-
Dandelion	<i>Taraxacum officinale</i>	TER
Cattail	<i>Typha</i> spp.	-
Stinging Nettle	<i>Urtica dioica</i>	-

Note: *More than one species recorded.

Traditional use plants are found throughout the pasture both in the understory of forested sites and in open grasslands, Table 4-4b. The mean cover of all traditional use species continues to be greatest in forested sites (42.5% in Year II compared to 27.8% in Year I), due to the greater presence of woody growth in the understory as low shrubs (19.3%; roses, raspberry), tall shrub seedlings (4.9%; Saskatoon, cherries, willows, and hazelnuts), and tree seedlings and saplings (16.1%; primarily trembling aspen). Highbush-cranberry was incidentally recorded in one site this season. Traditional herbs are less abundant in the forest understory (mean cover 2.2%) and consist primarily of common dandelion and strawberry. Woody growth in the mid-canopy layer in Year II is restricted to sparse trembling aspen saplings found in all 10 monitoring sites (compared to four sites in 2021) and chokecherry recorded in just one forested site.

In grassland sites, there continues to be a lower mean abundance of traditional use plants in Year II monitoring (5.2%) due to the marked absence of woody seedlings from tall shrubs and trees, but a slight increase in cover from Year I (4.5%). Low shrubs in grassland sites consist entirely of prairie rose (mean cover 2.5%), found in nearly all sites (nine sites). Grassland sites have a slight greater abundance of traditional use herbs (mean cover 2.7%) compared to forested sites, which consist primarily of sages and crocus, with onion and strawberry; wood lily was incidentally recorded in one site. The mid-canopy layer is absent again in Year II, in grassland sites.

The mean total traditional use plant cover was again comparable for grassland sites prior to construction (4.0% vs 5.2% in Year II) while the understory value of forest sites measured pre-construction (26.9%) has been exceeded in Year II monitoring (38.6%), see Table 4-4b. In pre-construction surveys, the mean cover of low growing shrubs (21.1%), tall shrub seedlings (3.7%), and tree seedlings (0.4%) in the forest understory have all been surpassed this season due to a change in woody growth composition and forest structure after previous RoW clearing. This succession pattern is as expected, as mid- and upper- canopies were removed and regeneration of woody species from these layers occurs. A high cover of traditional use plants is generally represented by sites with good woody regeneration in forested sites. The mean cover of traditional herbs in Year II was comparable to pre-construction values for both grassland (2.0%) and forested (1.8%) sites, with 2.7% and 2.2% this season, respectively.

Table 4-4b. Traditional Use plants: Total understory vegetation cover by growth form and number of species, by site, 2022.

Sites	Total Understory Cover	Herbs	Low shrubs	Tall shrub seedl.	Tree seedl.	Species
PRA-26	8.0	6.6	1.4	-	-	4
PRA-51	9.4	4.4	5.0	-	-	4
PRA-52	2.8	2.8	-	-	-	4
PRA-53	6.0	1.4	4.6	-	-	3
PRA-54	6.2	1.2	5.0	-	-	3
PRA-55	3.0	1.6	1.4	-	-	4
PRA-56	1.6	1.0	0.6	-	-	4
PRA-57	2.8	2.4	0.4	-	-	5
PRA-58	2.2	1.2	1.0	-	-	3
PRA-59	10.0	4.8	5.2	-	-	6
mean PRA Year II	5.2	2.7	2.5	-	-	4
TER-25	24.2	3.0	2.8	11.0	7.4	10
TER-61	20.0	3.6	3.4	0.8	12.2	7
TER-62	26.4	3.6	5.8	7.2	9.8	7

TER-63	39.6	2.6	25.4	6.0	5.6	9
TER-64	46.8	1.8	37.0	1.8	6.2	6
TER-65	56.4	1.4	38.8	2.2	14.0	7
TER-66	41.2	1.8	22.6	6.6	10.2	8
TER-67	35.8	3.0	16.8	2.4	13.6	6
TER-68	30.8	-	9.8	2.6	18.4	5
TER-69	64.4	1.4	30.2	6.8	26.0	6
mean TER Year II	38.6	2.2	19.3	4.7	12.3	7.1

4.5 Species of Conservation Concern

Species of conservation concern were identified as an environmental indicator of both grassland and forest habitat. Species of conservation concern were recorded from quantitative sites, and incidentally along the RoW, between July 18 to 23 and August 3 to 7, 2022 (Map 4-1, Appendix II) (Field Activity ID BTP_LTM_FA606 and 607). No species listed by the federal *Species at Risk Act*, the Manitoba *Endangered Species and Ecosystems Act* or listed by the Committee on the Status of Endangered Wildlife in Canada were observed during fieldwork.

Thirty-eight species of conservation concern were observed along the RoW in 2022, summarized in Table 4-5a. Among these species, eight are ranked Critically Imperilled or Imperilled (S1-S2) including Louisiana broomrape (*Aphyllon ludovicianum*, S2), sun sedge (*Carex inops* ssp. *heliophila*, S1?), Schweinitz's flatsedge (*Cyperus schweinitzii*, S2), sand millet (*Dichanthelium wilcoxianum*, S2?), sand-dune wheatgrass (*Elymus lanceolatus* ssp. *psammophilus*, S1), tufted fleabane (*Erigeron caespitosus*, S1), sand ricegrass (*Eriocoma hymenoides*, S2) and showy locoweed (*Oxytropis campestris* var. *spicata*, S1). The remaining 30 species are ranked as Vulnerable (S3-S3S5).

The species of conservation concern recorded on the RoW are all grassland species, generally restricted to open upland prairie, or woodland openings, with some species further restricted to sandy soils, Table 4-5b. Twenty-six species were recorded in grassland sites, while thirteen were recorded from openings in previously forested sites. Fourteen species of conservation concern were recorded from the site at Tower 114. Among these, six species were found uniquely in the grassland in and around the footing at this Tower site.

Table 4-5a. Species of conservation concern recorded in the community pasture, on the RoW, 2022.

Scientific Name	Common Name	Rank
Critically Imperilled and Imperilled Species (S1-S2)		
Louisiana Broomrape	<i>Aphyllon ludovicianum*</i>	S2
Sun Sedge	<i>Carex inops</i> ssp. <i>heliophila</i>	S1?
Schweinitz's Flatsedge	<i>Cyperus schweinitzii*</i>	S2
Sand Millet	<i>Dichanthelium wilcoxianum</i>	S2?
Sand-dune Wheatgrass	<i>Elymus lanceolatus</i> ssp. <i>psammophilus</i>	S1
Tufted Fleabane	<i>Erigeron caespitosus</i>	S1
Sand Ricegrass	<i>Eriocoma hymenoides*</i>	S2
Showy Locoweed	<i>Oxytropis campestris</i> var. <i>spicata</i>	S1
Vulnerable Species (S3-S3S5)		
Ground-plum	<i>Astragalus crassicaarpus</i>	S3S4
Hooker's Oat Grass	<i>Avenula hookeri</i>	S3S4
Pumpelly's Brome	<i>Bromus pumpellianus</i>	S3S4
Blunt Sedge	<i>Carex obtusata</i>	S3S4
Rose Chamaerhodos	<i>Chamaerhodos erecta</i>	S3S4
Goosefoot	<i>Chenopodium pratericola</i>	S3
White Prairie-clover	<i>Dalea candida*</i>	S3S5
Smooth Scouring-rush	<i>Equisetum laevigatum</i>	S3S4
Rough Fleabane	<i>Erigeron strigosus</i>	S3S5
Prairie-rocket Wallflower	<i>Erysimum asperum</i>	S3S4
Plains Rough Fescue	<i>Festuca hallii</i>	S3
Beautiful Sunflower	<i>Helianthus pauciflorus</i> ssp. <i>subrhomboides</i>	S3S4
Needle-and-thread Grass	<i>Hesperostipa comata</i>	S3S4
Western Porcupine Grass	<i>Hesperostipa curtisetia</i>	S3S4
Long-leaved Bluets	<i>Houstonia longifolia</i>	S3S5
Narrow-leaved Puccoon	<i>Lithospermum incisum</i>	S3
Rush Skeletonweed	<i>Lygodesmia juncea*</i>	S3S4
Hairy Umbrellawort	<i>Mirabilis albida</i>	S3S4
Shrubby Evening-primrose	<i>Oenothera serrulata</i>	S3
Prairie Breadroot	<i>Pedimelum esculentum</i>	S3S4
Lilac-flowered Beard-tongue	<i>Penstemon gracilis</i>	S3S4
Moss Pink	<i>Phlox hoodii</i>	S3
Divided-leaved Cinquefoil	<i>Potentilla concinna</i> var. <i>divisa</i>	S3
Pennsylvania Cinquefoil	<i>Potentilla pensylvanica</i>	S3S4
Upright Prairie Coneflower	<i>Ratibida columnifera*</i>	S3S4
Little Bluestem	<i>Schizachyrium scoparium</i>	S3S4
Prairie Spikemoss	<i>Selaginella densa</i>	S3
Drummond's Cockle	<i>Silene drummondii</i>	S3

