Keeyask Generation Project

Terrestrial Effects Monitoring Plan

Long-Term Effects on Wetland Habitat Monitoring Report

TEMP-2023-05

KEEYASK

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KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2023-05

LONG-TERM EFFECTS ON WETLANDS MONITORING
YEAR 1 OPERATION
2022

Prepared for

Manitoba Hydro

By

ECOSTEM Ltd.

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SUMMARY

Background

Construction of the Keeyask Generation Project (the Project) at Gull Rapids began in July 2014. The vast majority of construction activities were completed by fall 2021 and all seven generating units were in service by March 2022.

The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the generating station on the terrestrial environment. Monitoring results will help the KHLP, government regulators, members of local First Nation communities, and the general public understand how construction and operation of the generating station are affecting the environment, and whether or not more needs to be done to reduce harmful effects.

This report describes the results of the Long-Term Effects on Wetlands monitoring conducted in 2022, the first summer of operation monitoring for the terrestrial monitoring studies.

A wetland is a land ecosystem where periodic or prolonged water saturation at or near the soil surface is the dominant factor shaping soil attributes and vegetation distribution and composition. Wetlands include land covered by water that is up to 2 metres deep (e.g., shallow water along shorelines).

Wetland functions are the natural properties or processes that are associated with wetlands, stated in ways that describe what they do for the ecosystem. Wetlands typically make relatively high contributions to overall ecosystem function.

Why is the study being done?

Project effects in areas adjacent to the reservoir are very different from those around the rest of the Project Footprint primarily due to the flooding, water level fluctuations and wave action within the reservoir. The Project effects predictions for areas adjacent to the reservoir had lower certainty than other wetland predictions due to the possibility that groundwater effects could extend a considerable distance inland of the shoreline. For this reason, and because the reservoir-affected area is relatively large, the Long-Term Effects on Wetlands study is determining the indirect effects of the reservoir on wetland function during Project operation.

This study is documenting indirect Project effects on shore zone habitat, which is habitat that occurs along the reservoir shoreline. This monitoring is being done to confirm that the Project effects predictions are accurate, and that no additional unexpected effects are occurring.

What was done?

The Long-Term Effects on Wetlands study includes periodic surveys of permanent shoreline transects, established beginning in summer of 2022.

The goal is to establish permanent transects at 5 locations representing the 5 most common shore zone habitat types. Ground and aerial surveys are done periodically during Project operation at each location to collect vegetation and environment data, and to collect photos that are used to create digital imagery of the transects.

In 2022, permanent transects were established and digital imagery was captured at 17 of the 25 planned locations, which corresponded to four of the five shore zone habitat types. The eight remaining locations were deferred to 2023 because they were inaccessible, and/or the shoreline position was not well defined one year after reservoir impoundment. Data were collected in nested belts referred to as the environment, tree, tall shrub, and low vegetation belts.

What was found?

Environmental conditions varied across the four sampled shore zone habitat types. The disturbed section of the transects ranged in length from 5 m to 100 m.

The tree and tall shrub belts included five tree species and 16 tall shrub species. In the low vegetation belt, a total of 122 vascular plant, seven moss, and five lichen species were recorded. Thirty species were widely distributed in at least one of the shore zone habitat types sampled in 2022.

No plant species of very high conservation concern or high invasive concern were found during the surveys.

What does it mean?

This study is monitoring changes in shore zone habitat over many years. The results available so far are limited as this was the first year that the transects were sampled and sampling one of the shore habitat types was deferred to 2023.

What will be done next?

Initial data collection at the eight remaining shore zone sample locations will occur in 2023.

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Chiefs and Councils of Tataskweyak Cree Nation (TCN), War Lake First Nation (WLFN), York Factory First Nation (YFFN) and Fox Lake Cree Nation (FLCN) are gratefully acknowledged for their support of this program.

We would also like to thank North/South Consultants Inc., in particular Ron Bretecher and Shari Fournier, for their guidance, logistical support and other resources that made these studies possible.

STUDY TEAM

Dr. James Ehnes was the project manager and study designer.

Fieldwork in 2022 was conducted by Brock Epp, Alex Snitowski, Alanna Sutton, Sofia Sparby, Owen Romanchuk, Candice Collette, Isaac Manness, Saul Mayhem, Grant Connell, Patrick Connell, Kenneth Ouskun, Kelvin Kitchekeesik and Tyler Kitchekeesik.

Data analysis and report writing in 2022 were completed by Alanna Sutton and Brock Epp. Brock Epp and James Ehnes reviewed the report. GIS analysis and cartography were completed by Alex Snitowski.

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt hydroelectric generating station (GS) and the associated facilities. The Project is located at the former Gull Rapids on the lower Nelson River in northern Manitoba where Gull Lake flows into Stephens Lake, 35 km upstream of the existing Kettle GS. Project construction began in July 2014 and the vast majority of construction activities were completed by fall 2021. The reservoir was first brought to full supply level in September 2020 and the final generating unit went into service on March 9, 2022.

The *Keeyask Generation Project Response to EIS Guidelines* (the EIS), completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project (KHLP 2012a). Technical supporting information for the terrestrial environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs is provided in the *Keeyask Generation Project Environmental Impact Statement Terrestrial Supporting Volume* (TE SV; KHLP 2012b). The *Keeyask Generation Project Terrestrial Effects Monitoring Plan* (TEMP; KHLP 2015) was developed as part of the licensing process for the Project. Monitoring activities for various components of the terrestrial environment were described, including the focus of this report, which is long term effects on wetlands.

A wetland is a land ecosystem where periodic or prolonged water saturation at or near the soil surface is the dominant factor shaping soil attributes and vegetation distribution and composition. Wetlands include land covered by water that is up to 2 metres deep (e.g., shallow water along shorelines).

Wetland functions are the natural properties or processes that are associated with wetlands, stated in ways that describe what they do for the ecosystem. Wetlands typically make relatively high contributions to overall ecosystem function. The EIS studies concluded that off-system marsh is a particularly important wetland type in the Keeyask region. This is based on the contributions that off-system marsh makes to the range of wetland functions.

As described in the TEMP, two studies are monitoring Project effects on wetland function. During construction, the Wetland Loss and Disturbance study monitored direct Project effects on wetlands due to habitat loss and disturbance (now completed; see KHLP 2015, Section 2.5.2). During operation, the Long-Term Effects on Wetlands study is monitoring long-term direct and indirect Project effects on wetland function (see KHLP 2015, Section 2.5.3). A third study, Created Wetlands, will monitor the efficacy of mitigation efforts to create 12 ha of off-system marsh (see KHLP 2015, Section 8.1).

The goal of the Long-Term Effects on Wetlands study is to determine indirect Project effects on wetland function during operation. Its focus is on effects within the Project's hydraulic zone of influence. Due to the possibility that groundwater effects could extend a considerable distance inland of the shoreline, these predictions had lower certainty than other wetland predictions. The relevant wetland area is relatively large and effects in this zone are expected to be positive relative to pre-Project conditions.

Based on this goal, the objectives of this study are to:

- Determine the characteristics of shoreline and offshore wetlands developing within the Project's hydraulic zone of influence,
- Locate and quantify Project related changes to shoreline and offshore wetland composition in the Project's hydraulic zone of influence,
- Characterize the nature of Project-related groundwater and edge effects to inland habitat near the hydraulic zone of influence,
- Locate and quantify areas developing into native wetland types, and,
- Locate and quantify long-term Project effects on wetland function.

The first year of monitoring for the Long-term Effects on Wetlands study was conducted in 2022. Fieldwork for this monitoring included establishing 17 of the 25 permanent sample locations that will be monitored during operation. This report describes the methods used to establish these transects and provides an overview of wetland attributes at the locations established in 2022.

2.0 METHODS

2.1 APPROACH

This study is documenting indirect Project effects on shore zone habitat, which is habitat that occurs along the reservoir shoreline.

Project effects are dramatically different in areas adjacent to the reservoir compared with the rest of the Project Footprint. Two factors are predominantly responsible for this. First, the main driver in the reservoir areas is water level fluctuations, wave action and hydrology. In other Project areas, the main Project impacts are clearing, physical disturbance, excavation, and excavated material placement. Second, the stand "edge" (i.e., the new reservoir shoreline) will be shifting inland in response to wave action and hydrological effects. In other Project areas, the spatial extent of Project impacts (i.e., clearing and physical disturbance during construction) is predominantly static.

