



Lake Winnipeg East System Improvement Transmission Project

2018 Vegetation Biophysical Monitoring Report

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With redactions for rare and important plant locations



NATURAL RESOURCE SOLUTIONS INC.

Aquatic, Terrestrial and Wetland Biologists

Lake Winnipeg East System Improvement Transmission Project

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1.0 Introduction

The Lake Winnipeg East System Improvement Transmission Project (LWESITP) herein referred to as the 'Project' is comprised of the construction, operation and maintenance of the PQ95 Transmission Line and Manigotagan Corner Station Site. The transmission line spans approximately 70km with the majority of the project footprint occurring within boreal forest and wetland habitat. The transmission line is in close proximity to Provincial Road #304 which was utilized extensively by field staff to access various trails and laneways leading to the survey locations.

As part of Manitoba Hydro's Construction Environmental Protection Plan (CEnvPP) for the Project (Manitoba Hydro 2015), a biophysical monitoring program has been implemented to ensure that mitigation efforts are effective and adaptive management is applied where necessary.

The specific requirements for the vegetation monitoring component of this project were developed through the Environmental Assessment (EA), which includes the Vegetation Technical Report (Calyx Consulting 2012). The CEnvPP (Manitoba Hydro 2015) is the guiding document for the assessment of mitigation and effects relating to the construction of the Project.

Natural Resource Solutions Inc. (NRSI) was retained by Manitoba Hydro in September 2014 to develop and implement a Vegetation Biophysical Monitoring Plan (VBMP) for the Project. The VBMP is intended to quantify the effectiveness of the implemented construction mitigation measures and inform the need for any further mitigation as part of an adaptive management approach. With reference to the general and specific mitigation measures and annual monitoring results, the implementation of the VBMP confirms the compliance with regulatory requirements.

The monitoring methodology outlined in the VBMP is based on annual, repeated sampling of a select group of monitoring components. The Environmental Effects Monitoring Plan (EEMP) (Manitoba Hydro 2015) along with the Environmental Act License (Government of Manitoba 2015) outline the monitoring requirements to be

fulfilled during and following construction of the Project. The VBMP is a component of the EEMP. Monitoring is to occur annually throughout the construction phase and one year following the completion of construction. The clearing of vegetation along the right-of-way (RoW) occurred in the winter of 2015/2016. Vegetation surveys completed in 2018 constitute Year 1 Post-construction and build on the during-construction surveys conducted in 2016 and 2017.

Given that the components to be monitored vary in nature from known populations of rare species to detection of invasive species and species important to First Nation and Métis communities, an adaptable, specific and measurable survey methodology is required.

This Vegetation Biophysical Monitoring Report summarizes all of the collected information from monitoring activities between 2016 and 2018. Map Set 1 indicates the location of each Environmentally Sensitive Site (ESS) which were informed partially by Valued Ecosystem Components (VECs) identified in the EA process. These ESSs include Species of Conservation Concern (SCC) and plant gathering areas. Specific locations of invasive non-native species monitoring are not indicated with weeds occurring sporadically throughout the project footprint with higher concentrations at road crossing locations. Two riparian buffer exceedances were flagged in 2016 and were re-assessed in 2017 as part of the watercourse crossing monitoring report. These areas were found to be vegetated and stable with no further issues apparent. To date, no further riparian buffer exceedances occurred since those reported in 2016. The issue of visual screens at the locations where the RoW crosses the highway was assessed in both 2017 and 2018. The need for improvements at these locations relates to the high visibility of Moose (*Alces alces*) within the RoW from the elevated roadway.

The vegetation survey data collected in 2018 informs changes which have occurred over the past three years. This data will be analyzed to provide conclusions based upon quantitative results and complemented with qualitative field observations of site conditions. Any deficiencies in the applied mitigations have been identified with recommendations for further effort to protect the identified ESSs.

2.0 Background

2.1 Monitoring Requirements

The purpose of the EEMP (and VBMP) is to determine the effectiveness of implemented mitigation measures which are intended to minimize the impact of the development on any identified ESS within and adjacent to the preferred transmission RoW. The Environmental Act License (Government of Manitoba 2015) issued in accordance with The Environment Act (C.C.S.M. c. E125) stipulates a number of conditions which the Project must fulfill. The following conditions pertain to the development and implementation of the VBMP:

“1. The Licencee shall, in addition to any of the specifications, limits, terms and conditions specified in this Licence, upon the request of the Director:

- a. sample, monitor, analyse or investigate specific areas of concern regarding any segment, component or aspect of the Development for such duration and at such frequencies as may be specified;*
- b. determine the environmental impact associated from the Development; and*
- c. provide the Director, within such time as may be specified, with such reports, drawings, specifications, analytical data, descriptions of sampling and other information as may from time to time be requested.*

25. The Licencee shall, during construction and maintenance of the Development, prevent the introduction and spread of foreign biota (e.g., weeds, non-native species) on land and to surface waters. Monitoring for incursion of invasive plant species as a result of the project, and control programs for invasive plants, shall be conducted as described in the Proposal dated January 2, 2013.

33. The Licencee shall prepare a report on monitoring programs to be undertaken in relation to the mitigation measures outlined in the Proposal and supporting information. The report shall be submitted prior to the initiation of construction, for the approval of the Director, and shall:

- a. provide a description of the proposed activities for monitoring the physical, aquatic, and terrestrial environments for effects from construction and operation of the Development;*
- b. describe the parameters to be measured, the methodology and frequency of measurement, references to establish thresholds and sustainability indicators, where appropriate, and the protocol for reporting the results of monitoring of the environmental conditions affected by the Development to Manitoba Conservation and Water Stewardship; and*
- c. include descriptions of proposed programs developed in cooperation and consultation with the Wildlife Branch, which employ pre- and post-*

construction monitoring components and methodologies (design, data collection, analyses);

i. for the monitoring of the population status, distribution, and movements of moose in the vicinity of the transmission line right-of-way;

ii. for the monitoring of wolf movements, territories, distribution, and predation on moose in the vicinity of the transmission line right-of-way;

and

iii. for the monitoring of the occurrence and distribution of white-tailed deer in the vicinity of the transmission line right-of-way.

34. *The Licencee shall implement the monitoring programs as approved pursuant to Clause 33 of this Licence.*

35. *The Licencee shall provide the data, and report annually to the Director, on the results of monitoring programs as approved pursuant to Clause 33 of this Licence.*

36. *The Licencee shall consult annually with the Wildlife Branch on the progress of the monitoring programs approved pursuant to Clause 33 of this Licence, and on any proposal adjustments or amendments to the programs.”*

The CEnvPP (Manitoba Hydro 2015) also stipulates a number of conditions which the Project must fulfill. The CEnvPP acts as the key guiding document to verify the predicted effects outlined in the EA and to assess the observed effects relating to project construction. The assessment of the effects will be used to inform adaptive management where deficiencies in environmental protection are observed. The following conditions pertain to the development and implementation of the VBMP:

As noted in Section 3.3 of the EA, the implementation of the CEnvPP includes:

“Inspection – to oversee adherence to and implementation of the terms and conditions of Project approval during Project construction and operation;

Effects monitoring – to measure the environmental changes that can be attributed to Project construction and/or operation and check the effectiveness of mitigation measures;

Environmental auditing – to verify the implementation of terms and conditions, the accuracy of the predictions, the effectiveness of mitigation measures, and the compliance with regulatory requirements and standards”

The ESSs which were identified in the EA are identified in Maps 1-18 of the CEnvPP. A revised version of these maps is appended to this report. These maps include the newly

documented locations of SCC which were observed during 2016 surveys as well as plots which were monitored in 2016 and 2017 to monitor medicinal and edible plants.