Sand Dropseed	<i>Sporobolus cryptandrous</i>	S3S5
Sand Reedgrass	<i>Sporobolus rigidus</i>	S3S5

Note: The six species marked (*) were observed uniquely at Tower 114.

Table 4-5b. Distribution of species of conservation concern 2022: counts of species by survey and habitat, with total number of observations.

	Total	PRA	TER	Tower 114
Critically Imperilled and Imperilled: S1-S2S3	8	4	1	5
Vulnerable: S3-S3S5	30	22	12	10
Total # species	38	26	13	15
Total # observations		156	21	-

Of the Imperilled species recorded from the RoW, Wilcox's panicgrass is Nationally Imperilled (N2N3), and both Louisiana broomrape and Schweinitz's flatsedge are Nationally Vulnerable (N3N4). Habitat and biological information for Critically Imperilled and Imperilled species below are taken from the following references: Leighton and Harms 2014; Leighton 2012; Flora of North America 1993+; and Looman and Best 1987. Saskatchewan sub-national ranks follow the Saskatchewan Conservation Data Center (SK CDC 2021).

- *Aphyllon ludovicianum* (Louisiana Broomrape) S2; N3N4; G5. Dry prairie, especially on sandy soils. Two stems of this species were recorded uniquely at Tower 114, in open sand. Louisiana broomrape parasitizes *Artemisia campestris* (field wormwood), which was growing adjacent, (SK rank: S3). Photograph 4-5a.
- *Carex inops* ssp. *heliophila* (Sun Sedge) S1?; N5; G5. Dry prairie, especially on sandy soils. This species was recorded in one grassland site. Sun sedge is likely more widespread in the community pasture, it is easily overlooked and cannot be identified without the fruiting body, (SK rank: S5).
- *Cyperus schweinitzii* (Schweinitz's Flatsedge) S2; N3N4; G5. Dry sandy soils, sand dunes, sandy openings in woods. Multiple plants were recorded uniquely at Tower 114, in open sand. (SK rank: S3).
- *Dichanthelium wilcoxianum* (Sand Millet) S2?; N2N3; G5. Dry, well-drained prairie slopes, pastures, sand dunes and open sandy pine woods. Recorded from seven grassland sites, and widespread, yet sparsely occurring throughout grassland sites on the RoW within the Community Pasture, (SK rank: S2).

- *Elymus lanceolatus* ssp. *psammophilus* (Sand-dune Wheatgrass) S1; N4; G5TNR. Dry, well-drained prairie slopes, pastures, sand dunes and open sandy pine woods. Single patch found at control site PRA-32 and very sparse single patch from open sand at Tower 114. (SK rank: S2).
- *Erigeron caespitosus* (Tufted Fleabane) S1; N5; G5. Dry prairie, and rocky or sandy, grassy hills, sagebrush-aspen. Tufted fleabane is found in five grassland sites in the western portion of the community pasture, sometimes occurring abundantly. White daisy-like flowers with yellow centers bloom in July-August, (SK rank: S4).
- *Eriocoma hymenoides* (Sand Ricegrass) S2; N5; G5. Sandy soils, slopes, dunes. Very resistant to wind action and a good sand-binder. This early colonizing grass was recorded uniquely from Tower 114 in open sand, amongst other native sand grasses. (SK rank: S4).
- *Oxytropis campestris* var. *spicata* (Showy Locoweed) S1; N5; G5. Dry hillsides, grasslands, and prairie openings in woods. Pale yellow blooms, May to July. This species was present in six grassland sites, (SK rank: S4).



Photograph 4-5a. Louisiana broomrape seen growing near *Artemisia campestris*, in open sand at Tower 114.

4.6 Vegetation Management and Rehabilitation

In 2022, vegetation management and rehabilitation were provided by the vegetation monitoring team, where required. There continues to be an extremely low presence of non-native and invasive species noted in the PRA sampling sites of the community pasture. A single Tier 3 species, flixweed (*Descurainia sophia*) and a non-native species, goat's-beard (*Tragopogon dubius*) were recorded from grassland sites. Flixweed plants were pulled from the ridge top near PRA-26 and removed from the pasture. A large patch of crested wheatgrass (*Agropyron cristatum*) along with smooth brome (*Bromus inermis*) was noted along main pasture trail (near PRA-26) and into an opening in nearby trees and shrubs. Crested wheatgrass was not detected in open grassland areas away from vehicle track.

Six occasionally occurring non-native or invasive species (Tier 3 and/or SNA) were noted in cleared TER sites, primarily common dandelion (*Taraxacum officinale*), smooth brome, and lamb's quarters (*Chenopodium album*), white sweetclover (*Melilotus albus*), field sow-thistle (*Sonchus arvensis*) and goat's-beard. Sweetclover (invasive) plants were pulled from the RoW at TER-25 and removed from the pasture. No Tier 1 or 2 noxious species were noted during PRA or TER sampling on the RoW or incidentally between sites.

In grassland sites, the equipment path (apparent in 2021 as some bare ground and sparse vegetation) was less apparent in 2022, with continued minimal to no soil disturbance. In 2021, vegetation on the equipment path near PRA-26 was extremely sparse which has now recovered to dense regrowth of pasture sage (Photograph 4-6a below).



Photograph 4-6a. Equipment path near PRA-26 with no bare ground and dense regrowth of pasture sage (top right).

No substantial areas of exposed soil were observed on the RoW in previously forested sites, and very little soil disturbance was noted. No re-seeding was required in or around grassland or previously forested sites.

A site visit was made to Tower 114 this second season post construction, to check on revegetation. Tower 114 is just outside the Community Pasture at the top of the Assiniboine Valley and below a native prairie and pasture area, with groves of aspen nearby. The area around the tower footprint was originally open grassland on sand soils, which slopes into the Assiniboine Valley.

To address bare ground post construction, the site had been previously treated with straw revegetation mats, placed on the slope above the tower and at the tower footing over an area of approximately <0.2 ha. Currently, sparse regrowth of native grasses and some ruderal forbs are present at the tower footing, along with broad areas of bare sand and worn straw mats (Photographs 4-6b, 4-6c). On the upper slope at the tower site is a small patch that appears to have been seeded over the straw mats to a dense regrowth of native grasses and native and non-native showy wildflowers, (Photograph 4-6d). The density and diversity of this patch stands out in contrast to the surrounding native vegetation both adjacent to and on the RoW. There is no evidence of invasive growth from the non-native species, which include poppies (e.g. *Eschscholzia* sp. and *Papaver* sp.), a non-native tickseed (*Coreopsis* sp.), and rocket candytuft (*Iberis amara*). Other expected native prairie species are also present, in great abundance including upright prairie coneflower (*Ratidiba columnifera*), blue flax (*Linum lewisii*), purple prairie clover and white prairie clover (*Dalea candida*). Native bunch grasses are also abundant throughout replanted area and downslope along fence line. These include one-sided wheatgrass, Virginia wildrye (*E. virginicus*), needle-and-thread grass (*Hesperostipa comata*), sand ricegrass (*Eriocoma hymenoides*), sand reedgrass (*Sporobolus rigidus*), sand dropseed (*S. cryptandrus*), and Schweinitz's flatsedge (*Cyperus schweinitzii*), some of which were not previously recorded from this site (pre-construction). A small wetland spring upslope of previously planted regrowth is surrounded by small trees and shrubs within the undisturbed native pasture. Moisture from the spring may be contributing to the relatively lush regrowth in the immediate area, it seems unlikely that this site has had soil amendments.