There are two components to this study. The first documents habitat attributes in affected shore zone wetlands, and how closely these attributes approximate those found in comparable native wetland types. The second component translates the periodically updated detailed terrestrial habitat mapping into effects on wetland function.

For the first component, the Long-Term effects on Wetlands study includes periodic surveys of permanent transects established during the early years of operation.

Section 2.5.3 of the TEMP describes the approach for the Long-Term effects on Wetlands study. The following details the study methods, and describes the activities conducted during the first year of this monitoring.

2.2 STUDY DESIGN

The Project's hydraulic zone of influence (Map 2-1) defined the spatial limits for monitoring long-term effects on shoreline and offshore wetland habitat. For offshore habitat, the monitoring included the shallow water areas within 100m of the shoreline. This report uses the term "shore zone" for the wetland areas included in the monitoring.

An impact-trend by time design was employed to document changes to shore zone habitat over time. Data are being collected on permanent transects that are resampled periodically during Project operation.

Permanent sample locations were selected from a stratified, random sample of the shore zone habitat types. Shore zone habitat types were obtained from a preliminary mapping of the 2021 post-impoundment terrestrial habitat shoreline. The terrestrial habitat shoreline was segmented

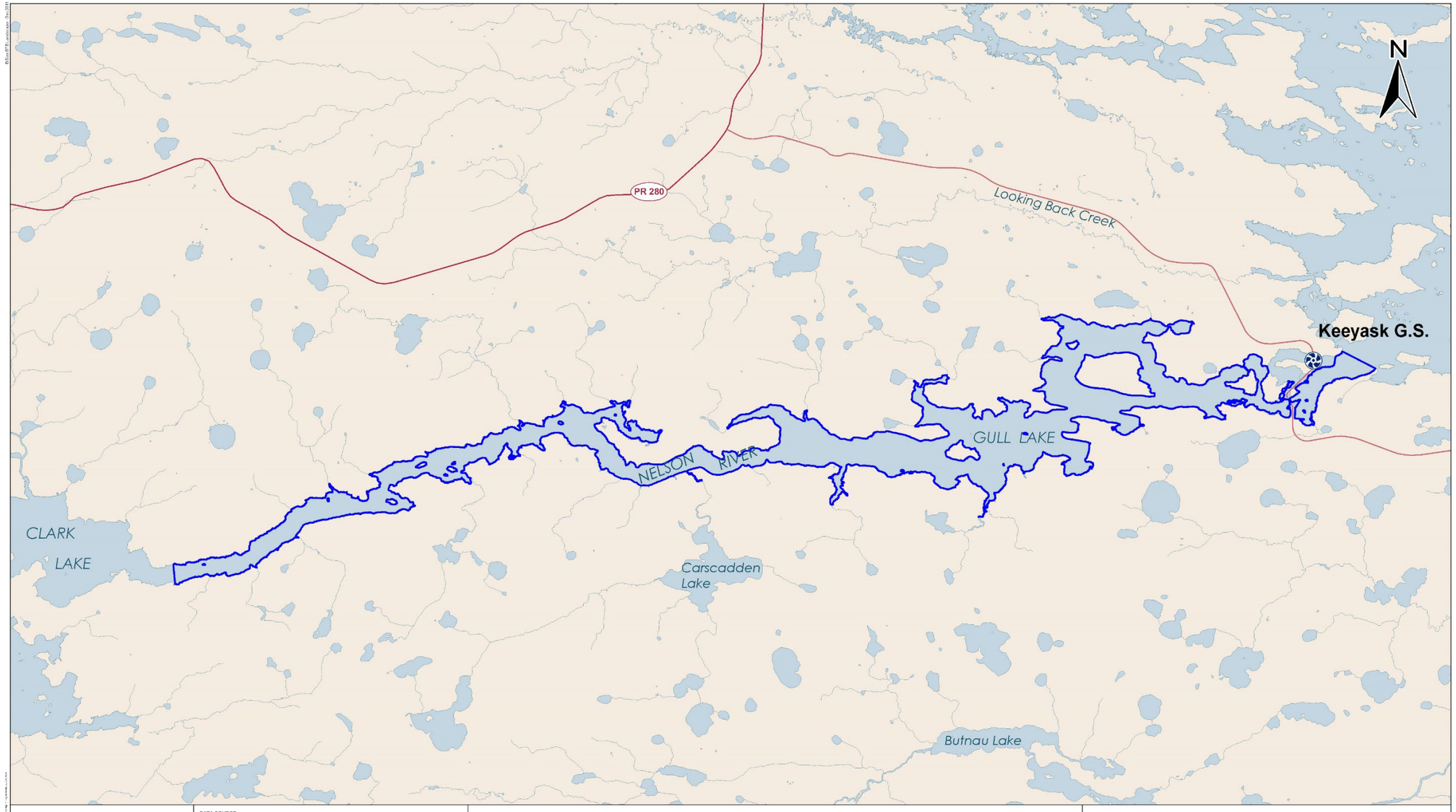
based on combinations of ecosite type, wave energy, water flow type (Lacustrine or Riverine), and bank height. The minimum shoreline segment length was 100 metres.

The preliminary shore zone habitat mapping was produced from a combination of digital stereo photos acquired in October 2021 and helicopter-based aerial surveys and photography. These data were collected by the Terrestrial Habitat Clearing, Disturbance and Indirect Effects monitoring program (see TEMP Section 2.1).

The shore zone habitat types selected for sampling were those that: i) comprised the most common combinations of environmental conditions; and, ii) were well distributed throughout the reservoir shoreline. The environmental conditions used to select stands were ecosite type, wave energy, water flow type, and bank height. Table 2-1 provides the five combinations of environmental type conditions selected for sampling.

Table 2-1: Shore zone habitat types sampled and description based on wave energy, water flow, ecosite and bank height

Habitat Type	Wave Energy	Water Flow	Ecosite	Bank Height
1	3,000	Lacustrine	Deep Dry Mineral	None
2	3,000	Lacustrine	Veneer Bog on Slope	None
3	3,000	Lacustrine	Veneer Bog	None
4	3,000	Lacustrine	Blanket bog	None
5	3,000	Riverine	Veneer Bog on Slope	None



Map 2-1: Project's hydraulic zone of influence

2.3 DATA COLLECTION

2.3.1 BELT TRANSECTS

At each of the selected shoreline segments, the sample location was positioned where: i) the shoreline was relatively straight (so transects would not approach each other); ii) at least 60 m long (to include two belt transects separated by 20 m); and, iii) had relatively homogenous environmental conditions.

At each sample location, two roughly parallel transects were established 20m apart. The transect origin was located at the edge of visible Project disturbance (Photo 2-1). The origin was either at the edge of the Project clearing (Figure 2-1A), or where evidence of previous reservoir inundation was obvious (Figure 2-1B), whichever was further inland. Each transect was oriented perpendicular to the overall orientation of the disturbance edge (Figure 2-1).

Each transect was subdivided into two sections: Project disturbed and undisturbed by the Project. At all sample locations, the undisturbed section of the transect was 30 m long. The disturbed section of the transect extended from the start of reservoir clearing (if present) into the water, either to a depth of 1 m or to the end of the emergent vegetation, whichever was further.

For the undisturbed section of the belt transect, data were collected in four nested belts (Figure 2-1) referred to as the environment, tree, tall shrub and low vegetation belts. The nesting reflected finding a balance between the larger area needed to adequately represent the different vegetation components and minimizing sampling effort.

The attributes recorded in each belt were the following:

1. Environment belt
    - For vegetation structure and environment attributes.
    - 10 m wide belt with three consecutive 10 m X 10 m quadrats.
    - Attributes for each quadrat included structure class (Table 2-2), average canopy height, average percent slope and aspect, slope position (Figure 2-2), slope shape, and disturbance.
2. Tree belt
    - For trees and snags (dead standing trees).
    - Stem tallies within a 4 m wide belt transect along the 30m transect.
    - Attributes for both trees and snags included distance along transect, perpendicular offset distance and direction (left or right), circumference at breast height (CBH, 1.3 m), and species.
    - Additional attributes for trees included condition (Table 2-3), and canopy position (Table 2-4).
    - Additional attributes for snags included condition (Table 2-5) and decay stage (Table 2-6).