2.2 Species of Conservation Concern

Species of Conservation Concern include species of plants that are listed by the Manitoba Conservation Data Centre (MBCDC). None of these species are protected under The Manitoba Endangered Species and Ecosystems Act or the federal Species at Risk Act. Pre-construction vegetation surveys (Calyx Consulting 2012) identified Hooker's Orchid (*Platanthera hookeri*) (S2S3), Sessile-fruited Arrowhead (*Sagittaria rigida*) (S2?), Dwarf Bilberry (*Vaccinium caespitosum*) (S3) and Swollen Sedge (*Carex intumescens*) (S3) to occur within the RoW. S2 indicates that a species is considered imperiled while S3 indicates that a species is considered vulnerable. With the exception of Swollen Sedge, these species had been noted to exist in low numbers, and have limited distribution within the project footprint. Surveys throughout the RoW have identified numerous locations where Swollen Sedge is present and it has been inferred that this species has had a positive response to the opening of canopy within the RoW.

The SCC listed above occur in four separate locations within the project footprint (with Swollen Sedge found to occur in numerous locations). All occurrences are within or in close proximity to the transmission line RoW and all less than 500m from a tower location.

Construction activities that can negatively affect plant SCC include the use of heavy equipment, clearing and grubbing of vegetation and competition from invasive species. While the transmission line overlaps the locations of these SCC, tower locations were selected to avoid direct impacts on these populations.

The following mitigation measures were identified in the CEnvPP:

- Identify and flag prior to start of work;
- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion;
- Provide 5m vegetated (shrub and herbaceous) buffer around site;
- Remove trees by low disturbance methods;

- Confine vehicle traffic to established trails to the extent possible; and
- Implement additional mitigation from site investigation.

The EEMP outlines the following objectives for the known occurrences of SCC:

- Document SCC during pre-construction;
- Document presence of SCC during construction; and
- Verify the implementation and effectiveness of protection measures.

Monitoring of SCC occurred in July of 2016 and 2017 (during construction) and in July of 2018 (post-construction).

2.3 Plants/Communities Important to Indigenous People

A series of Aboriginal Traditional Knowledge (ATK) workshops identified ESSs where plants such as Blueberries or medicinal plants may be impacted by the construction and operation of the project. These areas are valued for their provision of resources used by First Nations and Métis including gathering of food and medicines. Information pertaining to plant gathering sites is provided in both the Cultural Resources Technical Report (NLHS 2012) and the Vegetation Technical Report (Calyx Consulting 2012). Manitoba Hydro worked with First Nation and Métis communities to further identify and map these sites and develop mitigation measures to minimize the effects of the project on them.

Clearing and construction of the transmission line RoW as well as the creation of new access roads/trails for the Project can allow increased access by non-community members to sensitive areas that have been identified by First Nation and Métis communities and can result in the potential loss of important vegetation resources found at these sites.

The following mitigation measures were identified in the CEnvPP:

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion;
- Minimize surface disturbance around the site to the extent possible;
- No herbicide to be applied during construction;
- Confine vehicle traffic to established trails to the extent possible;

- Remove trees by low disturbance methods; and
- Implement additional mitigation from site investigation.

As berry harvesting was identified in the CEnvPP as an ESS which may be impacted, representative plot-based surveys were conducted to quantify the percentage cover of berry harvesting species. A plot-based approach was utilized for species such as Low Sweet Blueberry (*Vaccinium angustifolium*) and Velvet-leaf Blueberry (*V. myrtilloides*) which are widespread and abundant within the RoW. Methods employed for sampling are described in further detail in Section 3.0.

The EEMP outlines the following objectives for the sites which contain plants and communities important to aboriginal people:

- Document the composition and abundance of vegetation;
- Confirm project effects on vegetation; and
- Verify the implementation and effectiveness of protection measures.

The decision trigger and threshold for action includes:

- Measurable significant decrease of plant abundance within ESS

Monitoring of plants and communities important to aboriginal people occurred in July of 2016 and 2017 (during construction) and in July of 2018 (post-construction).

2.4 Invasive and Non-native Species

While the majority of clearing, geotechnical and construction work along the transmission line has occurred during the winter months, there is the potential for the introduction and spread of invasive non-native vegetation species. The introduction of these species is often the result of the movement of contaminated equipment and/or the introduction of fill or foreign plant materials to a site. Contaminated equipment may include seed or portions of rootstock which arrive to a site on dirty equipment. Within the site, equipment may pass through existing areas of invasive species and move plant materials to new locations along the RoW. The presence of newly introduced non-native species may not be apparent until several years of growth and establishment have occurred. Once established, these species can become widespread through seed

production and/or rhizomatous growth. The spread of these species has impacts on native vegetation through increased competition and displacement of sensitive natural species. Impacts to native vegetation can also impact wildlife which depend upon these natural habitats.

For all work occurring on agricultural lands in the vicinity of Pine Falls, Manitoba Hydro has implemented an Agricultural Biosecurity Policy which includes a Standard Operating Procedure (SOP). While cropland is restricted to a small portion of the study area, field staff of Manitoba Hydro are ensuring that contractors adhere to the policy which aims to prevent the spread of diseases, pests or invasive species. NRSI biologists were notified of the policy and provided with a copy of the SOP. Biologists did not enter the agricultural lands in the vicinity of Pine Falls.

The CEnvPP identifies mitigations pertaining to rehabilitation and re-vegetation that stipulate that a Rehabilitation Plan will be developed for all sites which are significantly disturbed as a result of construction activities. The mitigation notes that regionally-appropriate grass mixtures will be incorporated into the Plan and seed mixtures will not contain any non-native or invasive species.

Consistent with the Environment Act License (No. 3120) (Government of Manitoba 2015), timber stockpiles were created to allow First Nations and Métis access to harvested wood in close proximity to all season access points. By locating stockpiles in centralized and easily accessible locations, the potential for spread of invasive species was minimized. One such site which was observed by NRSI biologists was located approximately 5km north of Pine Falls, in an existing cleared area and easily accessed from Provincial Road #304. All log stock piles had been removed prior to the July 2017 surveys.

The Lake Winnipeg East System Improvement Project Environmental Assessment Report (EAR) (Manitoba Hydro 2012) identified mitigations to limit the introduction of foreign biota. Aggregate materials required for the project would be sourced from local suppliers to the extent possible. It was expected that the use of local aggregate materials would lower the possibility of introducing invasive and non-native species. In

general, the project required a limited amount of aggregate material for concrete batching and backfilling. The EAR also noted the potential for dirty equipment to introduce invasive and non-native species and identified that all equipment arriving and departing the site should be clean and free of soil and plant materials.

Lastly, the EAR identified that a containment/control program would be implemented for invasive and non-native plants which establish as a result of the project construction.

The EEMP outlines the following objectives for invasive and non-native species:

- Document the composition and abundance of invasive and non-native vegetation within the project footprint;
- Document the degree of invasive and non-native plant introduction and spread; and
- Recommend appropriate control and eradication programs, as required.