A custom native reclamation seed mix (Skinner's Native Seeds) was broadcast throughout the tower area where vegetation was sparse or absent, on straw mats and bare ground. Native seed content was a 60:40 mix of grasses to forb, specifically one-sided wheatgrass (20%), blue grama grass (10%), plains rough fescue (10%), little bluestem (10%), western porcupine grass (10%), and purple prairie clover (40%). Each of these species occur within the broader area, and at least half are pre-existing at the tower site specifically.



Photograph 4-6b. Upslope of Tower 114, with remains of straw revegetation mats and sparse native vegetation regrowth, and patch of dense replanted native grasses and native and non-native wildflowers (center top, to fence line, pale green).



Photograph 4-6c. Downslope of Tower 114 with original native vegetation in foreground, ruderal *Chenopodium pratericola* on sand (center). Area of native and non-native wildflower planting is visible upslope below the trees.



Photograph 4-6d. Upslope of Tower 114, area of dense regrowth (previously planted), with native grasses and native and non-native wildflowers over revegetation mats. Native bunch grasses continue downslope along fence line. Very sparse natural regeneration of native vegetation on remains of straw mats is visible in Tower footing. Note original sparse vegetation across fence line.

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 previous 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 for grassland sites. Species richness values increased ($p < 0.03$) on the RoW between pre-construction and Year II monitoring for herbaceous and low shrub cover (34.0 and 37.6, respectively). In forested sites, average species richness showed similar values ($p > 0.05$) between pre-construction (26.2) and Year II monitoring (24.6). This observed difference in richness is likely a function of increased observations with repeat sampling, and year to year differences in vegetation growth and composition due to environmental factors (such as rainfall). The increased species richness noted in Year II is unlikely to do with any lasting project effect.

Hypothesis 2 (*Invasive and non-native species abundance is related to transmission line clearing and construction activities along the right-of-way*) cannot be proven true in Year II

post-construction monitoring. This season, there was a notable low presence of non-native and invasive species in the community pasture, two years after clearing and construction activities. This pattern continues from pre-construction surveys and Year I monitoring where non-native and invasive species were remarkably absent or with low cover in sites. In grassland and previously forested sites, just three species were recorded with negligible cover (<1% on average) in plots this season, with four other species recorded incidentally in the RoW.

5.0 RECOMMENDATIONS

Based on the post-construction vegetation monitoring in 2022, the following are recommendations for the project:

1. In the community pasture, carry out future project maintenance activities on frozen (ideally snow-covered) or dry ground conditions to minimize surface damage, rutting and erosion. Sandy soils found throughout the community pasture and along the RoW are susceptible to disturbance. The ground cover of native vascular and non-vascular vegetation on sandy soils has poor resilience to mechanical disturbance, which increases the prairie's vulnerability to the introduction and spread of invasive species.
2. Care must be taken that equipment and machinery used during maintenance activities does not import any invasive or non-native plant materials into the community pasture grassland. Removal of visible plant materials and mud/gravel from all vehicles prior to accessing the prairie can reduce the possibility of invasive species introduction.
3. In the community pasture, use existing access roads and trails and confine traffic to these locations, to the extent possible during maintenance activities.
4. Tower 114 on private land in the Assiniboine River Valley (outside of the community pasture) should be revisited to assess the rehabilitation implemented. Prior to this season, straw revegetation mats were applied at the footing and in the vicinity, and native grasses and native and non-native wildflowers were planted in over a section of the revegetation mats. In 2022 a native vegetation reclamation mix was hand broadcast at and in the vicinity of the Tower footing, over bare soil, sparse revegetation and remains of straw mats.

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APPENDIX I. Definitions of selected technical terms.

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 (Cauboue et al. 1996).

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).

Bryophyte – A plant of the group Bryophyta; a liverwort, moss or hornwort (Johnson et al. 1995).

Canopy – The more or less continuous cover of branches and foliage formed by the crowns of trees (Cauboue et al. 1996).

Canopy Closure – The degree of canopy cover relative to openings (Cauboue et al. 1996).

Classification – The systematic grouping and organization of objects, usually in a hierarchical manner (Cauboue et al. 1996).

Cluster Analysis – A multidimensional statistical technique used to group samples according to their degree of similarity (Cauboue et al. 1996).

Community-Type – A group of vegetation stands that share common characteristics, an abstract plant community (Cauboue et al. 1996).

Coniferous – Narrow-leaved evergreens; a cone-bearing plant belonging to the taxonomic group Gymnospermae (Cauboue et al. 1996).

Cover – The area of ground covered with plants of one or more species, usually expressed as a percentage (Cauboue et al. 1996).

Deciduous – Refers to perennial plants from which the leaves abscise and fall off at the end of the growing season (Cauboue et al. 1996).

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

Ecoregion – An area characterized by a distinctive regional climate as expressed by vegetation (Cauboue et al. 1996).

Endangered Species - A species that is facing imminent extirpation or extinction (Government of Canada 2019).

Extirpated Species - A species that no longer exists in the wild in Canada, but exists elsewhere in the wild (Government of Canada 2019).

Flora - A list of the plant species present in an area (Cauboue et al. 1996).

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 (Cauboue et al. 1996).

Graminoid - A plant that is grass-like; the term refers to grasses and plants that look like grasses, i.e. only narrow-leaved herbs (Cauboue et al. 1996).

Grassland - Vegetation consisting primarily of grass species occurring on sites that are arid or at least well drained (Cauboue et al. 1996).

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 (Cauboue et al. 1996).

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 2022).

Mitigation - Often the process or act of minimizing the negative effects of a proposed action (Cauboue et al. 1996).

Mixedwood - Forest stands composed of conifers and angiosperms each representing between 25 and 75% of the cover (Cauboue et al. 1996).

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 (eg. 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 2022).

Plot – A vegetation sampling unit used to delineate a fixed amount of area for the purpose of estimating plant cover, biomass, or density (Cauboue et al. 1996).

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 (Cauboue et al. 1996).

Shrub – A perennial plant usually with a woody stem, shorter than a tree, often with a multi-stemmed base (Cauboue et al. 1996).

Site – The place or category of places, considered from an environmental perspective, that determines the type and quality of plants that can grow there (Cauboue et al. 1996).

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 (Cauboue et al. 1996).

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 2019).

Stand – A collection of plants having a relatively uniform composition and structure, and age in the case of forests (Cauboue et al. 1996).

Stratum – A distinct layer within a plant community, a component of structure (Cauboue et al. 1996).

Terrestrial – Pertaining to land as opposed to water (Cauboue et al. 1996).

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 2019).

Understory – Vegetation growing beneath taller plants such as trees or tall shrubs (Cauboue et al. 1996).

Vascular Plant – A plant having a vascular system (Usher 1996). Non-vascular plants include the mosses and lichens.

Vegetation – The general cover of plants growing on a landscape (Cauboue et al. 1996).