3. Tall shrub belt
    - For tree recruitment and tall shrubs
    - Tree “pseudospecies”, i.e.: tree seedlings (height < 0.5m), tree saplings (height ≥ 0.5m), and tall shrub species (Table 2-7).
    - Tallies for each species within a 2 m wide belt transect for contiguous 2 m X 5 m quadrats.
4. Low vegetation belt
    - For plant species composition.
    - Presence by species within a 1 m wide belt transect for contiguous 25 cm X 100 cm quadrats.

For the disturbed section of the transect, the extent of data collection depended on whether some of the transect was above water (Figure 2-1A). For transects that had an initial portion above water, environment and vegetation attributes were generally recorded in the same way as for the undisturbed section. The exception was that a tree and snag belt were not included because these stems had been predominantly removed by reservoir clearing.

For the portion of the transect under water, the attributes were recorded in two nested belts, including a 2 m wide belt for tree recruitment and tall shrubs emerging from the water, and a 1 m wide belt for the remaining attributes (Figure 2-1):

1. Environment
    - Water depth, recorded wherever a slope change was perceived, or every 5m.
    - Surface substrate within contiguous 25 cm X 100 cm quadrats.
2. Tree recruitment and tall shrubs
    - Tree seedlings (height <0.5m), tree saplings (height ≥0.5m), and tall shrub species (Table 2-7). Only living stems emerging from the water were counted.
    - Tallies for each species within a 2 m wide belt transect for contiguous 2 m X 5 m quadrats.
3. Plant species composition
    - Presence by species within a 1 m wide belt transect for contiguous 25 cm X 100 cm quadrats.

Photo 2-1: Transect setup at LRK22SE12 on August 3, 2022

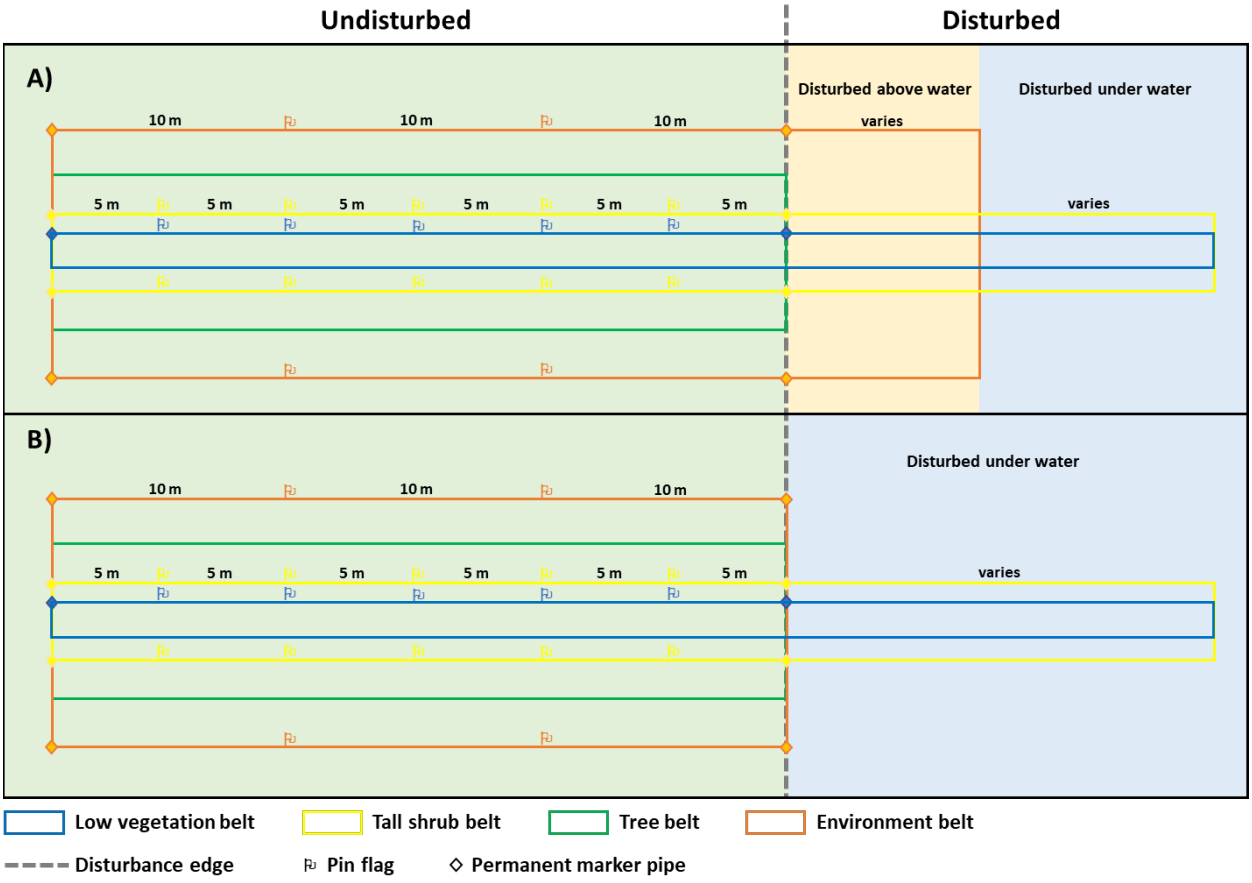


Figure 2-1: Shore zone belt transect layout for locations with A) a portion of the disturbed transect above water, and B) all of the disturbed transect under water

Table 2-2: Vegetation structure classes

Code	Type	Criteria
F	Forest	Dominated by trees (i.e., tree species with stems that have CBH >0) that have ≥75% canopy closure.
W	Woodland	Trees (i.e., tree species with stems that have CBH > 0) form the canopy and those trees have ≥25% and <75% canopy closure.
T	Shrubland- Tall	Tall shrubs (shrub species whose height ≥ 0.5m) and/ or saplings (tree species >0.5m < CBH) form the canopy and have at least 25% cover
L	Shrubland- Low	Low shrubs (shrub species whose height <0.5m) or tree seedlings (tree species <0.5m tall) form the canopy and have at least 25% cover.
G	Grassland/ Herbland	Grasses and/ or sedges and/ or herbs form the canopy and have at least 25% cover
B	Bryoid	Mosses, hepatics and/ or lichens are the tallest vegetation with at least 25% cover.
S	Sparse	All vegetation combined has ≥25% cover if all of the strata are combined but no one stratum has at least 25% cover.
N	Barren	All vegetation combined has <25% cover.
E	Edge	Used to identify the location of a hard edge.