The decision trigger and threshold for action includes:

- Establishment and spread of invasive species along ROW

Monitoring of invasive and non-native plants during pre-construction occurred in July 2016 in the vicinity of Pine Falls. In 2017 monitoring was repeated in the vicinity of Pine Falls and also included an aerial survey of the entire transmission line including several investigations at areas of notable disturbance at tower locations. It was determined that the disturbance areas at some tower locations did not warrant seeding or intervention as these areas were re-vegetating with the adjacent native plant species. The scope of invasive and non-native vegetation monitoring which was conducted in 2018 (post-construction) assessed the ROW in the vicinity of Pine Falls and various RoW locations between Pine Falls and the Manigotagan substation.

2.5 Road Crossing Visual Screens

A large number of Willow (*Salix* spp.) plantings were installed at the highway crossings in order to enhance the visual barrier afforded by woody vegetation. The intention of the plantings was to obscure views down the transmission line from the elevated roadway

which was seen as an issue for Moose hunting as Moose could be easily spotted from the roadway. Between May 29 and June 14, 2018, approximately 25,000 cuttings were soaked in Stim-root for 2 weeks and pushed into the ground in large blocks on each side of each crossing location. Species which were used included Pussy Willow (*Salix discolor*), Bebb's Willow (*S. bebbiana*), Sandbar Willow (*S. exigua*) and Heart-leaved Willow (*S. eriocephala*). The cuttings were sourced from near the Manigotagan substation, Black River and Access Road 7 (Tembec laydown yard).

3.0 Methods

3.1 Study Design

The components of the EEMP are listed below and include discussion of the monitoring effort and methodology required in order to effectively evaluate the success of mitigation measures. The respective methodology for each component reflects the spatial extent of the feature or circumstances which could impact the feature. A blanket approach of transect or plot based sampling is not justified in all instances and the methodology proposed for each reflects the nature of the feature.

All field data was collected according to the Data Management Protocol (DMP) established by Manitoba Hydro. All reports and accompanying files and documents were uploaded to the Environmental Protection Information Management System (EPIMS). NRSI is finalizing the geospatial datasets with metadata for survey work completed to date; these files will be uploaded to EPIMS during the winter of 2019.

Surveys conducted in 2017 included monitoring of identified point locations of Environmentally Sensitive Sites. This included 7 point locations of plant SCC and 17 point locations of gathering sites. Of the 17 point locations for gathering sites, 6 had been previously identified with the remaining 11 point locations established in 2016 within the 3 polygons encompassing large areas of the RoW identified as plant gathering sites. All SCC occurrences and plant gathering survey plots are indicated in Map Set 1.

An exhaustive search for invasive species was conducted in the vicinity of Pine Falls in 2016 and was re-visited in 2017 and 2018. Given the extent of disturbance within this section of the RoW, this area was a focus for the establishment of invasive species. An aerial survey, which included touch down at disturbed areas in question, was conducted in July 2017 for the length of the transmission RoW between Pine Falls and the Manigotagan Corner Station.

All surveys were completed between July 24-27, 2018; a total of four consecutive days. Surveys were completed by two NRSI biologists (Patrick Deacon and Andrew Dean). Kris Watts (Manitoba Hydro) accompanied NRSI staff on the July 25, 2018 survey.

For the 2018 surveys, community members from Sagkeeng (Randy Bruyere), Black River (Adam Courchene) and Hollow Water First Nation (Kimball Bushie) accompanied NRSI staff on July 25-27, 2018.

Species of Conservation Concern

Plant SCC populations were surveyed at 7 locations. The original 4 locations had been provided to NRSI based upon observation made during pre-construction survey work with an additional 3 locations added during 2016 monitoring. The surveys carried out by NRSI involved locating the species occurrence (ESS Site), completing stem counts and evaluating the health of the plants (various parameters), site conditions, and noting the effectiveness of mitigation efforts. In order to align with peak bloom/fruitletting period for each species, surveys were conducted in mid-July.

Surveys are to occur for 3 years as follows:

- Survey 1 – July 2016 (First year during construction)
- Survey 2 – July 2017 (Second year during-construction)
- Survey 3 – July 2018 (First year post-construction)

Surveys over the course of the three years documented the following details (data units are provided in brackets):

- Exhaustive count of all live stems within the population (numerical)
- Number of plants bearing bloom/fruit (numerical/percent)
- Average plant height (centimeters)
- Spatial extent of population (square meters and GIS polygon shapefile)
- Canopy cover (4-point densitometer reading averaged, converted to percent)
- Photographic record from established point (.jpeg file)
- Incidental observations of animal browse, disturbance, trampling (qualitative data)
- General area search for the establishment of satellite populations nearby (qualitative data, UTM coordinates, all of the above-mentioned parameters)

Invasive and Non-native Species

Invasive species monitoring was conducted as an area search of the southern extent of the transmission RoW in the vicinity of Pine Falls to assess the same area which had been monitored in 2016 and 2017. General area searches were conducted at all road crossings and many of the locations were access trails intersect the RoW. Areas of disturbed soils including soil piles at tower locations and excavated features, which had been documented in previous years, were revisited to assess the establishment of invasive species and the degree of natural succession which had occurred.

Although the EEMP had identified that fly-over surveys would be conducted in both 2017 and 2018, observations made in 2017 suggested that areas of invasive species proliferation are largely restricted to road and trail crossings of the RoW. As a result, surveys in 2018 were conducted by foot with the aerial survey deemed unnecessary. Stretches of maintenance trails which run down the RoW were observed to contain some invasive species and limited regrowth of trees and shrubs (within the footprint of the tracked equipment). During the 2017 fly-over it was noted that disturbed areas at tower locations were regenerating with native species cover and the vast majority of wetland, forest and rock barren habitat, while now cleared of tree cover, did not contain aggressive invasive and non-native species requiring further assessment.

The ground survey in Pine Falls was conducted in 2016, 2017 and 2018 between angle tower 3-7 and 10-13 (including the transmission line RoW). Surveys in 2016 were intended to document existing invasive species while surveys in 2017 and 2018 were intended to assess the spread of existing invasive species and to document any new species occurrences. Access to land parcels in this area was granted by the respective landowners with the exception of a large agricultural field located between angle tower 7 and angle tower 10. Due to biological contamination concerns and the unsuitable conditions for permanent invasive species establishment (actively farmed row-crop), this length of the transmission line was not assessed and does not present a concern at this time.

Surveys occurred between 2016 and 2018 as follows:

- Survey 1 – July 2016 (First year during construction, area of Pine Falls)
- Survey 2 – July 2017 (Second year during construction, all 20 angle towers)
- Survey 3 – July 2017 (Second year during construction, transmission line)
- Survey 4 – July 2018 (First year post-construction, road and trail crossings, subset of towers)

Comprehensive invasive and non-native species surveys commenced in 2017 as it was very unlikely that introduced species would be apparent in the summer of 2016 following the first winter of work.

Surveys in 2018 documented the following details (data units are provided in brackets):

- Presence/absence of invasive, non-native species (Yes/No)
- All invasive, non-native species present (scientific name)
- Locational data (centroid UTM coordinates)
- Number of patches (numeric)
- Stem count (numeric)
- Number of plants bearing bloom/fruit (numeric)
- Spatial extent of population (square meters and GIS polygon shapefile)
- Photographic record (.jpeg file)

Plants/Communities Important to Indigenous People

The VBMP outlined the methodology for monitoring of plants and plant communities important to First Nations and Métis. As berry harvesting was identified in the CEnvPP as an ESS which may be impacted, surveys were conducted to document their response to clearing and construction within the RoW. A similar approach was taken for other plant species which have been identified as having traditional use.