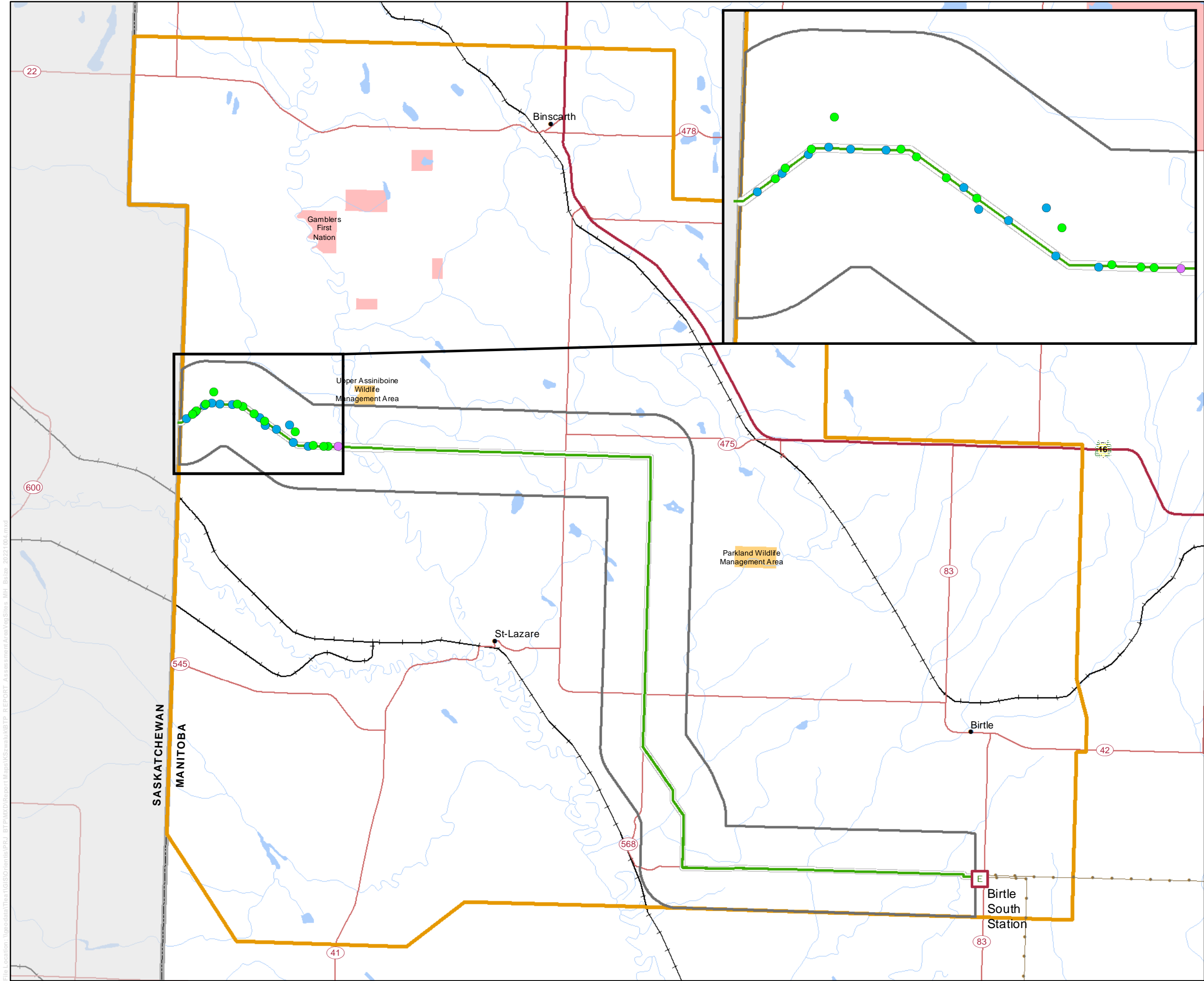
Vegetation Type – In phytosociology, the lowest possible level to be described (Cauboue et al. 1996).

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 (Cauboue et al. 1996).

APPENDIX II. Report maps.

Map 1-1

Birtle Transmission Project Area



Birtle Transmission Project

Project Infrastructure
Final Preferred Route

Vegetation Sites
Prairie
Forest
Rehabilitation

Assessment Areas
Project
Local
Regional

Infrastructure
Electric Station
Transmission Line

Landbase
Community
Road
Railway Line
First Nation
National/Provincial Park
Wildlife Management Area
Province of Manitoba Boundary

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date: October 4, 2022
Available in accessible formats upon request.

0 2.5 5 Kilometres
0 2 4 Miles

1:140,000

Map 4-1
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 Assessment Report (Manitoba Hydro 2018a) and the Biophysical Existing Environment Technical Report (Manitoba Hydro 2018b).

Number	Potential Environmental Effect
1	Loss of native vegetation during construction and maintenance activities.
2	Modification of vegetation composition and structure adjacent to the project footprint from clearing activities.
3	Disturbance to native grasslands and a reduction in floristic diversity from construction and maintenance activities.
4	Loss of plant species of conservation concern during construction and maintenance activities.
5	Introduction and spread of non-native invasive species during construction and maintenance activities.
6	Loss or impairment of desirable plant species from herbicide application during maintenance activities.
7	Disturbance or removal of traditional use plants during clearing and construction activities.
8	Loss or impairment of vegetation from the accidental release of fuels or hazardous substances from construction and maintenance activities.
9	Disturbance to wetlands during construction activities.

APPENDIX IV. Project commitments for pre-construction surveys and environmental monitoring of botanical and vegetation resources. Reference documents include the Environmental Monitoring Plan (Manitoba Hydro 2020a) and the Environment Act Licence (Manitoba Conservation and Climate 2020).

Commitment Document	Page/Section or Clause	Environmental Component	Commitment Description Summary	Objectives to meet intent of Commitment
Environmental Monitoring Plan	Page 18	Grassland Habitat - Plant Species of Conservation Concern	Survey for species occurrence	Pre-construction survey and environmental monitoring
Environmental Monitoring Plan	Page 21	Grassland Habitat - Invasive Plant Species	Survey for species occurrence	Pre-construction survey and environmental monitoring
Environmental Monitoring Plan	Page 23	Grassland Habitat - Traditional Use Plant Species	Survey for species occurrence	Pre-construction survey and environmental monitoring
Environmental Monitoring Plan	Page 28	Forest Habitat - Plant Species of Conservation Concern	Survey for species occurrence	Pre-construction survey and environmental monitoring
Environmental Monitoring Plan	Page 30	Forest Habitat - Invasive Plant Species	Survey for species occurrence	Pre-construction survey and environmental monitoring
Environmental Monitoring Plan	Page 32	Forest Habitat - Traditional Use Plant Species	Survey for species occurrence	Pre-construction survey and environmental monitoring
Licence	Clause 39	Vegetation Management	The Licensee shall, within six months of the completion of construction of the Development, submit for approval of the Director of the Environmental Approvals Branch, a plan for management of vegetation along the transmission line RoW	Manitoba Hydro to develop and implement a vegetation management plan

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

Site	Component	UTM Zone	Easting	Northing
BTP-PRA-26	Final Preferred Route	14U	329313	5598502
BTP-PRA-28	Final Preferred Route	14U	328602	5599304
BTP-PRA-32	Final Preferred Route	14U	327672	5599289
BTP-PRA-51	Final Preferred Route	14U	328728	5598649
BTP-PRA-52	Final Preferred Route	14U	328087	5599135
BTP-PRA-53	Final Preferred Route	14U	327468	5599587
BTP-PRA-54	Final Preferred Route	14U	326408	5600093
BTP-PRA-55	Final Preferred Route	14U	325928	5600109
BTP-PRA-56	Final Preferred Route	14U	325632	5600135
BTP-PRA-57	Final Preferred Route	14U	325352	5600037
BTP-PRA-58	Final Preferred Route	14U	324994	5599780
BTP-PRA-59	Final Preferred Route	14U	324660	5599529
BTP-TER-25	Final Preferred Route	14U	330069	5598494
BTP-TER-27	Final Preferred Route	14U	328812	5599035
BTP-TER-43	Final Preferred Route	14U	325711	5600547
BTP-TER-61	Final Preferred Route	14U	329887	5598499
BTP-TER-62	Final Preferred Route	14U	329488	5598530
BTP-TER-63	Final Preferred Route	14U	327653	5599441
BTP-TER-64	Final Preferred Route	14U	327233	5599721
BTP-TER-65	Final Preferred Route	14U	326828	5600003
BTP-TER-66	Final Preferred Route	14U	326612	5600113
BTP-TER-67	Final Preferred Route	14U	325391	5600111
BTP-TER-68	Final Preferred Route	14U	325035	5599847
BTP-TER-69	Final Preferred Route	14U	324899	5599706
BTP-Tower-114	Final Preferred Route	14U	330435	5598486

APPENDIX VI. Species of conservation concern recorded at or near surveys, 2022.