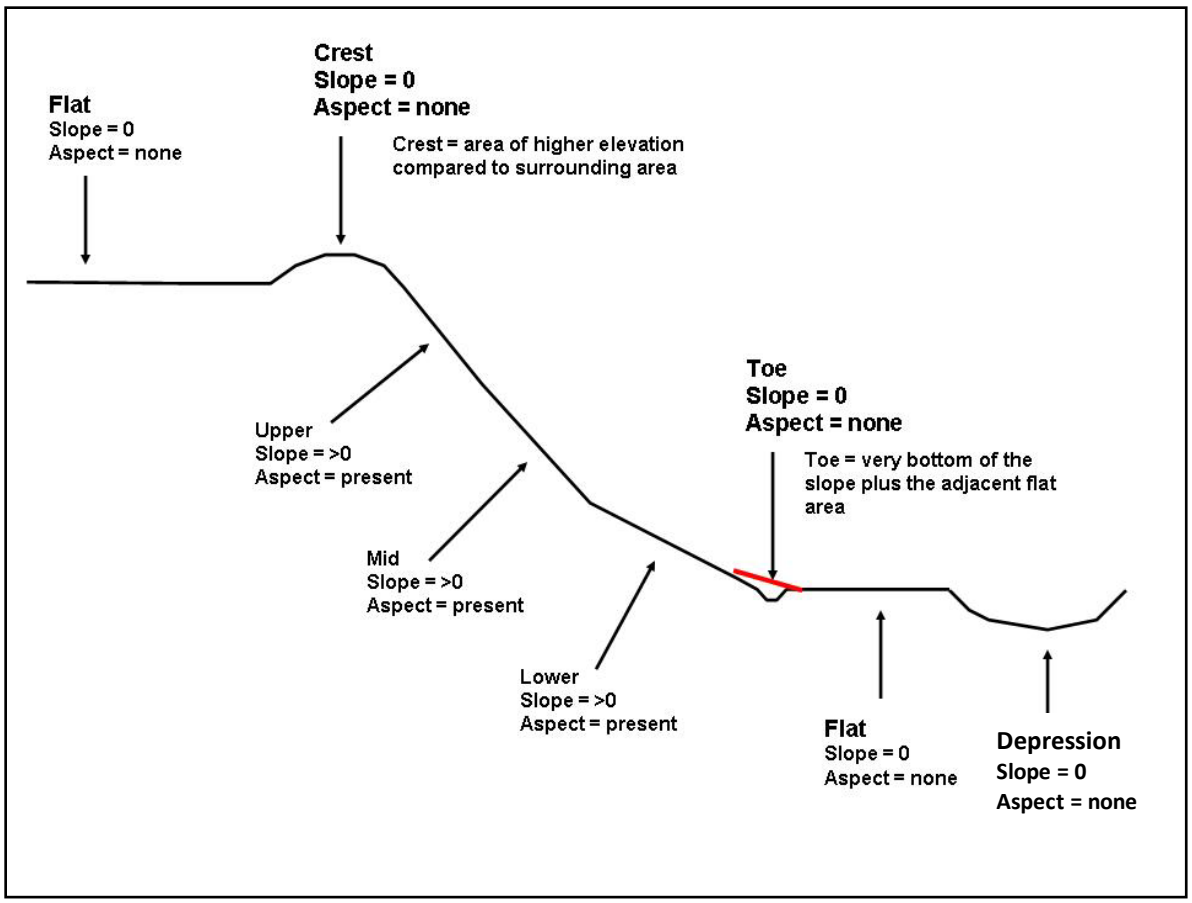


Figure 2-2: Slope positions

Table 2-3: Tree condition

Code	Condition	Description
1	Intact	Tree has not sustained any damage, i.e. canopy and bole are intact
2	Broken canopy	Majority of the branches in upper portion of tree are missing
3	Broken bole	Bole broken below canopy
4	Windfall	Tree uprooted by wind
5	Heart rot	Tree with evidence of heart rot
6	Disease	Evidence of other type of disease e.g., conk
7	Insect	Evidence of insect attack
8	Knocked down	Tree pushed over by forwarder/harvester as seen by bark scarring
9	Stump	Tree that was cut during reservoir clearing
10	Forked canopy	Canopy is forked
11	Browsed	Tree browsed by animals, damaged by birds (e.g. sapsuckers)
12	Dead top	Upper portion of tree canopy is dead

Table 2-4: Tree canopy position

Code	Position	Description
1	Veteran	Tree that survived last stand-replacing disturbance
2	Dominant	Top of crown is not shaded by other trees
3	Sub-Dominant	Crown is in upper canopy but slightly below the crowns of dominant trees
4	Secondary	In second tier, if one exists
5	Understorey	Crown below the secondary and upper canopies
9	Not applicable	Stump or windfall

Table 2-5: Snag condition

Code	Condition	Description
1	Intact	Main stem and branches in canopy are unbroken
2	Broken canopy	Majority of the branches in upper portion of snag are missing
3	Broken bole	Entire canopy and upper portion of main stem axis broken off

Table 2-6: Snag decay stage

Code	Stage
1	Recently killed
2	Twigs and leaves lost; bark intact
3	Small branches lost; bark beginning to peel; wood hard
4	Only major branches remaining; >20% bark lost; wood condition soft to hard
5	Canopy broken; bark condition variable; wood conditions variable
6	Decomposing stump; wood soft; bark peeling

Table 2-7: Species considered as tall shrubs

Species Name	Common Name
Alnus incana	Speckled alder
Alnus alnobetula	Green alder
Amelanchier alnifolia	Saskatoon
Betula pumila	Bog birch
Cornus sericea	Red-osier dogwood
Corylus cornuta	Beaked hazelnut
Endotropis alnifolia	Alder-leaved buckthorn
Prunus pensylvanica	Pin cherry
Rosa acicularis	Prickly rose
Rubus idaeus	Red raspberry
Salix arbusculoides	Shrubby willow
Salix bebbiana	Bebb's willow
Salix glauca	Smooth willow
Salix pellita	Satin willow
Salix planifolia	Plane-leaved willow
Salix pseudomonticola	False mountain willow
Salix pseudomyrsinites	Myrtle-leaved willow
Salix spp.	Other willow species
Shepherdia canadensis	Soapberry
Viburnum edule	Mooseberry

The soil sampling method was intended to be sufficient to detect moisture regime changes in the rooting zone. Soils were sampled in pits (Photo 2-2) and from soil cores obtained using a Dutch auger. The soil pits collected detailed soil information while the soil cores focused on moisture regime (Figure 2-3). Soil pits were dug at 1m and 10m along the undisturbed portion of the transect. Soil cores was completed at 5m, 15m, 20m and 30m on the undisturbed section of the transect, and at 1m and 5m on the disturbed section unless those distances were under water.

Data recorded at soil pits included:

- LFH and/or organic matter depth.
- Depth to prominent mottling, gleying, ice, water table and bedrock.
- Soil horizon information, such as depth, texture and stoniness was also recorded.
- Collected at 1m and 10m on the undisturbed section of the transect.

Photo 2-2: Pedologist collecting data at a soil pit

Portion of Transect	Distance (m)	Pit Type
Undisturbed	30	Moisture Regime
	20	Moisture Regime
	15	Moisture Regime
	10	Full
	5	Moisture Regime
	1	Full
Disturbed - above water	1	Moisture Regime
	varies	Moisture Regime
Disturbed - under water		

Figure 2-3: Schematic representation of soil sampling locations and type

2.3.2 DRONE IMAGERY

Digital orthorectified imagery (DOI) of each transect was captured to monitor:

- Environmental conditions surrounding the transect;
- Overstorey canopy closure; and,
- Trees and snags in the flooded portion of the transects.

Photos of each transect were captured twice, at two elevations above ground level: 40 m and 70 m. Photos were acquired with forward and side overlap to produce a DOI for a 140 m wide band centred on each transect, extending 30 m offshore and 100m inland from either end.

The photos were acquired using an Autel EVO II Pro drone equipped with a 20 MP RGB camera.

2.3.3 PLANT TAXA

Plant nomenclature followed the Manitoba Conservation Data Centre (MBCDC 2021) species and plant community database standards.

Plants recorded in the belt transects were identified to species if it was a taxon for which this was generally feasible in the field and to a taxon otherwise. Trees were recorded as pseudospecies

based on growth form (Section 2.3.1). In this report, the singular “taxon” and plural “taxa” are used to refer to species, broader taxa, and psudospecies collectively.

Additionally, plants of ecological concern (see Section 2.4.3) were recorded between sampling locations and included as incidentals in their respective studies (ECOSTEM 2023a, b).

2.4 DATA ANALYSIS

In 2022, data collection had not been completed for all planned sample locations. Therefore, data analysis for this report is limited to basic descriptive statistics and percent occurrences. A more detailed analysis will be provided after all the planned locations have been sampled (planned for 2023).

2.4.1 ENVIRONMENTAL ATTRIBUTES

Environment attributes and soil data from both transects were pooled for each sample location. Descriptive statistics generated included average slope, total quadrat occurrences for each slope position category, and total soil profile occurrences for each moisture regime and drainage regime category.

2.4.2 PLANTS

Tree, snag, and tall shrub tallies were pooled for both transects for each sample location. Descriptive statistics included percent occurrence for each species.

Descriptive statistics generated for species distributions were based on species data collected in the low vegetation belt. As this was the first year of data collection, all species occurring in at least 1 quadrat in one of the transects were retained for analysis.

Species meeting the criterion for inclusion were classified into the distribution classes shown in Table 2-8 based on the percentage of locations they were found in.

Table 2-8: Distribution Class Names and Ranges as a percentage of locations surveyed

Distribution Class	Percentage range	Generalized Distribution
Very Widespread	90% ≤ D ≤ 100%	Widely
Widespread	75% ≤ D < 90%	
Scattered	25% ≤ D < 75%	Narrowly
Localized	0% < D < 25%	
Absent	0%	Absent

2.4.3 PLANTS OF ECOLOGICAL CONCERN

Plant species of ecological concern were given additional consideration. These included priority and non-native plants.