Surveys occurred between 2016 and 2018 as follows:

- Survey 1 – July 2016 (First year during construction)
- Survey 2 – July 2017 (Second year during-construction)
- Survey 3 – July 2018 (First year post-construction)

Surveys in documented the following details (data units are provided in brackets):

- Presence/absence of the identified plant species at each identified location (Yes/No)
- Locational data (centroid UTM coordinates)
- Number of patches (numeric)
- Stem count (numeric)
- Number of plants bearing bloom/fruit (numeric)
- Spatial extent of population (square meters and GIS polygon shapefile)
- Photographic record (.jpeg file)

The 10x10m monitoring plots for gathering areas (food or medicinal) which were established in 2016 were re-visited in 2017 and 2018. General notes were taken at each plot to assess the effectiveness of mitigation efforts. As those gathering areas which were identified as polygons cover large areas of the RoW, the plots are intended to be representative of the various plants which are gathered in these areas (predominantly Blueberry and Cranberry patches).

Individual stem counts were not feasible for Blueberry which typically grown in dense colonies consisting of thousands of matted stems or Cranberry which has a low, prostrate growth form which roots in multiple locations. As a result, these species are not easily distinguished on a plant-by-plant basis.

A GPS track was recorded for the NRSI biologists who worked in tandem walking transects as necessary. GPS points were documented for all photographs.

4.0 Results

4.1 Species of Conservation Concern

Similar to the survey results collected in previous years, monitoring of SCC in 2018 found most populations to be accounted for and in good health following the woody vegetation clearing which occurred during the winter of 2015/2016. Survey results suggest that some species may be benefitting from the RoW creation as a result of additional sunlight and reduced competition afforded to herbaceous plants.

Dwarf Bilberry

The population of Dwarf Bilberry (LWE-Eco-301) was not re-located in 2016 and has not been observed in any of the monitoring years. As noted in the 2016 report, the 5m vegetated buffer had not been implemented at this location during vegetation clearing. A thick layer of wood mulch which had been present in the vicinity of the occurrence in 2016 had been reduced in depth by the 2017 survey. The mulch depth in July 2016 had been 15-20cm which had been reduced to 5-10cm in the same location in July 2017 and remained present in 2018. The reduction in mulch depth was recommended in the 2016 report as a means to improve conditions which would allow the species to return. Despite having not been observed over the past 3 monitoring years, persistent seed or root stock of Dwarf Bilberry may remain viable in the soil.

The area has undergone dense re-growth of vegetation including numerous Trembling Aspen (*Populus tremuloides*), as well as Saskatoon (*Amelanchier* sp.), Red Raspberry (*Rubus idaeus*) and Hazel (*Corylus* sp.). The dense woody vegetation limits the ability to thoroughly search the vicinity and the plant may in fact be present, but is undetectable due to the dense cover

Suitable habitat for the species is widespread throughout the Project and forest areas adjacent to the RoW and periodic vegetation removal along the RoW will maintain the semi-open conditions favoured by this species.

Hooker's Orchid

The 2018 survey of the known Hooker's Orchid population (LWE-Eco-302) documented a total of 11 plants (11 had been observed in 2016 and 10 in 2017). In general, conditions have remained the same at the rocky opening which remains surrounded by a stand of conifers, outside of, but near the actual RoW. The plants occupy the same spatial extent and 2 flowering stems were documented in 2018.

The 2 additional populations of Hooker's Orchid which were observed in 2016 (see Table 1), could not be re-located in 2017 or 2018. The first location is within the RoW immediately west of the LWE-Eco-302 site, while a second population occurs within the RoW northwest of the Sagkeeng log stockpile yard, approximately 5km north of Pine Falls.

As noted for Dwarf Bilberry, the dense re-growth of Trembling Aspen has altered the open ground cover which was present in 2016 to a thicket of tree stems 1-2m in height. It is inferred that the plants are still present among the dense tree cover. In time, this tree cover will thin as individual stems begin to dominate. As well, periodic maintenance (vegetation control) within the RoW by Manitoba Hydro will re-instate the open ground cover from time to time. This species is found naturally in both full shade and part shade conditions and it is therefore unlikely that periodic variations in canopy cover would have a negative effect on the plants. As Hooker's Orchid has a preference for shallow substrates (often growing on mosses or a thin layer of detritus over bedrock), the accumulation of wood mulch at these locations will likely have a negative effect on the plants. The recommendation to instate a 5m vegetated (shrub and herbaceous) buffer at these locations is outlined in Section 5.0.

Sessile-fruited Arrowhead

The population of Sessile-fruited Arrowhead located along the Sandy River has remained in excellent health with no visible signs of stress or impacts relating to the clearing of the transmission line. It is noted that fluctuations in water levels between 2016 and 2018 are likely to dictate the extent of the populations as the species is specific to a shallow depth of water which is influenced by periods of high water or

drawdown of the river system. Plants still occur in long bands along the riverbank which is a reflection of the preferred water depth for the species.

Due to the large extent of the population and the location of plants within the river, an estimate count was conducted from the bank. The 2016 estimate of 2700 plants within the RoW (north and south bank) remained consistent in 2017 and 2018. The percentage of plants in flower ranges from 20% in 2016 and 2018 to 10% in 2017. This change has been attributed to water level fluctuation. The population continues both upriver and downriver contiguous with those stands occurring within the RoW.

The riparian buffer at this crossing is intact with dense shrubs regenerating from the crest of the bank to the water edge where a flat area of riverine forbs and graminoids surround the stands of Arrowhead.

Swollen Sedge

Pre-construction surveys had identified 1 population of Swollen Sedge occurring within the RoW (LWE-Eco-304). Surveys conducted in 2018 found this population to exhibit a lower stem count of 34 plants (47 in 2016, 54 in 2017). This decrease may be a result of the regenerating Trembling Aspen which is now 1-2m in height and shading many of the plants. It was noted in 2017 that the open (recently grubbed) conditions observed in 2016 did not reflect the natural conditions which this species would be found within. It is inferred that stem counts would react positively in the year or two following tree clearing activities, to then return to a lower population of plants growing among the suckering woody species. This species can be found in a variety of mesic to wet habitats including forest, swamp, marsh, wet meadow and trails which attests to the tolerance the species has to various environmental conditions.

During the 2016 surveys 7 additional populations were documented (see Table 1). Due to the widespread and abundant nature of Swollen Sedge within the RoW, these sites were not re-visited in 2017 or 2018.