Site	Species	Common Name	Rank
BTP-Tower 114	<i>Aphyllon ludovicianum</i>	Louisiana Broomrape	S2
BTP-PRA-32	<i>Astragalus crassicaarpus</i>	Ground-plum	S3S4
BTP-PRA-28	<i>Avenula hookeri</i>	Hooker's Oat Grass	S3S4
BTP-PRA-32	<i>Avenula hookeri</i>	Hooker's Oat Grass	S3S4
BTP-PRA-51	<i>Avenula hookeri</i>	Hooker's Oat Grass	S3S4
BTP-PRA-52	<i>Avenula hookeri</i>	Hooker's Oat Grass	S3S4
BTP-PRA-53	<i>Avenula hookeri</i>	Hooker's Oat Grass	S3S4
BTP-PRA-54	<i>Avenula hookeri</i>	Hooker's Oat Grass	S3S4
BTP-PRA-55	<i>Avenula hookeri</i>	Hooker's Oat Grass	S3S4
BTP-PRA-57	<i>Avenula hookeri</i>	Hooker's Oat Grass	S3S4
BTP-PRA-58	<i>Avenula hookeri</i>	Hooker's Oat Grass	S3S4
BTP-PRA-59	<i>Avenula hookeri</i>	Hooker's Oat Grass	S3S4
BTP-TER-43	<i>Bromus pumpellianus</i>	Pumpelly's Brome	S3S4
BTP-TER-62	<i>Bromus pumpellianus</i>	Pumpelly's Brome	S3S4
BTP-TER-64	<i>Bromus pumpellianus</i>	Pumpelly's Brome	S3S4
BTP-TER-65	<i>Bromus pumpellianus</i>	Pumpelly's Brome	S3S4
BTP-TER-66	<i>Bromus pumpellianus</i>	Pumpelly's Brome	S3S4
BTP-TER-66	<i>Carex inops</i> ssp. <i>heliophila</i>	Sun Sedge	S1?
BTP-PRA-26	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-28	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-32	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-51	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-52	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-53	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-54	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-55	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-56	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-57	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-58	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-59	<i>Carex obtusata</i>	Blunt Sedge	S3S4
BTP-PRA-26	<i>Chamaerhodos erecta</i> ssp. <i>nuttallii</i>	Chamaerhodos	S3S4
BTP-TER-25	<i>Chamaerhodos erecta</i> ssp. <i>nuttallii</i>	Chamaerhodos	S3S4
BTP-PRA-32	<i>Chenopodium pratericola</i>	Goosefoot	S3
BTP-Tower 114	<i>Chenopodium pratericola</i>	Goosefoot	S3
BTP-Tower 114	<i>Cyperus schweinitzii</i>	Schweinitz's Flatsedge	S2
BTP-Tower 114	<i>Dalea candida</i>	White Prairie Clover	S3S5
BTP-PRA-26	<i>Dichanthelium wilcoxianum</i>	Sand Millet	S2?

BTP-PRA-28	<i>Dichanthelium wilcoxianum</i>	Sand Millet	S2?
BTP-PRA-32	<i>Dichanthelium wilcoxianum</i>	Sand Millet	S2?
BTP-PRA-51	<i>Dichanthelium wilcoxianum</i>	Sand Millet	S2?
BTP-PRA-52	<i>Dichanthelium wilcoxianum</i>	Sand Millet	S2?
BTP-PRA-56	<i>Dichanthelium wilcoxianum</i>	Sand Millet	S2?
BTP-PRA-57	<i>Dichanthelium wilcoxianum</i>	Sand Millet	S2?
BTP-PRA-58	<i>Dichanthelium wilcoxianum</i>	Sand Millet	S2?
BTP-PRA-59	<i>Dichanthelium wilcoxianum</i>	Sand Millet	S2?
BTP-Tower 114	<i>Elymus lanceolatus ssp. psammophilus</i>	Sand-dune Wheatgrass	S1
BTP-PRA-32	<i>Elymus lanceolatus ssp. psammophilus</i>	Sand-dune Wheatgrass	S1
BTP-TER-66	<i>Equisetum laevigatum</i>	Smooth Scouring-rush	S3S4
BTP-PRA-32	<i>Erigeron caespitosus</i>	Tufted Fleabane	S1
BTP-PRA-55	<i>Erigeron caespitosus</i>	Tufted Fleabane	S1
BTP-PRA-57	<i>Erigeron caespitosus</i>	Tufted Fleabane	S1
BTP-PRA-58	<i>Erigeron caespitosus</i>	Tufted Fleabane	S1
BTP-PRA-59	<i>Erigeron caespitosus</i>	Tufted Fleabane	S1
BTP-PRA-54	<i>Erigeron strigosus</i>	Rough Fleabane	S3S5
BTP-PRA-51	<i>Erysimum asperum</i>	Prairie-rocket Wallflower	S3S4
BTP-PRA-26	<i>Festuca hallii</i>	Plains Rough Fescue	S3
BTP-PRA-28	<i>Festuca hallii</i>	Plains Rough Fescue	S3
BTP-PRA-53	<i>Festuca hallii</i>	Plains Rough Fescue	S3
BTP-PRA-54	<i>Festuca hallii</i>	Plains Rough Fescue	S3
BTP-PRA-55	<i>Festuca hallii</i>	Plains Rough Fescue	S3
BTP-PRA-56	<i>Festuca hallii</i>	Plains Rough Fescue	S3
BTP-PRA-58	<i>Festuca hallii</i>	Plains Rough Fescue	S3
BTP-PRA-59	<i>Festuca hallii</i>	Plains Rough Fescue	S3
BTP-PRA-28	<i>Helianthus pauciflorus ssp. subrhomboideus</i>	Beautiful Sunflower	S3S4
BTP-PRA-51	<i>Helianthus pauciflorus ssp. subrhomboideus</i>	Beautiful Sunflower	S3S4
BTP-PRA-54	<i>Helianthus pauciflorus ssp. subrhomboideus</i>	Beautiful Sunflower	S3S4
BTP-PRA-55	<i>Helianthus pauciflorus ssp. subrhomboideus</i>	Beautiful Sunflower	S3S4
BTP-PRA-56	<i>Helianthus pauciflorus ssp. subrhomboideus</i>	Beautiful Sunflower	S3S4
BTP-PRA-58	<i>Helianthus pauciflorus ssp. subrhomboideus</i>	Beautiful Sunflower	S3S4
BTP-PRA-59	<i>Helianthus pauciflorus ssp. subrhomboideus</i>	Beautiful Sunflower	S3S4
BTP-Tower 114	<i>Hesperostipa comata</i>	Needle-and-thread Grass	S3S4
BTP-PRA-26	<i>Hesperostipa comata</i>	Needle-and-thread Grass	S3S4