Priority plants included species on the Manitoba Endangered Species Act (MESA), the Species at Risk Act (SARA) or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) lists, as well as species ranked provincially critically imperiled to vulnerable (S1 to S3 ranked).

Non-native plants included species that were categorized based on their concern level (Table 2-9 for classification criteria). Species in the level 1 and 2 concern levels were considered for immediate management within the Study Area where possible (ECOSTEM 2023a).

Table 2-9: Levels of invasive concern for plants in the Project footprint

Invasive Concern Level	Plant Species Included
Level 1	Species the ISCM classifies as "Category 1" or "Category 2"
Level 2	Species the ISCM classifies as "other" or White et al. (1993) classify as "high" or "moderate" invasives
Level 3	Species that either White et al. (1993) classify as "minor" invasives, or government sources classify as noxious weeds or weed seed species[1]
Level 4	All remaining non-native plant species

Notes: [1] The government regulations list some native boreal plant species (e.g., foxtail barley) as weeds since they focus on species that are problematic for agriculture. Native boreal species appearing on these lists are not considered to be invasive for the Project area.

3.0 RESULTS

3.1 SAMPLE LOCATIONS

Sampling occurred from July 11 to 21, August 3 to 10 and August 19 to 24, 2022.

Of the 25 planned locations, 17 were sampled in 2022 (Map 3-1). Sampling the remaining eight locations was deferred to the 2023 because they were inaccessible (due to debris and peatland disintegration), and/or the shoreline position was not yet well defined one year after reservoir impoundment. In the latter case, this was because some flooded peatlands were still in the process of resurfacing inland of the water's edge.

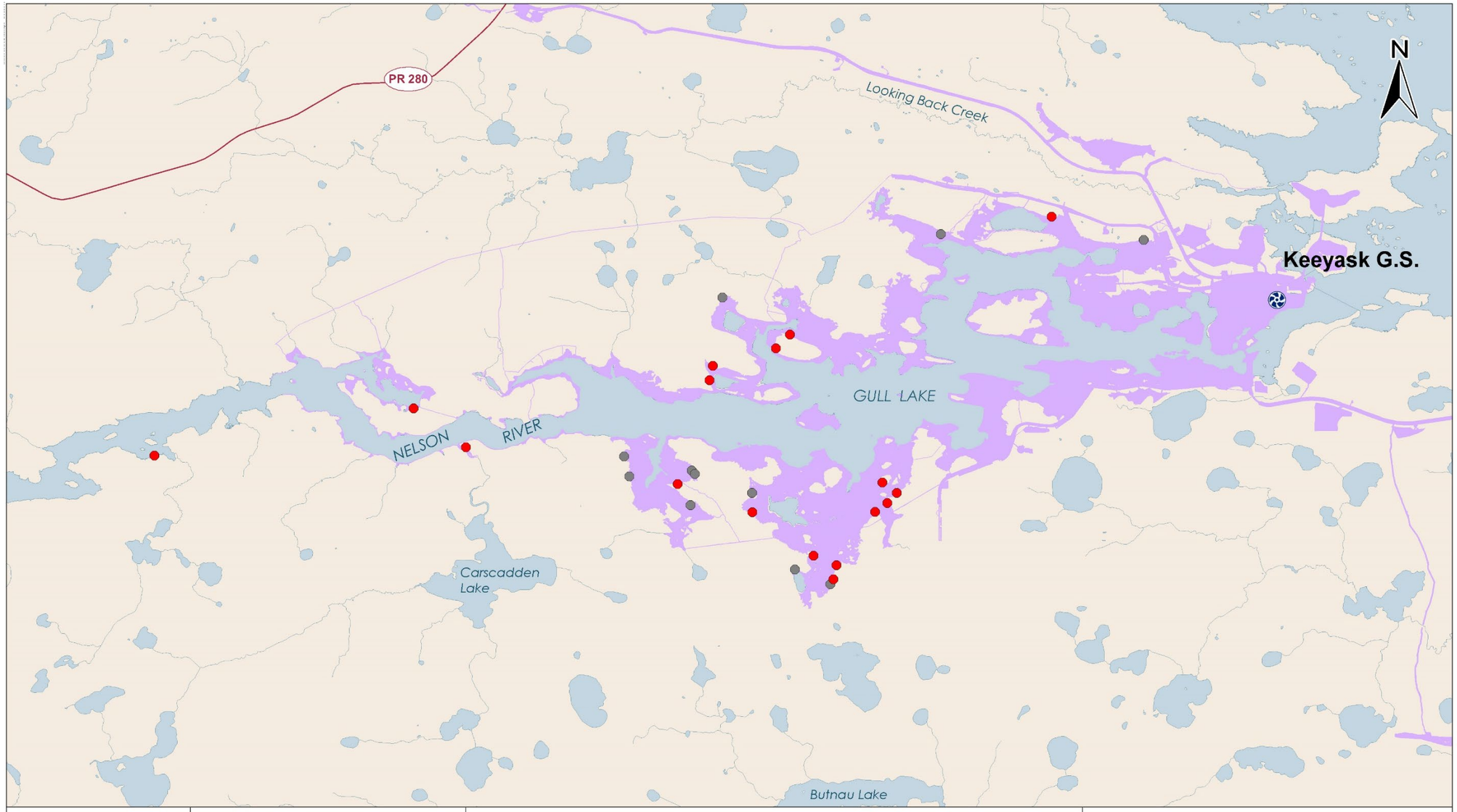
Data were collected in four of the five different environmental combinations across the four geographic zones (Table 3-1), all of which had 3 replicates or more in 2022. No locations were sampled in the Lacustrine, Blanket Bog environmental combination in 2022 for the reasons described above.

Of the 34 transects sampled, 19 had a 5m cleared area inland of water inundation. The cleared portion was sampled similarly to the undisturbed section of the transect but without the tree belt (Section 2.3.1).

Table 3-1: Number of planned and sampled locations in 2022

Environmental Combination	Number of planned sample locations	Number of sampled locations[1]
Lacustrine, Deep Dry Mineral	5	5
Lacustrine, Veneer Bog on Slope	5	5
Lacustrine, Veneer Bog	5	3
Lacustrine, Blanket Bog	5	0
Riverine, Veneer Bog on Slope	5	4

Notes: [1] A sample location includes a pair of parallel transects.



Map 3-1: Long-term Effects on Wetland Function sample locations

3.2 ENVIRONMENT AND SOILS

Over the 34 transects, 121 10 m X 10 m environment quadrats were sampled.

Quadrat slope varied from 0% to 14%, with 86% of the quadrats having a slope of 3% or less. On average, slope was highest in the Lacustrine, Veneer Bog on Slope environmental combination, followed by the Lacustrine, Deep Dry Mineral environmental combinations (Table 3-2). For slope position (Figure 2-2), over half of the quadrats were on either the lower slope or flat in all of the environmental combinations (Table 3-3). The mid slope position accounted for 35% and 21% of the quadrats in the Lacustrine Veneer Bog on Slope and Veneer Bog, respectively. Eighty percent of quadrats had a flat shape, except in the Lacustrine Veneer Bog on Slope, where it was 68%.

The disturbed section of the transects varied in length from 5 m to 100 m, with an average length of 37.2 m. The soil substrate on the disturbed section of the transects was mainly organic, with a small proportion of clay or sand in some locations.

Soil data collection included 68 full soil pits (two at each transect) and 144 auger pits, for a total of 212 soil profiles. Average organic matter thickness ranged from 5 cm to 60 cm. The most common moisture regime was moderately to very wet, followed by fresh (Table 3-4). The most common drainage regime was very poor, followed by moderately well and well (Table 3-5).