Table 1. Environmentally Sensitive Site - Species of Conservation Concern

ESS Identifier	Species	UTM Coordinate	Comments
LWE-Eco-301	Dwarf Bilberry (<i>Vaccinium caespitosum</i>)	Bilberry-001	2016: No plants observed
			2017: No plants observed
			2018: No plants observed
LWE-Eco-302	Hooker's Orchid (<i>Platanthera hookeri</i>)	Orchid-001	2016: 11 plants (3 fruiting, 8 basal leaves only)
			2017: 10 plants (3 fruiting, 7 basal leaves only)
			2018: 11 plants (2 fruiting, 8 basal leaves only)
New LWE-Eco*		Orchid-002	2016: 3 plants (2 fruiting, 1 basal leaves only)
			2017: not relocated due to dense woody growth
			2018: not relocated due to dense woody growth
New LWE-Eco*		Orchid-003	2016: 2 plants (1 fruiting, 1 basal leaves only)
			2017: not relocated due to dense woody growth
			2018: not relocated due to dense woody growth
LWE-Eco-303	Sessile-fruited Arrowhead (<i>Sagittaria rigida</i>)	Arrowhead-001	2016: 700 plants on north bank (approximate count), 20% fruiting
			2017: still approximately 700 plants, 10% fruiting
			2018: approximately 750 plants, 20% fruiting
New LWE-Eco*		Arrowhead-002	2016: 2000 plants on south bank (approximate count) 20% fruiting
			2017: still approximately 2000 plants, 10% fruiting
			2018: still approximately 2000 plants, 20% fruiting

LWE-Eco-304	Swollen Sedge (<i>Carex intumescens</i>)	Sedge-001	2016: 47 plants, log pile likely covering additional plants
			2017: 54 plants observed, log pile removed, no other Swollen Sedge sites monitored in 2017 due to widespread and abundant nature of species within RoW
			2018: 34 plants observed, competition from woody species restoring typical habitat conditions
New LWE-Eco*		Sedge-002	2016: 1 plant
New LWE-Eco*		Sedge-003	2016: 50 plants
New LWE-Eco*		Sedge-004	2016: 20 plants
New LWE-Eco*		Sedge-005	2016: 5 plants
New LWE-Eco*		Sedge-006	2016: 2 plants
New LWE-Eco*		Sedge-007	2016: 19 plants
New LWE-Eco*	Sedge-008	2016: 1 plant	

An asterisk (*) denotes newly documented SCC from 2016 surveys, no new occurrences were documented in 2017 or 2018.

The CEnvPP identifies the potential for direct loss of SCC vegetation due to vegetation clearing and construction activities. Specific mitigation measures to protect vegetation SCC, to be coordinated by the Environmental Monitor, are outlined in Table 2 below.

Table 2. Assessment of Mitigation Measures at Species of Conservation Concern Sites

Mitigation Measure	LWE-Eco-301	LWE-Eco-302	LWE-Eco-303	LWE-Eco-304
Identify and flag prior to start of work.	Y	Y	Y	Y
Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion.	Y	Y	Y	Y
Provide 5m vegetated (shrub and herbaceous) buffer around site.	N	Y	Y	N
Remove trees by low disturbance methods.	Y	Y	Y	Y
Confine vehicle traffic to established trails to the extent possible.	Y	*	*	Y
Implement additional mitigation from site investigation.	Y	-	-	N

Note: Y/N (Yes/No) denotes whether mitigation measure was implemented.

A dash (-) indicates not applicable.

An asterisk (*) indicates that ESS feature is located beside the Row or within a river and thus vehicle traffic is not applicable.

Species of Conservation Concern sites were identified through pre-construction surveys and identified as ESSs. Contractors conducting vegetation clearing in 2015/2016 were supplied with map books outlining these locations and were responsible for flagging and buffering them appropriately. During their regular inspections of the project area, Manitoba Hydro staff did verify that some of these SCC locations had been flagged by contractors. It is unclear at this time if the LWE-Eco-301 site had been flagged in the field; however, full vegetation clearing occurred with no buffer retained.

The removal of trees using low disturbance methods was achieved in part through the mitigation of working on frozen ground. Angle towers were installed in the winter of 2016/2017 to utilize frozen ground conditions and to minimize disturbance to wildlife.

The disappearance of an SCC or its significant decline within an ESS is identified as a decision trigger and threshold for action. The inability to relocate Dwarf Bilberry within LWE-Eco-301 was likely a result of the thick covering of wood mulch acting to smother the plants. As of July 2017, the depth of mulch has been reduced but no plants were observed in any of the past 3 monitoring years. At this time, the establishment of a 5m vegetated buffer may allow the population to re-establish in time.

4.2 Plants/Communities Important to Indigenous People

Surveys conducted between 2016 and 2018 indicate that plant species gathered by Indigenous People for food or medicine appear to have responded well to the clearing along the RoW. Blueberry is the most abundant gathering plant which was identified and both Low Sweet Blueberry and Velvet-leaf Blueberry are present in large swaths with many patches bearing abundant fruits at the time of the July surveys. As noted in the 2016 annual report, Blueberry prefers rocky outcrops and shallow soils and these areas generally lacked abundant tree cover and thus the accumulation of mulch at these sites is not a concern.

Similarly, both Large Cranberry (*Vaccinium macrocarpon*) and Small Cranberry (*V. oxycoccos*) show a preference for open or semi-open peatlands which generally lack abundant tree cover and have minimal (if any) wood mulch at these sites within the RoW.

Other edible or medicinal species including Highbush Cranberry (*Viburnum trilobum*), Wild Ginger (*Asarum canadense*), Sweetflag (*Acorus americanus*), various Raspberry species (*Rubus* spp.), Wild Rice (*Zizania aquatic*), Beaked Hazel (*Corylus cornuta*) and Wild Plum (*Prunus americana*) were observed incidentally during the surveys and remain present in similar numbers.

Table 3 outlines the various sample plots which were surveyed and an overview of plant abundance and health within each of these plots.

Table 3. Environmentally Sensitive Site Codes – Food or Medicinal Plants

ESS Identifier	Description	Sample Plot Location	Survey Results		
			2016	2017	2018
LWE-Ruse-200	Large berry picking area.	Blueberry-001	<p>Both Blueberry species present.</p> <p>Estimated cover: 35%</p> <p>Bearing fruit: 80%</p> <p>Plants are healthy, 30cm in height, thin layer of wood mulch is present but patchy.</p>	<p>Estimated cover: 10%</p> <p>Bearing fruit: 0%</p> <p>Plants are healthy, but cover has reduced and no plants are bearing fruit.</p> <p>The plot is adjacent to a recently erected tower with equipment tracks evident in the plot. The disturbance which occurred at this location is likely to have a temporary impact and plants will return to good health in the coming years.</p> <p>Additional swaths of Blueberries are present beyond the plot and appear to be in good health and fruiting.</p>	<p>Estimated cover: 15%</p> <p>Bearing fruit: 60%</p> <p>Plants are healthy, 30cm in height. Both species are present.</p> <p>The thin and patchy layer of mulch is decomposing and not impeding plant growth.</p> <p>Impacts of machinery operation for tower and guy wire installation are not apparent.</p>
		Cranberry-001	<p>Both Cranberry species present.</p> <p>Estimated cover: 3%</p>	<p>Estimated cover: 5%</p> <p>Bearing fruit: 3%</p>	<p>Estimated cover: 30%</p> <p>Bearing fruit: 5%</p>