BTP-PRA-32	<i>Hesperostipa comata</i>	Needle-and-thread Grass	S3S4
BTP-PRA-26	<i>Hesperostipa curtiseta</i>	Western Porcupine Grass	S3S4
BTP-PRA-28	<i>Hesperostipa curtiseta</i>	Western Porcupine Grass	S3S4
BTP-PRA-32	<i>Hesperostipa curtiseta</i>	Western Porcupine Grass	S3S4
BTP-PRA-51	<i>Hesperostipa curtiseta</i>	Western Porcupine Grass	S3S4
BTP-PRA-53	<i>Hesperostipa curtiseta</i>	Western Porcupine Grass	S3S4
BTP-PRA-54	<i>Hesperostipa curtiseta</i>	Western Porcupine Grass	S3S4
BTP-PRA-55	<i>Hesperostipa curtiseta</i>	Western Porcupine Grass	S3S4
BTP-PRA-56	<i>Hesperostipa curtiseta</i>	Western Porcupine Grass	S3S4
BTP-PRA-57	<i>Hesperostipa curtiseta</i>	Western Porcupine Grass	S3S4
BTP-PRA-58	<i>Hesperostipa curtiseta</i>	Western Porcupine Grass	S3S4
BTP-PRA-59	<i>Hesperostipa curtiseta</i>	Western Porcupine Grass	S3S4
BTP-PRA-26	<i>Houstonia longifolia</i>	Long-leaved Bluets	S3S5
BTP-PRA-52	<i>Houstonia longifolia</i>	Long-leaved Bluets	S3S5
BTP-PRA-53	<i>Houstonia longifolia</i>	Long-leaved Bluets	S3S5
BTP-PRA-57	<i>Houstonia longifolia</i>	Long-leaved Bluets	S3S5
BTP-PRA-26	<i>Lithospermum incisum</i>	Narrow-leaved Puccoon	S3
BTP-PRA-28	<i>Lithospermum incisum</i>	Narrow-leaved Puccoon	S3
BTP-PRA-51	<i>Lithospermum incisum</i>	Narrow-leaved Puccoon	S3
BTP-PRA-52	<i>Lithospermum incisum</i>	Narrow-leaved Puccoon	S3
BTP-PRA-55	<i>Lithospermum incisum</i>	Narrow-leaved Puccoon	S3
BTP-PRA-58	<i>Lithospermum incisum</i>	Narrow-leaved Puccoon	S3
BTP-TER-27	<i>Lithospermum incisum</i>	Narrow-leaved Puccoon	S3
BTP-Tower 114	<i>Lygodesmia juncea</i>	Rush Skeletonweed	S3S4
BTP-Tower 114	<i>Mirabilis albida</i>	Hairy Umbrellawort	S3S4
BTP-Tower 114	<i>Oenothera serrulata</i>	Shrubby Evening-primrose	S3
BTP-PRA-59	<i>Oenothera serrulata</i>	Shrubby Evening-primrose	S3
BTP-PRA-26	<i>Oxytropis campestris</i> var. <i>spicata</i>	Showy Locoweed	S1
BTP-PRA-28	<i>Oxytropis campestris</i> var. <i>spicata</i>	Showy Locoweed	S1
BTP-PRA-51	<i>Oxytropis campestris</i> var. <i>spicata</i>	Showy Locoweed	S1
BTP-PRA-53	<i>Oxytropis campestris</i> var. <i>spicata</i>	Showy Locoweed	S1
BTP-PRA-55	<i>Oxytropis campestris</i> var. <i>spicata</i>	Showy Locoweed	S1
BTP-PRA-57	<i>Oxytropis campestris</i> var. <i>spicata</i>	Showy Locoweed	S1
BTP-PRA-32	<i>Pediomelum esculentum</i>	Prairie Breadroot	S3S4
BTP-PRA-51	<i>Pediomelum esculentum</i>	Prairie Breadroot	S3S4
BTP-PRA-52	<i>Pediomelum esculentum</i>	Prairie Breadroot	S3S4
BTP-PRA-54	<i>Pediomelum esculentum</i>	Prairie Breadroot	S3S4
BTP-PRA-55	<i>Pediomelum esculentum</i>	Prairie Breadroot	S3S4
BTP-PRA-56	<i>Pediomelum esculentum</i>	Prairie Breadroot	S3S4

BTP-PRA-57	<i>Pedimelum esculentum</i>	Prairie Breadroot	S3S4
BTP-PRA-58	<i>Pedimelum esculentum</i>	Prairie Breadroot	S3S4
BTP-PRA-59	<i>Pedimelum esculentum</i>	Prairie Breadroot	S3S4
BTP-PRA-53	<i>Penstemon gracilis</i>	Lilac-flowered Beard-tongue	S3S4
BTP-PRA-57	<i>Penstemon gracilis</i>	Lilac-flowered Beard-tongue	S3S4
BTP-PRA-59	<i>Penstemon gracilis</i>	Lilac-flowered Beard-tongue	S3S4
BTP-TER-27	<i>Penstemon gracilis</i>	Lilac-flowered Beard-tongue	S3S4
BTP-TER-63	<i>Penstemon gracilis</i>	Lilac-flowered Beard-tongue	S3S4
BTP-PRA-32	<i>Phlox hoodii</i>	Moss Pink	S3
BTP-PRA-56	<i>Phlox hoodii</i>	Moss Pink	S3
BTP-PRA-26	<i>Potentilla concinna</i> var. <i>divisa</i>	Divided-leaved Cinquefoil	S3
BTP-PRA-32	<i>Potentilla concinna</i> var. <i>divisa</i>	Divided-leaved Cinquefoil	S3
BTP-PRA-51	<i>Potentilla concinna</i> var. <i>divisa</i>	Divided-leaved Cinquefoil	S3
BTP-PRA-58	<i>Potentilla concinna</i> var. <i>divisa</i>	Divided-leaved Cinquefoil	S3
BTP-PRA-59	<i>Potentilla concinna</i> var. <i>divisa</i>	Divided-leaved Cinquefoil	S3
BTP-Tower 114	<i>Potentilla pensylvanica</i>	Pennsylvania Cinquefoil	S3S4
BTP-PRA-26	<i>Potentilla pensylvanica</i>	Pennsylvania Cinquefoil	S3S4
BTP-PRA-32	<i>Potentilla pensylvanica</i>	Pennsylvania Cinquefoil	S3S4
BTP-PRA-57	<i>Potentilla pensylvanica</i>	Pennsylvania Cinquefoil	S3S4
BTP-PRA-58	<i>Potentilla pensylvanica</i>	Pennsylvania Cinquefoil	S3S4
BTP-PRA-59	<i>Potentilla pensylvanica</i>	Pennsylvania Cinquefoil	S3S4
BTP-Tower 114	<i>Ratidiba columnifera</i>	Upright Prairie Coneflower	S3S4
BTP-PRA-32	<i>Schizachyrium scoparium</i>	Little Bluestem	S3S4
BTP-PRA-54	<i>Schizachyrium scoparium</i>	Little Bluestem	S3S4
BTP-PRA-56	<i>Schizachyrium scoparium</i>	Little Bluestem	S3S4
BTP-PRA-57	<i>Schizachyrium scoparium</i>	Little Bluestem	S3S4
BTP-PRA-58	<i>Schizachyrium scoparium</i>	Little Bluestem	S3S4
BTP-PRA-59	<i>Schizachyrium scoparium</i>	Little Bluestem	S3S4
BTP-PRA-26	<i>Selaginella densa</i>	Prairie Spike-moss	S3
BTP-PRA-28	<i>Selaginella densa</i>	Prairie Spike-moss	S3
BTP-PRA-32	<i>Selaginella densa</i>	Prairie Spike-moss	S3
BTP-PRA-51	<i>Selaginella densa</i>	Prairie Spike-moss	S3
BTP-PRA-52	<i>Selaginella densa</i>	Prairie Spike-moss	S3
BTP-PRA-53	<i>Selaginella densa</i>	Prairie Spike-moss	S3
BTP-PRA-54	<i>Selaginella densa</i>	Prairie Spike-moss	S3
BTP-PRA-55	<i>Selaginella densa</i>	Prairie Spike-moss	S3
BTP-PRA-56	<i>Selaginella densa</i>	Prairie Spike-moss	S3
BTP-PRA-57	<i>Selaginella densa</i>	Prairie Spike-moss	S3
BTP-PRA-58	<i>Selaginella densa</i>	Prairie Spike-moss	S3

BTP-PRA-59	<i>Selaginella densa</i>	Prairie Spike-moss	S3
BTP-PRA-32	<i>Silene drummondii</i>	Drummond's Cockle	S3
BTP-PRA-51	<i>Silene drummondii</i>	Drummond's Cockle	S3
BTP-PRA-54	<i>Silene drummondii</i>	Drummond's Cockle	S3
BTP-PRA-59	<i>Silene drummondii</i>	Drummond's Cockle	S3
BTP-TER-43	<i>Silene drummondii</i>	Drummond's Cockle	S3
BTP-Tower 114	<i>Sporobolus cryptandrous</i>	Sand Dropseed	S3S5
BTP-TER-25	<i>Sporobolus cryptandrous</i>	Sand Dropseed	S3S5
BTP-TER-66	<i>Sporobolus cryptandrous</i>	Sand Dropseed	S3S5
BTP-Tower 114	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-PRA-26	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-PRA-28	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-PRA-51	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-PRA-52	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-PRA-53	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-PRA-54	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-PRA-55	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-PRA-56	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-PRA-58	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-PRA-59	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-TER-25	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
BTP-TER-27	<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5

APPENDIX VII. Flora List for the Birtle Transmission Project RoW at the Spy Hill-Ellice Community Pasture and area, 2022.