Table 3-2: Average sample location slope during the first year of Project operation, 2022

Environmental Combination	N	Average Slope (%)	Standard Deviation of Slope
Lacustrine, Deep Dry Mineral	5	1.8	2.2
Lacustrine, Veneer Bog on Slope	5	2.8	2.6
Lacustrine, Veneer Bog	3	1.0	1.0
Lacustrine, Blanket Bog	0	-	-
Riverine, Veneer Bog on Slope	4	1.2	1.1
All	17	1.8	2.1

Table 3-3: Slope position of environment quadrats during the first year of Project operation, 2022

Position	Percent of quadrats			
	Lacustrine Deep Dry Mineral	Lacustrine Veneer Bog on Slope	Lacustrine Veneer Bog	Riverine Veneer Bog on Slope
Crest	12	3	-	-
Upper	12	11	17	7
Mid	6	35	21	15
Lower	55	46	25	37
Flat	15	5	38	33
Depression	-	-	-	7
Total number of quadrats	*33*	*37*	*24*	*27*

Table 3-4: Soil moisture regime during the first year of Project operation, 2022

Moisture Regime	Percent of soil profiles			
	Lacustrine Deep Dry Mineral	Lacustrine Veneer Bog on Slope	Lacustrine Veneer Bog	Riverine Veneer Bog on Slope
Dry	3	-	-	-
Moderately dry	2	-	-	-
Moderately fresh	19	-	-	2
Fresh	70	37	16	2
Moderately moist	3	-	-	-
Very moist	2	-	-	-
Moderately wet to very wet	2	63	84	96
Total number of soil profiles	*63*	*63*	*38*	*48*

Table 3-5: Soil drainage regime during the first year of Project Operation, 2022

Drainage regime	Percent of soil profiles			
	Lacustrine Deep Dry Mineral	Lacustrine Veneer Bog on Slope	Lacustrine Veneer Bog	Riverine Veneer Bog on Slope
Very rapid	3	-	-	-
Well	27	10	-	-
Moderately well	68	27	16	4
Very poor	2	63	84	96
Total number of soil profiles	*63*	*63*	*38*	*48*

3.3 VEGETATION

Five tree species were recorded within the tree belt in 2022 (Table 3-6). Black spruce (*Picea mariana*) trees made up approximately 90% of the stems tallied. Black spruce accounted for 80%-90% of the stems tallied in each of the environmental combinations except for the Lacustrine Deep Dry type, where it accounted for 71% of the stems. Here, 20% of the stems were balsam poplar (*Populus balsamifera*) and trembling aspen (*Populus tremuloides*). Tamarack (*Larix laricina*) was the next most frequent tree species at 8%. Tamarack was most frequent in the Lacustrine, Veneer Bog on Slope locations, and was not present in the Riverine Veneer Bog on Slope locations. Tree height ranged from 1.3 m to 13 m and maximum circumference at breast height was 58 cm. Nearly all of the trees were intact and 63% of the trees were dominant or co-dominant and 19% were understorey.

Black spruce was also the most abundant snag species by far (over 90% of the snags in all environmental combinations; Table 3-6). Tamarack was the only snag that could be identified to species.

Taxa recorded in the low vegetation belt included 122 vascular plants, seven mosses, and five lichens (see Appendix1, Table 5-2 for full species list).

Table 3-6: Tree and snag species within the tree belt during the first year of Project operation, 2022

Species	Percent of stems							
	Lacustrine Deep Dry Mineral		Lacustrine Veneer Bog on Slope		Lacustrine Veneer Bog		Riverine Veneer Bog on Slope	
	Tree	Snag	Tree	Snag	Tree	Snag	Tree	Snag
Paper birch	4	-	4	-	-	-	-	-
Tamarack	4	3	13	4	10	-	-	-
Black spruce	71	92	80	96	90	100	98	92
Balsam poplar	11	-	-		-	-	2	-
Trembling aspen	9	-	4	-	1	-	-	-
Unknown	-	5	-	-	-	-	-	8
Total stems	*45*	*39*	*56*	*54*	*346*	*9*	*113*	*52*

3.3.1 UNDISTURBED SECTION OF TRANSECTS

Tree recruitment (seedlings and saplings) in the undisturbed sections included six pseudospecies (Table 3-7). One species, jack pine (*Pinus banksiana*), was present as seedlings and saplings at a single location, but it was not found in the tree layer at any other locations. Black spruce seedlings and saplings were the most abundant pseudospecies in the tree recruitment layer by far, making up more than 90% of the tree recruitment in all the environmental combinations. None of the remaining pseudospecies represented more than 2% of the stems in any of the environmental combinations, except for jack pine and trembling aspen, which accounted for 3% and 4% of the stems, respectively, in the Lacustrine, Deep Dry Mineral sites.

Table 3-7: Tree recruitment stem counts within the tall shrub belt on the undisturbed portion of the transects during the first year of Project operation, 2022

Pseudospecies	Percent of stems			
	Lacustrine Deep Dry Mineral	Lacustrine Veneer Bog on Slope	Lacustrine Veneer Bog	Riverine Veneer Bog on Slope
Paper birch sapling	0	1	-	0
Paper birch seedling	1	-	-	-
Tamarack sapling	-	0	0	-
Tamarack seedling	-	2	0	-
Black spruce sapling	21	21	41	1
Black spruce seedling	70	75	59	97
Jack pine sapling	1	-	-	-
Jack pine seedling	2	-	-	-
Balsam poplar sapling	-	0	-	-
Balsam poplar seedling	1	-	-	0
Trembling aspen sapling	0	1	-	-
Trembling aspen seedling	4	0	-	1
Total stems	*667*	*804*	*694*	*1,172*

Sixteen tall shrub species were recorded in the tall shrub belt of the undisturbed section across all locations (Table 3-8). Prickly rose (*Rosa acicularis*) and green alder (*Alnus alnobetula*) were the most abundant species in the undisturbed sections. Prickly rose was the most abundant in the Lacustrine Deep Dry Mineral and Veneer Bog on Slope combinations, while green alder was one of the two most abundant species in all the combinations. Plane-leaved willow (*Salix planifolia*) was the most abundant species in the Lacustrine Veneer Bog combination, accounting for 66% of all shrub stems.

Table 3-8: Tall shrub stem counts within the tall shrub belt on the undisturbed portion of the transects during the first year of Project operation, 2022

Species	Percent of stems			
	Lacustrine Deep Dry Mineral	Lacustrine Veneer Bog on Slope	Lacustrine Veneer Bog	Riverine Veneer Bog on Slope
Speckled alder	-	-	7	7
Green alder	22	30	12	29
Bog birch	-	9	7	15
Red-osier dogwood	-	-	-	6
Alder-leaved buckthorn	1	0	-	0
Prickly rose	60	32	0	9
Red raspberry	0	-	-	-
Shrubby willow	-	3	-	-
Bebb's willow	4	15	8	6
Smooth willow	-	-	-	8
Satin willow	-	-	-	3
Plane-leaved willow	-	3	66	15
False mountain willow	-	-	-	2
Myrtle-leaved willow	-	-	-	0
Soapberry	8	-	-	-
Mooseberry	5	6	-	1
Total stems	*3,312*	*1,349*	*384*	*1,381*

In the undisturbed section of the transects, 30 taxa (Table 3-9) were found to be widely distributed in at least one of the environmental combinations (see Table 2-8 for class definitions). None of the taxa were very widespread in all the combinations; however, five were at least widespread in all four of the combinations sampled in 2022.

The taxa that were widely distributed in all of the environmental combinations included black spruce sapling and seedling (Photo 3-1), Labrador-tea (*Rhododendron groenlandicum*) (Photo 3-2), bog whortleberry (*Vaccinium uliginosum*; Photo 3-3), and bog cranberry (*Vaccinium vitis-idaea*; Table 3-9).

The environmental combination with the largest number of widely distributed taxa was the Riverine Veneer Bog on Slope type (Table 3-9).

Table 3-9: Widely distributed taxa by environmental combination for the undisturbed portions during the first year of Project operation, 2022

Distribution	Lacustrine Deep Dry Mineral	Lacustrine Veneer Bog on Slope	Lacustrine Veneer Bog	Riverine Veneer Bog on Slope
Very Widespread	Fireweed Bunchberry Black spruce sapling Black spruce seedling Prickly rose	Dwarf scouring-rush Black spruce sapling Black spruce seedling Labrador-tea Myrtle-leaved willow Bog whortleberry Bog cranberry	Green reindeer lichen Cup lichens Round-leaved sundew Bog-laurel Black spruce sapling Black spruce seedling Black spruce tree Labrador-tea Cloudberry Sphagnum moss Small cranberry Bog whortleberry Bog cranberry	Sheathed sedge Green reindeer lichen Labrador-tea Bebb's willow Myrtle-leaved willow Plane-leaved willow Sphagnum moss Bog whortleberry
Widespread	Tall lungwort Palmate-leaved colt's-foot Labrador-tea Red raspberry Bebb's willow Bog whortleberry Bog cranberry	Fireweed Green reindeer lichen Cup lichens Bunchberry Field horsetail Northern comandra Black spruce tree Sphagnum moss	None	Bog birch Bluejoint reedgrass Fireweed Bunchberry Black spruce sapling Black spruce seedling Prickly rose Stemless raspberry Small cranberry Bog cranberry

Photo 3-1: Black spruce seedlings and saplings growing at LRK225NN22 on August 21, 2022

Photo 3-2: Labrador-tea growing at LRK25NN21 on August 8, 2022

Photo 3-3: Bog whortleberry growing at LRK22SS22 on August 24, 2022

3.3.2 DISTURBED SECTION OF TRANSECTS

In the disturbed section of the transects (Table 3-10), tree recruitment (seedlings and saplings) included the same six pseudospecies as in the undisturbed portion. Black spruce seedlings and saplings were the most abundant pseudospecies in the tree recruitment layer by far, making up more than 95% of the stems in all but the Lacustrine Deep Dry Mineral environmental combination. In the Lacustrine Deep Dry Mineral combination locations, recruitment from all the other species except tamarack accounted for 3% or more of the stems.