ESS Identifier	Description	Sample Plot Location	Survey Results		
			2016	2017	2018
			<p>Bearing fruit: 5%</p> <p>Plants are healthy, growing among saturated peat hummocks.</p> <p>K. Guimond notes the presence of Cloudberry (<i>Rubus chamaemorus</i>) and Labrador Tea (<i>Ledum groenlandicum</i>), other species gathered by First Nations and Métis.</p>	<p>Plants are healthy, growing among saturated peat hummocks.</p> <p>Generally consistent with 2016 coverage and percent fruiting.</p>	<p>Plants are abundant and cover most peat hummocks within the plot.</p> <p>Cloudberry and Labrador Tea remain present.</p>
		Blueberry-002	<p>Both Blueberry species present.</p> <p>Estimated cover: 20%</p> <p>Bearing fruit: 60%</p> <p>Plants are healthy, up to 40cm in height. Located on rocky outcrop with minimal wood mulch.</p>	<p>Estimated cover: 15%</p> <p>Bearing fruit: 60%</p> <p>Plants are healthy and similar to 2016.</p> <p>Plot is located beneath a guy wire and minor disturbance may have occurred during tower construction.</p>	<p>Estimated cover: 15%</p> <p>Bearing fruit: 50%</p> <p>Plants are healthy.</p> <p>Future work around the tower may impact the localized area but would not reflect the larger RoW.</p>
LWE-Ruse-201	Food/medicinal plant gathering area including Sweetflag, Sweetgrass, Ginger,	Sweetflag-001	<p>A large stand of Sweetflag (Weekay) along Manigotagan River (UTM is central within the stand).</p>	<p>50 clumps were observed growing within the littoral zone at the western extent of the RoW. This patch is approximately 10m by</p>	<p>35 clumps were observed in a single patch and it appears that lower water levels have reduced, or temporarily shifted the area</p>

ESS Identifier	Description	Sample Plot Location	Survey Results		
			2016	2017	2018
	Cranberries, berry picking, Sage gathering and ceremonial plants. North shore.		<p>15 clumps were observed growing within the littoral zone. Additional plants upstream and downstream of RoW.</p> <p>Clumps range from 1m x1m to 2m x 15m.</p> <p>Plants healthy, above-water plant height of 1m.</p> <p>75% of plants bearing fruit.</p> <p>No construction-related disturbance apparent.</p> <p>Wild Rice (<i>Zizania aquatica</i>) is present in outer littoral zone. 1% bearing fruit (early in season).</p>	<p>3m in size and it appears the 2016 patches have merged to form a larger continuous patch.</p> <p>Additional plants remain present upstream and downstream of RoW.</p> <p>Plants are healthy with an above-water height of 1m.</p> <p>30% of plants bearing fruit.</p> <p>Water levels appear lower than in 2016.</p>	<p>of suitable habitat for the species.</p> <p>Additional plants remain present upstream and downstream of RoW.</p> <p>The plants are healthy despite a portion of them growing in mud flats (not shallow water).</p> <p>50% of plants bearing fruit.</p> <p>Water levels are similar to 2017 (low in comparison to 2016) which is affecting the number and distribution of Sweetflag plants within the RoW.</p> <p>Wild Rice is more abundant and may favour the lower water level.</p>
LWE-Ruse-202	Food/medicinal plant gathering area including Sweetflag, Sweetgrass, Ginger, Cranberries, berry picking, Sage	Sweetflag-002	<p>A large stand of Sweetflag along Manigotagan River (UTM is central within the stand).</p> <p>Approximately 350 clumps were observed</p>	<p>Approximately 350 clumps were observed growing within the littoral zone (as in 2016).</p> <p>Additional plants remain present upstream and downstream of RoW.</p>	<p>A stand of approximately 350 clumps remains present as was observed in 2016 and 2017.</p> <p>Plants remain healthy.</p> <p>30% of plants bearing fruit.</p>

ESS Identifier	Description	Sample Plot Location	Survey Results		
			2016	2017	2018
	gathering and ceremonial plants. South shore.		<p>growing within the littoral zone.</p> <p>Additional plants upstream and downstream of RoW.</p> <p>Clumps are continuous across the entire span of the RoW.</p> <p>Plants healthy, above-water plant height of 1m.</p> <p>50% of plants bearing fruit.</p> <p>No construction-related disturbance apparent.</p> <p>Wild Rice (<i>Zizania aquatica</i>) is present in outer littoral zone. 1% bearing fruit (early in season).</p>	<p>Water levels appear lower than in 2016 (possibly by as much as 50cm).</p> <p>Plants healthy, above-water plant height of 1m.</p> <p>30% of plants bearing fruit.</p>	<p>Wild Rice is more abundant and may favour the lower water level.</p>
LWE-Ruse-203	Large berry picking area.	Blueberry-003	<p>Both Blueberry species present.</p> <p>Estimated cover: 45%</p> <p>Bearing fruit: 2%</p> <p>Plants are healthy, up to 30cm in height. Located</p>	<p>Estimated cover: 45%</p> <p>Bearing fruit: 90%</p> <p>Plants are healthy, up to 30cm in height. A significant increase in percent fruiting is evident.</p>	<p>Estimated cover: 20%</p> <p>Bearing fruit: 50%</p> <p>Plants are healthy, up to 25cm in height.</p> <p>Wood mulch still evident but not affecting plants.</p>

ESS Identifier	Description	Sample Plot Location	Survey Results		
			2016	2017	2018
			on rocky outcrop with minimal wood mulch.		
LWE-Ruse-204	Food/medicinal plant gathering area including Sweetflag, Sweetgrass, Ginger, Cranberries, berry picking, Sage gathering and ceremonial plants. North shore.	Sweetflag-003	<p>A large stand of Sweetflag along Sandy River (UTM is central within the stand).</p> <p>15 clumps were observed growing within the littoral zone. Additional plants upstream and downstream of RoW.</p> <p>Most clumps 1m x1m.</p> <p>Plants healthy, above-water plant height of 1m.</p> <p>40% of plants bearing fruit.</p> <p>No construction-related disturbance apparent.</p>	<p>The clumps of Sweetflag remain healthy and intermittent along the river edge.</p> <p>18 clumps were observed with additional plants upstream and downstream.</p> <p>Clumps remain approximately 1m x 1m and with an above-water height of 1m.</p> <p>50% of plants bearing fruit.</p>	<p>The plants remain healthy and occur intermittently along the river edge.</p> <p>16 clumps were observed. It is suspected that small vegetative plants could be overlooked.</p> <p>No apparent effects due to lowered water levels.</p> <p>50% of plants bearing fruit.</p>
LWE-Ruse-205	Food/medicinal plant gathering area including Sweetflag, Sweetgrass, Ginger, Cranberries, berry picking,	Sweetflag-004	<p>A large stand of Sweetflag along Sandy River (UTM is central within the stand).</p> <p>13 clumps were observed growing within the littoral zone, in the western portion of the</p>	<p>The clumps of Sweetflag remain healthy and intermittent along the river edge.</p> <p>14 clumps were observed with additional</p>	<p>The plants remain healthy and occur intermittently along the river edge.</p> <p>17 clumps were observed.</p> <p>40% of plants bearing fruit.</p>

ESS Identifier	Description	Sample Plot Location	Survey Results		
			2016	2017	2018
	Sage gathering and ceremonial plants. South shore.		<p>RoW. Additional plants upstream and downstream of RoW.</p> <p>Most clumps 1m x1m.</p> <p>Plants healthy, above-water plant height of 1m.</p> <p>30% of plants bearing fruit.</p> <p>No construction-related disturbance apparent.</p>	<p>plants upstream and downstream.</p> <p>Clumps remain approximately 1m x 1m and with an above-water height of 1m.</p> <p>30% of plants bearing fruit.</p>	
LWE-Ruse-206	Food/medicinal plant gathering area including Sweetflag, Sweetgrass, Ginger, Cranberries, berry picking, Sage gathering and ceremonial plants. North shore.	Sweetflag-005	<p>A large stand of Sweetflag along Black River (UTM is central within the stand).</p> <p>200 clumps were observed growing within the littoral zone.</p> <p>Additional plants upstream of RoW.</p> <p>Most clumps 1m x1m.</p> <p>Plants healthy, above-water plant height of 1m.</p> <p>80% of plants bearing fruit.</p> <p>A downed tree within the stand of Sweetflag may</p>	<p>It was estimated that 200 clumps of Sweetflag remained at this location in July 2017.</p> <p>Additional plants upstream of RoW.</p> <p>Plants healthy, above-water plant height of 1m.</p> <p>60% of plants bearing fruit.</p> <p>The downed log noted in 2016 has been removed from the site.</p>	<p>During 2018 monitoring, approximately 200 clumps of Sweetflag were observed at this location.</p> <p>The plants were in good health with no apparent impacts from the RoW construction.</p> <p>30% of plants bearing fruit.</p> <p>Water level fluctuation may have bearing on the percentage of plants fruiting.</p>