Family/Species	Common Name	MB Rank
VASCULAR SPECIES		
Pteridophytes – Ferns and Allies		
EQUISETACEAE	HORSETAIL FAMILY	
<i>Equisetum hyemale</i>	Common Scouring-rush	S5
<i>Equisetum laevigatum</i>	Smooth Scouring-rush	S3S4
SELAGINELLACEAE	SPIKE-MOSS FAMILY	
<i>Selaginella densa</i>	Prairie Spike-moss	S3
Gymnosperms		
CUPRESSACEAE	CYPRESS FAMILY	
<i>Juniperus horizontalis</i>	Creeping Juniper	S5
Angiosperms - Monocotyledons		
CYPERACEAE	SEDGE FAMILY	
<i>Carex granularis</i>	Meadow Sedge	S4?
<i>Carex inops</i> ssp. <i>heliophila</i>	Sun Sedge	S1?
<i>Carex obtusata</i>	Blunt Sedge	S3S4
<i>Carex siccata</i>	Dry-spike Sedge	S5
<i>Carex</i> sp.	A sedge	
<i>Cyperus schweinitzii</i>	Schweinitz's Flatsedge	S2
IRIDACEAE	IRIS FAMILY	
<i>Sisyrinchium montanum</i>	Blue-eyed Grass	S5
LILIACEAE	LILY FAMILY	
<i>Allium stellatum</i>	Pink-flowered Onion	S5
<i>Lilium philadelphicum</i>	Wood Lily	S4
<i>Maianthemum canadense</i>	Canada May Flower	S5
<i>Maianthemum stellatum</i>	Solomon's Seal	S5
POACEAE	GRASS FAMILY	
<i>Agrostis scabra</i>	Ticklegrass	S5
<i>Avenula hookeri</i>	Hooker's Oat Grass	S3S4
<i>Bouteloua gracilis</i>	Blue Grama	S4
<i>Bromus inermis</i>	Smooth Brome	SNA
<i>Bromus pumpellianus</i>	Pumpelly's Brome	S3S4

<i>Danthonia intermedia</i>	Timber Oatgrass	SU
<i>Dichanthelium wilcoxianum</i>	Sand Millet	S2?
<i>Elymus lanceolatus</i> ssp. <i>psammophilus</i>	Sand-dune Wheatgrass	S1
<i>Elymus trachycaulus</i>	Slender Wheat Grass	S5
<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>	One-sided Wildrye	SNR
<i>Elymus virginicus</i>	Virginia Wildrye	S4
<i>Elymus</i> sp.	A wheatgrass	
<i>Eriocoma hymenoides</i>	Sand Ricegrass	S2
<i>Festuca hallii</i>	Plains Rough Fescue	S3
<i>Festuca saximontana</i>	Rocky Mountain Fescue	S4S5
<i>Hesperostipa comata</i>	Needle-and-thread Grass	S3S4
<i>Hesperostipa curtisetia</i>	Western Porcupine Grass	S3S4
<i>Hesperostipa spartea</i>	Plains Porcupine Grass	S4
<i>Koeleria macrantha</i>	June Grass	S5
<i>Oryzopsis asperifolia</i>	White-grained Mountain-ricegrass	S5
<i>Piptatheropsis pungens</i>	Northern Rice Grass	S4S5
<i>Poa pratensis</i>	Kentucky Bluegrass	S5
<i>Poa</i> sp.	A bluegrass	
<i>Schizachne purpurascens</i>	Purple Oatgrass	S5
<i>Schizachyrium scoparium</i>	Little Bluestem	S3S4
<i>Sporobolus cryptandrous</i>	Sand Dropseed	S3S5
<i>Sporobolus rigidus</i>	Sand Reedgrass	S3S5
SMILACACEAE	CATBRIER FAMILY	
<i>Smilax lasioneura</i>	Carrion Flower	S4S5

Angiosperms - Dicotyledons

ANACARDIACEAE	SUMAC FAMILY	
<i>Toxicodendron rydbergii</i>	Poison Ivy	S5
APIACEAE	CARROT FAMILY	
<i>Sanicula marilandica</i>	Snakeroot	S5
APOCYNACEAE	DOGBANE FAMILY	
<i>Apocynum androsaemifolium</i>	Spreading Dogbane	S5
ARALIACEAE	GINSENG FAMILY	
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	S5
ASTERACEAE	ASTER FAMILY	
<i>Achillea millefolium</i>	Yarrow	S5
<i>Agoseris glauca</i>	False Dandelion	S4S5
<i>Antennaria neglecta</i>	Field Pussetoes	S5

<i>Antennaria parvifolia</i>	Small-leaved Everlasting	S4
<i>Antennaria</i> spp.	An everlasting	
<i>Artemisia campestris</i>	Field sagewort	S4S5
<i>Artemisia frigida</i>	Pasture Sage	S4S5
<i>Artemisia ludoviciana</i>	Prairie Sage	S5
<i>Coreopsis</i> sp.	A tickseed	
<i>Crepis runcinata</i>	Dandelion Hawksbeard	S4
<i>Erigeron caespitosus</i>	Tufted Fleabane	S1
<i>Erigeron strigosus</i>	Rough Fleabane	S3S5
<i>Erigeron</i> sp.	A fleabane	
<i>Gaillardia aristata</i>	Great-flowered Gaillardia	S5
<i>Helianthus pauciflorus</i> ssp. <i>subrhomboideus</i>	Beautiful Sunflower	S3S4
<i>Heterotheca villosa</i>	Hairy Golden-aster	S5
<i>Liatris punctata</i>	Dotted Blazing Star	S4
<i>Lygodesmia juncea</i>	Rush Skeletonweed	S3S4
<i>Mulgedium pulchellum</i>	Blue Lettuce	S5
<i>Nabalus albus</i>	White Rattlesnake-root	S5
<i>Packera cana</i>	Silvery Groundsel	S4
<i>Ratibida columnifera</i>	Upright Prairie Coneflower	S3S4
<i>Solidago canadensis</i>	Canada Goldenrod	S5
<i>Solidago missouriensis</i>	Missouri Goldenrod	S5
<i>Solidago nemoralis</i>	Field Goldenrod	S5
<i>Solidago ptarmicoides</i>	Upland White Goldenrod	S4S5
<i>Solidago</i> sp.	A goldenrod	
<i>Sonchus arvensis</i>	Field Sow-thistle	SNA
<i>Symphyotrichum ciliolatum</i>	Lindley's Aster	S5
<i>Symphyotrichum ericoides</i>	White Heath Aster	S4
<i>Symphyotrichum laeve</i>	Smooth Aster	S5
<i>Taraxacum officinale</i>	Common Dandelion	SNA
<i>Tragopogon</i> sp.	Goat's-beard	SNA
BETULACEAE	BIRCH FAMILY	
<i>Betula papyrifera</i>	Paper Birch	S5
<i>Corylus americana</i>	American Hazelnut	S4
<i>Corylus cornuta</i>	Beaked Hazelnut	S5
BORAGINACEAE	BORAGE FAMILY	
<i>Lithospermum canescens</i>	Hoary Puccoon	S5
<i>Lithospermum incisum</i>	Narrow-leaved Puccoon	S3
BRASSICACEAE	MUSTARD FAMILY	
<i>Descurainia sophia</i>	Flixweed	SNA
<i>Erysimum asperum</i>	Prairie-rocket Wallflower	S3S4