Table 3-10: Tree recruitment stem counts within the tall shrub belt on the disturbed portion of the transects during the first year of Project operation, 2022

Pseudospecies	Percent of stems			
	Lacustrine Deep Dry Mineral	Lacustrine Veneer Bog on Slope	Lacustrine Veneer Bog	Riverine Veneer Bog on Slope
Paper birch sapling	-	-	-	-
Paper birch seedling	3	-	-	-
Tamarack sapling	-	1	0	-
Tamarack seedling	-	1	1	-
Black spruce sapling	15	47	31	-
Black spruce seedling	63	51	68	98
Jack pine sapling	4	-	-	-
Jack pine seedling	-	-	-	-
Balsam poplar sapling	3	0	-	-
Balsam poplar seedling	-	-	-	-
Trembling aspen sapling	5	0	-	1
Trembling aspen seedling	6	-	-	2
Total stems	*94*	*277*	*367*	*125*

Twelve tall shrub taxa were recorded in the tall shrub belt of the disturbed section across all locations (Table 3-11). Plane-leaved willow was the most abundant tall shrub in the Lacustrine Veneer Bog on Slope and Veneer Bog combinations in the disturbed sections. Prickly rose and red osier dogwood (*Cornus sericea*) were the most abundant in the Lacustrine Deep Dry Mineral and Riverine Veneer Bog on Slope combinations. Bebb's willow (*Salix bebbiana*) was the second most abundant tall shrub in all of the Lacustrine environmental combinations.

Table 3-11: Tall shrub stem counts within the tall shrub belt on the disturbed portion of the transects during the first year of Project Operation, 2022

Taxon	Percent of stems			
	Lacustrine Deep Dry Mineral	Lacustrine Veneer Bog on Slope	Lacustrine Veneer Bog	Riverine Veneer Bog on Slope
Speckled alder	-	7	8	1
Green alder	13	12	5	7
Bog birch	-	12	2	5
Red-osier dogwood	-	-	-	43
Alder-leaved buckthorn	7	-	-	3
Prickly rose	41	6	1	9
Bebb's willow	30	24	10	2
Plane-leaved willow	0	40	75	9
Myrtle-leaved willow	-	-	-	19
Willow species	0	-	-	-
Soapberry	6	-	-	-
Mooseberry	1	0	-	-
Total stems	*750*	*660*	*554*	*696*

In the disturbed section of the transects, 22 taxa were widely distributed in at least one of the environmental combinations (Table 3-12). None of the taxa were widely distributed in all four environmental combinations, and only three were widely distributed across 3 of the combinations.

The taxa that were widely distributed in three of the combinations included black spruce seedlings, Labrador-tea, and bog whortleberry. In the Lacustrine Deep Dry Mineral type, the only very widespread species was fireweed (*Chamaenerion angustifolium*).

The environmental combination with the largest number of widely spread taxa was the Lacustrine Veneer Bog type (Table 3-12).

Table 3-12: Widely distributed taxa by environmental combination for the disturbed portions during the first year of Project operation, 2022

Distribution	Lacustrine Deep Dry Mineral	Lacustrine Veneer Bog on Slope	Lacustrine Veneer Bog	Riverine Veneer Bog on Slope
Very Widespread	Fireweed	Labrador-tea Bog whortleberry	Water sedge Green reindeer lichen Round-leaved sundew Bog-laurel Black spruce sapling Black spruce seedling Black spruce tree Labrador-tea Plane-leaved willow Sphagnum moss Small cranberry Bog whortleberry Bog cranberry	Bluejoint reedgrass Plane-leaved willow Bog whortleberry
Widespread	Twinflower Palmate-leaved colt's-foot Black spruce seedling Prickly rose Bebb's willow	Sheathed sedge Fireweed Green reindeer lichen Cup lichens Duckweed	None	Duckweed Labrador-tea Sphagnum moss

3.4 PLANTS OF ECOLOGICAL CONCERN

No MESA, SARA or COSEWIC listed plant species (see Appendix 1, Table 5-1 for potential species) or provincially critically imperiled or imperiled (S1 or S2 rank) plant species were found along any of the shore zone sample transects in 2022. Additionally, none of these species were incidentally found during the fieldwork.

One American milkvetch (*Astragalus americanus*) plant and one shrubby willow (*Salix arbusculoides;* Photo 3-4), both provincially imperiled to vulnerable species (S2S3), as well as

two rock willow (*Salix vestita*; Photo 3-5) plants, a provincially vulnerable species (S3), were found at or near sample transects. None of the remaining provincially critically imperiled to vulnerable species that had been identified in the EIS (KHLP 2012a) were found along the transects, or incidentally during the 2022 surveys.

Photo 3-4: Shrubby willow growing at LRK22SS21 on August 24, 2022

Photo 3-5: Rock willow growing at LRK22SS21 on August 24, 2022

No Level 1 or 2 (highest concern) non-native species were recorded along any of the long-term effects on wetlands transects, or incidentally during surveys in 2022. Two non-native species were recorded on the transects. Dandelion (*Taraxacum officinale*; concern level 3) and common plantain (*Plantago major*; concern level 4) were recorded at one location each.

4.0 SUMMARY AND CONCLUSIONS

The Long-Term Effects on Wetlands monitoring began in 2022. During the summer of 2022, 17 of the 25 planned permanent sample locations were established and sampled. Eleven potential locations could not be sampled because they were inaccessible, and/or the shoreline position was not yet well defined one year after reservoir impoundment. The remaining permanent sample locations will be established and sampled in summer 2023.

Data were collected in four of the five planned shore zone habitat types. Each habitat type included at least three replicate locations. In total, 34 transects were sampled at the 17 locations.

Black spruce was by far the most recorded species for trees and snags. Also, black spruce seedlings and saplings accounted for nearly 97% of the tree recruitment. The most abundant tall shrub species were green alder and prickly rose in the undisturbed section of the transects, and plane-leaved willow in the disturbed section.

A total of 30 plant taxa were found to be very widely or widely distributed in at least one environmental combination in the undisturbed section of the transects. The most widespread taxa were black spruce sapling, black spruce seedling, Labrador-tea, and bog whortleberry. In the disturbed section of the transects, 25 taxa were widely distributed in at least one environmental combination. The most widespread taxa were black spruce seedlings, Labrador-tea, bog whortleberry, and unidentified moss species.

No plant species of very high conservation concern (i.e., MBCDC ranked S1 or S2) were recorded either on the transects or incidentally during fieldwork.

None of the non-native species of highest invasive concern were recorded along any of the transects, or incidentally during surveys.

Sampling at the remaining eight sample locations will occur in 2023.