ESS Identifier	Description	Sample Plot Location	Survey Results		
			2016	2017	2018
			be the result of vegetation clearing. It is not recommended that this log be removed as it will likely move during spring melt or would cause additional disturbance to remove it mechanically. This downed snag may also be naturally occurring as no indication of a saw cut was apparent on the stem.		
LWE-Ruse-207	Food/medicinal plant gathering area including Sweetflag, Sweetgrass, Ginger, Cranberries, berry picking, Sage gathering and ceremonial plants. South shore.	Sweetflag-006	<p>A large stand of Sweetflag along Black River (UTM is central within the stand).</p> <p>1000 clumps were observed growing within the littoral zone. Additional plants upstream and downstream of RoW.</p> <p>Most clumps 1m x1m.</p> <p>Plants healthy, above-water plant height of 1m.</p>	<p>It was estimated that 1000 clumps of Sweetflag remained at this location in July 2017.</p> <p>Additional plants upstream of RoW.</p> <p>Plants healthy, above-water plant height of 1m.</p> <p>50% of plants bearing fruit.</p>	<p>During 2018 monitoring, approximately 1000 clumps of Sweetflag were observed at this location.</p> <p>The plants were in good health with no apparent impacts from the RoW construction.</p> <p>10% of plants bearing fruit.</p>

ESS Identifier	Description	Sample Plot Location	Survey Results		
			2016	2017	2018
			80% of plants bearing fruit. No construction-related disturbance apparent.		
LWE-Ruse-208	Large berry picking area. Berries (eg. Raspberries) used to be picked along the road under the hydro line from the intersection of the road to Black River then south to Pine Falls.	Ginger-001	<p>Wild Ginger (<i>Asarum canadense</i>) patch within RoW.</p> <p>Estimated cover: 1% (43 plants in plot)</p> <p>Bearing fruit: 21% (9 plants)</p> <p>Plants are healthy, growing up through 40cm deep mulch. The plants are likely to persist and spread; however, canopy will reduce sun scald to the benefit of the plants</p> <p>Other species which Indigenous People gather are present including Highbush Cranberry (<i>Viburnum trilobum</i>), Dwarf Raspberry (<i>Rubus pubescens</i>), Beaked Hazel (<i>Corylus cornuta</i>)</p>	<p>Estimated cover: 1% (8 plants in plot)</p> <p>Bearing fruit: 13% (1 plant)</p> <p>This patch appears to have been heavily impacted by tower construction with a reduction between 2016 and 2017.</p> <p>It is noted that suitable habitat remains in the forest to the west.</p> <p>This species is not tolerant of full sun and may have declined, in part, as a result of sun exposure. Re-growth of shrubs will enhance conditions for this species.</p>	<p>No plants were observed.</p> <p>The direct sunlight due to canopy removal has resulted in unsuitable conditions for this species.</p> <p>Wild Ginger plants may be persisting as root stock or seed material and may rebound once shrubs have grown back to shade the site.</p> <p>Invasive non-native species Canada Thistle and White Sweet Clover are present within the plot. These species were likely present in the seed bank given the proximity to agricultural fields and development. Regrowth of woody species will suppress invasive species and maintaining clean equipment will prevent their spread.</p>

ESS Identifier	Description	Sample Plot Location	Survey Results		
			2016	2017	2018
			and Wild Plum (<i>Prunus americana</i>).		
		Blueberry-004	Both Blueberry species present. Estimated cover: 3% Bearing fruit: 5% Plants are healthy, up to 20cm in height. Located on rocky outcrop with minimal wood mulch.	Estimated cover: 5% Bearing fruit: 50% A significant increase in percent fruiting from 2016. The regrowth of grasses and forbs is creating competition for the Blueberry plants.	Estimated cover 7% Bearing fruit: 40% Plants appear healthy and have perhaps returned to a stable state following clearing.
		Cranberry-002	Small Cranberry present. Estimated cover: 3% Bearing fruit: 0% Plants are healthy, sprawling across peat hummocks. Wood mulch covers 50% of the plot and may have a small impact on Cranberry through suppressing plants.	Estimated cover: 5% Bearing fruit: 5% Plants are healthy. Wood mulch continues to cover a portion of the plot but will not impact the population long term.	Estimated cover: 10% Bearing fruit: 0% Plants are healthy. Wood mulch continues to cover a portion of the plot but will not impact the population long term. Associate bog species regenerating well.
		Blueberry-005	Both Blueberry species present. Estimated cover: 65%	Estimated cover: 85% Bearing fruit: 75% Plants are healthy, up to 30cm in height. Notable	Estimated cover: 85% Bearing fruit: 20%

ESS Identifier	Description	Sample Plot Location	Survey Results		
			2016	2017	2018
			Bearing fruit: 10% Plants are healthy, up to 30cm in height. Located on rocky outcrop with wood mulch covering 30% of the plot.	increase in cover and percent fruiting.	Plants are healthy and up to 35cm in height. A small amount of mulch and slash continues to cover the plot.
		Cranberry-003	Small Cranberry present. Estimated cover: 65% Bearing fruit: 5% Plants are healthy, sprawling across peat hummocks. Wood mulch covers 50% of the plot and may have a small impact on Cranberry through suppressing plants.	Estimated cover: 65% Bearing fruit: 5% Plants are healthy with no disturbance apparent. No apparent change in cover or percent fruiting.	Estimated cover: 45% Bearing fruit: 0% Wood mulch continues to cover some plants. Cloudberry also within plot.
		Blueberry-006	Both Blueberry species present. Estimated cover: 35% Bearing fruit: 5% Plants are healthy, up to 30cm in height. Located on rocky outcrop with wood mulch covering 10% of the plot.	Estimated cover: 35% Bearing fruit: 30% Plants are healthy, up to 30cm in height. No apparent change in cover but noticeable increase in percent fruiting.	Estimated cover: 80% Bearing fruit: 20% Most plants are healthy, up to 30cm in height. 20% are desiccated due to thin soils/bare rock. Both species remain present.

ESS Identifier	Description	Sample Plot Location	Survey Results		
			2016	2017	2018
					Limited regrowth of other vegetation (Saskatoon in SW corner of plot).
New LWE- Ruse*	Newly documented in 2016.	Cranberry-004	<p>Small Cranberry present.</p> <p>Estimated cover: 0.5% (20 plants)</p> <p>Bearing fruit: 50%</p> <p>Plants are healthy, sprawling across peat hummocks. Wood mulch covers 20% of the plot and may have a small impact on Cranberry through suppressing plants.</p>	<p>Estimated cover: 2%</p> <p>Bearing fruit: 0%</p> <p>Plants are healthy but the peat seems dry, potentially a result of reduced precipitation or increased evaporation.</p>	<p>Estimated cover: 3%</p> <p>Bearing fruit: 10%</p> <p>Plants are healthy and substrates are damp. Wood mulch has decayed and does not appear to have an effect on plant growth at this time.</p>

An asterisk (*) denotes newly documented food or medicinal plant from 2016 surveys.