<i>Erysimum inconspicuum</i>	Small-flowered Prairie-rocket	S4S5
<i>Iberis amara</i>	Rocket Candytuft	SNA
<i>Lepidium densiflorum</i>	Common Pepper-grass	S5
CAMPANULACEAE	BELLFLOWER FAMILY	
<i>Campanula rotundifolia</i>	Harebells	S5
CAPRIFOLIACEAE	HONEYSUCKLE FAMILY	
<i>Lonicera dioica</i>	Twining Honeysuckle	S5
<i>Symphoricarpos occidentalis</i>	Western Snowberry	S5
<i>Viburnum opulus</i>	Highbush-cranberry	S5
CARYOPHYLLACEAE	PINK FAMILY	
<i>Cerastium arvense</i>	Field Chickweed	S5
<i>Silene antirrhina</i>	Sleepy Catchfly	S4S5
<i>Silene drummondii</i>	Drummond's Cockle	S3
CHENOPODIACEAE	GOOSEFOOT FAMILY	
<i>Chenopodium album</i>	Lamb's-quarters	SNA
<i>Chenopodium pratericola</i>	Goosefoot	S3
CORNACEAE	DOGWOOD FAMILY	
<i>Cornus sericea</i>	Red-osier Dogwood	S5
ELAEAGNACEAE	OLEASTER FAMILY	
<i>Elaeagnus commutata</i>	Silverberry	S4S5
ERICACEAE	HEATH FAMILY	
<i>Arctostaphylos uva-ursi</i>	Bearberry	S5
<i>Monotropa uniflora</i>	Convulsion Root	S4
FABACEAE	PEA FAMILY	
<i>Astragalus crassicaupus</i>	Ground-plum	S3S4
<i>Astragalus laxmanii</i>	Ascending Milkvetch	S5
<i>Astragalus</i> sp.	A vetch	
<i>Dalea candida</i>	White Prairie-clover	S3S5
<i>Dalea purpurea</i>	Purple Prairie Clover	S5
<i>Lathyrus ochroleucus</i>	Pale Vetchling	S5
<i>Lathyrus venosus</i>	Wild Peavine	S5
<i>Melilotus albus</i>	White Sweet Clover	SNA
<i>Melilotus officinalis</i>	Yellow Sweet Clover	SNA
<i>Oxytropis campestris</i> var. <i>spicata</i>	Showy Locoweed	S1
<i>Pedimelum esculentum</i>	Prairie Breadroot	S3S4

<i>Vicia americana</i>	American Purple Vetch	S5
FAGACEAE	BEECH FAMILY	
<i>Quercus macrocarpa</i>	Bur Oak	S5
LAMIACEAE	MINT FAMILY	
<i>Agastache foeniculum</i>	Blue Giant Hyssop	S5
<i>Monarda fistulosa</i>	Wild Bergamot	S4
LINACEAE	FLAX FAMILY	
<i>Linum lewisii</i>	Blue Flax	S4
NYCTAGINACEAE	FOUR O'CLOCK FAMILY	
<i>Mirabilis albida</i>	Hairy Umbrellawort	S3S4
ONAGRACEAE	EVENING PRIMROSE FAMILY	
<i>Oenothera serrulata</i>	Shrubby Evening-primrose	S3
OROBANCHACEAE	BROOMRAPE FAMILY	
<i>Aphyllon ludovicianum</i>	Louisiana Broomrape	S2
PAPAVERACEAE	POPPY FAMILY	
<i>Eschscholzia</i> sp.	A poppy	SNA
<i>Papaver</i> sp.	A poppy	SNA
POLEMONIACEAE	PHLOX FAMILY	
<i>Phlox hoodii</i>	Moss Pink	S3
POLYGALACEAE	MILKWORT FAMILY	
<i>Polygala senega</i>	Seneca Snakeroot	S4
POLYGONACEAE	SMARTWEED FAMILY	
<i>Fallopia convolvulus</i>	Black Bindweed	SNA
PRIMULACEAE	PRIMULA FAMILY	
<i>Androsace septentrionalis</i>	Pygmyflower	S5
<i>Lysimachia ciliata</i>	Fringed Loosestrife	S5
PYROLACEAE	WINTERGREEN FAMILY	
<i>Pyrola asarifolia</i>	Pink Pyrola	S5
<i>Pyrola</i> sp.	A wintergreen	
RANUNCULACEAE	CROWFOOT FAMILY	

<i>Actaea rubra</i>	Red Baneberry	S5
<i>Anemone cylindrica</i>	Thimbleweed	S5
<i>Anemone multifida</i>	Cut-leaved Anemone	S5
<i>Anemone</i> sp.	An anemone	
<i>Pulsatilla nuttalliana</i>	Prairie crocus	S4
<i>Thalictrum dasycarpum</i>	Tall Meadow-rue	S5
<i>Thalictrum venulosum</i>	Veiny Meadow-rue	S5
RHAMNACEAE	BUCKTHORN FAMILY	
<i>Endotropis alnifolia</i>	Alder-leaved Buckthorn	S5
ROSACEAE	ROSE FAMILY	
<i>Amelanchier alnifolia</i>	Saskatoon	S5
<i>Chamaerhodos erecta</i>	Chamaerhodos	S4
<i>Drymocallis arguta</i>	Tall Wood Beauty	S5
<i>Fragaria virginiana</i>	Smooth Wild Strawberry	S5
<i>Geum triflorum</i>	Three-flowered Avens	S4S5
<i>Potentilla concinna</i> var. <i>divisa</i>	Divided-leaved Cinquefoil	S3
<i>Potentilla pennsylvanica</i>	Pennsylvania Cinquefoil	S3S4
<i>Potentilla</i> sp.	A cinquefoil	
<i>Prunus pensylvanica</i>	Pin Cherry	S5
<i>Prunus pumila</i>	Sand Cherry	S4S5
<i>Prunus virginiana</i>	Chokecherry	S5
<i>Rosa arkansana</i>	Prairie Rose	S4
<i>Rosa</i> sp.	A rose	
<i>Rubus idaeus</i>	Raspberry	S5
<i>Rubus pubescens</i>	Trailing Dewberry	S5
RUBIACEAE	MADDER FAMILY	
<i>Galium boreale</i>	Northern Bedstraw	S5
<i>Galium triflorum</i>	Sweet-scented Bedstraw	S5
<i>Houstonia longifolia</i>	Long-leaved Bluets	S3S5
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
SANTALACEAE	SANDALWOOD FAMILY	
<i>Comandra umbellata</i>	Bastard Toadflax	S5
SAXIFRAGACEAE	SAXIFRAGE FAMILY	
<i>Heuchera richardsonii</i>	Alumroot	S5

SCROPHULARIACEAE	FIGWORT FAMILY	
<i>Orthocarpus luteus</i>	Owl's-clover	S4S5
<i>Penstemon gracilis</i>	Lilac-flowered Beard-tongue	S3S4
VIOLACEAE	VIOLET FAMILY	
<i>Viola adunca</i>	Early Blue Violet	S5
<i>Viola canadensis</i> var. <i>rugulosa</i>	Canada Violet	S5
<i>Viola pedatifida</i>	Purple Prairie Violet	S4
<i>Viola</i> sp.	A violet	
NON-VASCULAR SPECIES		
Lichens		
<i>Cladonia</i> sp.	A reindeer lichen	
<i>Cetraria arenaria</i>	Sand-loving Iceland Lichen	SU