5.0 LITERATURE CITED

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APPENDIX 1:

SPECIES LISTS

Table 5-1: SARA, COSEWIC and MESA Listed endangered species which occur in Manitoba

Species	Common Name	SARA	COSEWIC	MESA
Endangered				
Agalinis aspera	Rough agalinis	X	X	X
Agalinis gattingeri	Gattinger's agalinis	X	X	X
Chenopodium subglabrum	Smooth goosefoot			X
Cypripedium candidum	Small white lady's-slipper	X		X
Pellaea gastonyi	Gastony's cliffbrake			X
Platanthera praeclara	Western prairie fringed-orchid	X	X	X
Spiranthes magnicamporum	Great Plains lady's tresses			X
Vernonian fasciculata	Fascicled ironweed	X	X	X
Threatened				
*Bouteloua dactyloides**	Buffalograss			X
Celtis occidentalis	Common hackberry			X
Chenopodium subglabrum	Smooth goosefoot	X	X	
Cypripedium candidum	Small white lady's-slipper		X	
*Dalea villosa**	Prairie clover	X		X
Solidago riddellii	Riddell's goldenrod			X
Symphyotrichum sericeum	Western silvery aster	X	X	X
Tradescantia occidentalis	Western spiderwort	X	X	X
Veronicastrum virginicum	Culver's-root			X
Leptogium rivulare[1]	Flooded jellyskin			

Notes: [1] *Leptogium rivulare* was rated as threatened at the time of the EIS (KHLP 2012b), but has since been adjusted to "special concern".

Table 5-2: List of species and taxa identified on Long Term Effects on Wetland study transects, including their common name, MBCDC S-rank and the number of transect occurrences in 2022

Scientific Name	Common Name	S-Rank	EIS	2022
Achillea millefolium	Common yarrow	SNA	26	2
Agrostis scabra	Rough bentgrass	S5	55	1
Alnus alnobetula	American green alder	S5	208	9
Alnus incana	Speckled alder	S5	203	5
Andromeda polifolia	Bog rosemary	S5	62	1
Anemonastrum canadense	Canada anemone	S5	8	1
Arctostaphylos uva-ursi	Common bearberry	S5	49	4
Arctous alpina	Alpine bearberry	S3S4		8
Astragalus americanus	American milkvetch	S2S3	9	1
Betula papyrifera	Paper birch	S5	197	6
Betula pumila	Bog birch	S5	236	9
Bidens cernua	Nodding beggarticks	S5	17	1
Calamagrostis canadensis	Bluejoint reedgrass	S5	342	14
Calla palustris	Wild calla	S5	25	5
Caltha palustris	Marsh marigold	S5	18	1
Campanula aparinoides	Marsh bellflower	S5		1
Carex aquatilis	Water sedge	S5	331	7
Carex canescens	Hoary sedge	S5	37	4
Carex concinna	Northern elegant sedge	S4S5	42	3
Carex foenea	Bronze sedge	S5	4	1
Carex scirpoidea	Single-spike sedge	S4S5	13	4
Carex spp				8
Carex vaginata	Sheathed sedge	S5	65	9
Chamaenerion angustifolium	Fireweed	S5	223	13
Cicuta bulbifera	Bulb-bearing water-hemlock	S5	33	2
Cladonia arbuscula ssp. *mitis*	Green reindeer lichen	S4	350	14
Cladonia rangiferina	Gray reindeer lichen	S5	189	3
Cladonia stellaris	Star-tipped reindeer lichen	S5	128	13
Cladonia spp			282	2
Comarum palustre	Marsh cinquefoil	S5	146	1
Cornus canadensis	Bunchberry	S5	216	14
Cornus sericea	Red-osier dogwood	S5	46	1
Diphasiastrum complanatum	Northern ground-cedar	S3S4	24	2
Drosera rotundifolia	Round-leaved sundew	S4S5	89	6
Eleocharis palustris	Creeping spikerush	S5	79	1

Scientific Name	Common Name	S-Rank	EIS	2022
Empetrum nigrum	Black crowberry	S5	65	2
Endotropis alnifolia	Alder-leaved buckthorn	S5	20	2
Epilobium palustre	Marsh willowherb	S5	1	3
Equisetum arvense	Field horsetail	S5	260	9
Equisetum scirpoides	Dwarf scouring-rush	S4S5	154	11
Equisetum sylvaticum	Woodland horsetail	S5	175	8
Fragaria virginiana	Smooth wild strawberry	S5	44	5
Galium triflorum	Sweet-scented bedstraw	S5	1	1
Gentiana spp				1
Geocaulon lividum	Northern comandra	S5	111	8
Glyceria spp				1
Grass spp				9
Hylocomium splendens	Stairstep moss	S4S5	347	4
Icmadophila ericetorum	Candy lichen	S5		4
Impatiens capensis	Spotted jewelweed	S5		1
Iris versicolor	Harlequin blue flag	S3S4		1
Juniperus communis	Common juniper	S5	39	2
Kalmia polifolia	Bog-laurel	S5	143	8
Larix laricina	Tamarack	S5	220	13
Lathyrus ochroleucus	Pale vetchling	S5		1
Lathyrus palustris	Marsh vetchling	S5	15	1
Lemna minor	Common duckweed		2	3
Lemna spp				12
Linnaea borealis	Twinflower	S5	140	7
Lonicera spp				1
Lonicera villosa	Mountain-fly-honeysuckle	S5	23	4
Lysimachia thyrsiflora	Tufted loosestrife	S5	18	1
Maianthemum trifolium	Three-leaved solomon's-seal	S5	49	2
Menyanthes trifoliata	Bogbean	S5	49	1
Mertensia paniculata	Tall lungwort	S5	45	4
Mitella nuda	Mitrewort	S5	77	3
Moss spp			584	16
Oryzopsis asperifolia	White-grained Mountain-ricegrass	S5	6	4
Packera paupercula	Balsam groundsel	S5	3	1
Parnassia palustris	Marsh grass of parnassus	S5	26	2
Peltigera spp			150	9
Petasites frigidus var. *palmatus*	Palmate-leaved colt's-foot	S5	106	8

Scientific Name	Common Name	S-Rank	EIS	2022
Picea mariana	Black spruce	S5	638	44
Pinus banksiana	Jack pine	S5	104	3
Plantago major	Common plantain	SNA	24	1
Platanthera spp				1
Pleurozium schreberi	Red-stemmed feather moss	S4S5	494	7
Polygonum amphibium	Water smartweed	S5	69	1
Polytrichum juniperinum	Juniper haircap moss	S4S5	12	6
Polytrichum strictum	Bog haircap moss	S4S5		1
Populus balsamifera	Balsam poplar	S5	62	2
Populus tremuloides	Trembling aspen	S5	58	16
Potentilla norvegica	Rough cinquefoil	S5	26	1
Pyrola spp				5
Ranunculus spp				2
Rhododendron groenlandicum	Labrador-tea	S5	627	16
Ribes americanum	Wild black currant	S5		1
Ribes glandulosum	Skunk currant	S5	15	2
Ribes oxyacanthoides	Canada wild gooseberry	S5	11	1
Ribes triste	Wild red currant	S5	66	3
Rosa acicularis	Prickly rose	S5	199	12
Rubus arcticus	Stemless raspberry	S5	121	7
Rubus chamaemorus	Cloudberry	S5	178	7
Rubus idaeus	Red raspberry	S5	30	7
Rubus pubescens	Dewberry	S5	55	3
Salix arbusculoides	Shrubby willow	S2S3	39	1
Salix bebbiana	Bebb's or beaked willow	S5	213	14
Salix glauca	Smooth willow	S4	34	1
Salix myrtillifolia	Myrtle-leaved willow	S5	150	11
Salix pseudomyrsinites	Myrtle-leaved willow	S3S5	26	2
Salix planifolia	Plane-leaved willow	S5	241	10
Salix pseudomonticola	False mountain willow	S4S5	6	2
Salix spp				2
Salix vestita	Rock willow	S3	28	2
Shepherdia canadensis	Soapberry	S5	48	2
Sium suave	Water-parsnip	S5	74	1
Solidago hispida	Hairy goldenrod	S5	30	2
Solidago spp				2
Sparganium spp				1
Sphagnum spp			379	12

Scientific Name	Common Name	S-Rank	EIS	2022
Spiranthes romanzoffiana	Hooded ladies'-tresses	S5	8	1
Symphyotrichum borealis	Boreal aster	S4S5	3	1
Symphyotrichum ciliolatum	Lindley's aster	S5	32	4
Taraxacum officinale	Common dandelion	SNA	32	1
Utricularia spp				2
Vaccinium myrtilloides	Velvet-leaf blueberry	S5	98	1
Vaccinium oxycoccos	Small cranberry	S5	202	10
Vaccinium uliginosum	Bog whortleberry	S5	309	16
Vaccinium vitis-idaea	Bog cranberry	S5	392	15
Viburnum edule	Mooseberry	S5	90	3
Vicia americana	American purple vetch	S5		2
Viola spp				2