A summary of the mitigation measures implemented at plant gathering sites is outlined in Table 4. The results of the 2018 surveys suggest that Blueberry and Cranberry plants are rebounding from minor disturbance related to grubbing; however, the regrowth of shrubs and other vegetation is also restoring competition with the plants. Located within river systems, Sweetflag and Wild Rice populations seem removed from any potential effects relating to the Project as buffers have been adhered to. The sparsely treed rocky outcrops where Blueberries are typically found, and the saturated peatlands where Cranberries are found have been preserved through the construction phase of the Project. With the exception of Wild Ginger, all of the medicinal or edible plants which were monitored are in good health and not showing impacts relating to the RoW grubbing and tower construction. As a species which requires shade, it is anticipated that Wild Ginger will not thrive at the documented location. The species may remain present among tree and shrub regrowth and favourable conditions for the species remain present adjacent to the RoW in areas of upland forest.

Table 4. Assessment of Mitigation Measures at Plant Gathering Sites

Mitigation Measure	LWE-Ruse-201	LWE-Ruse-202	LWE-Ruse-204	LWE-Ruse-205	LWE-Ruse-206	LWE-Ruse-207	LWE-Ruse-200	LWE-Ruse-203	LWE-Ruse-208
Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion.	Y	Y	Y	Y	Y	Y	Y	Y	Y
Minimize surface disturbance around the site to the extent possible.	Y	Y	Y	Y	Y	Y	Y	Y	Y
No herbicide to be applied during construction.	Y	Y	Y	Y	Y	Y	Y	Y	Y
Confine vehicle traffic to established trails to the extent possible.	*	*	*	*	*	*	Y	Y	Y
Remove trees by low disturbance methods.	Y	Y	Y	Y	Y	Y			
Implement additional mitigation from site investigation.	-	-	-	-	-	-			

Note: Y/N (Yes/No) denotes whether mitigation measure was implemented.

A dash (-) indicates not applicable.

An asterisk (*) indicates that ESS feature is located within a river and thus vehicle traffic is not applicable.

4.3 Invasive and Non-native Species

The section of RoW between the Pine Falls Generating Station and Broadlands Road was surveyed in all three monitoring years to assess the presence of invasive, non-native species. These surveys did not identify any notable populations or species which require management at this time.

Assessing the presence and extent of invasive, non-native species across the remaining portion of the RoW (approximately 70km to the Manigotagan Corner Station), involved a combination of on-the-ground surveys as well as an aerial survey in 2017 along the entire transmission line. Although tower construction locations had been identified as potential sites for invasive species establishment and spread, these sites were found to be very limited in non-native species establishment with no invasive species establishing as a result of the project construction.

The locations which show the greatest extent of invasive species are those areas where the RoW crosses Provincial Road #304 and those areas where existing access trails perpendicular to Provincial road #304 intersect with the RoW.

To date, notable invasive, non-native species which have been observed within the RoW include:

- Canada Thistle (*Cirsium arvense*)
- Birdsfoot Trefoil (*Lotus corniculatus*)
- Wild Parsnip (*Pastinica sativa*)
- Timothy (*Phleum pratense*)
- Common Plantain (*Plantago major*)
- Field Sow Thistle (*Sonchus arvensis*)
- Ox-eye Daisy (*Leucanthemum vulgare*)
- Pineapple Weed (*Matricaria discoidea*)
- Red Clover (*Trifolium pratense*)
- Sweet White Clover (*Melilotus alba*)

- Sweet Yellow Clover (*Melilotus officinalis*)
- Black Medick (*Medicago lupulina*)

Of those species listed above, surveys have noted White Sweet Clover, Canada Thistle and to a lesser extent Yellow Sweet Clover and Wild Parsnip, to be the most widespread and aggressive species within the RoW. The remaining species are very localized and typically not prone to outcompeting native vegetation and becoming widespread. The problematic species listed above all favour dry to mesic upland soils, particularly along trails including where tracked equipment was used for the construction of towers. The wetlands, which comprise a large proportion of the RoW, remain free of non-native invasive species.

As discussed in the 2017 report, the presence of a seed bank of non-native species may be responsible, in part, for the representation of these species within the RoW in 2018. As vegetation clearing occurred during the winter of 2015/2016, presumably when all or most non-native species seeds had already fallen, the potential that this work is responsible for spreading these species is limited.

The creation of trails running down the RoW, as a result of repeated use by tracked equipment, has acted as a gateway for invasive species establishment. In the absence of tree and shrub cover, these pathways are disturbed habitats which show little resilience to invasive species establishment. At the intersection of most road and trail crossings a stretch of White Sweet Clover or Canada Thistle now extends several hundred meters down the tracked machinery trail within the RoW. Immediately beside these access trails, where tree and shrub cover has regrown, the non-native species are essentially absent. This difference indicates the effect that disturbance and resilience play in the establishment and spread of problematic species. It is not foreseeable that the intact areas of forest, swamp and wetland adjacent to the RoW would have these non-native species establish within the natural habitat as the level of disturbance required is not present and the native vegetation outcompetes species such as White Sweet Clover or Canada Thistle. Although the occurrence of invasive and non-native species within the project is not desirable, NRSI biologists observed extensive use of these species by a variety of insects during the surveys.

Recommendations which should be incorporated into the long term management of the RoW with the intent of minimizing the spread of non-native species are outlined in Section 5.0.

4.4 Road Crossing Visual Screens

During the 2018 surveys, NRSI biologists assessed the planting of Willow cuttings at locations where the transmission line crosses Provincial Road #304. Of the approximately 25,000 Willow cuttings planted in the late spring of 2018, it is estimated that the total survival was 1250 stems (5%). Crossing 22 showed 3-5% survival, Crossing 12 showed 5-7% survival, and Crossing 17 showed 3-5% survival.

A number of factors are likely responsible for the low establishment rates.

- In many locations, cuttings were pushed into shallow and somewhat dry upland soils which would not typically support Willow species.
- The installation of cuttings through early June is not ideal as soil moisture is typically decreasing by this time and hot, dry summer weather soon follows prior to any root establishment.
- A number of cuttings seemed to have been pushed too shallow into the soil, with only 10-15cm of stem below ground.
- Lastly, some cuttings were installed as small bundles of several stems which creates an air pocket which wicks moisture away from the stem and any potential roots. Ideally, a single stem would be pushed at least 30cm into the ground to obtain good soil and moisture contact.

Most cuttings had brown, dry leaves and wrinkled stems indicative of desiccation. In areas where cuttings were planted into wetter soils (typically low-lying wetlands or depressions in upland rock features) some survival was noted with fresh leaf growth and green, firm stems partially rooted into the substrate.

At this time the plantings have not obscured the sight lines down the transmission line; but those cuttings which survive will contribute to producing a shrub barrier in an estimated 3-5 years. Existing shrubs and trees are present adjacent to the road I some

locations and the cutting of these groves should be avoided or limited in frequency. As noted in the 2017 report, any equipment access which occurs from a crossing location should aim to utilize a diagonal or off-set entry to the transmission line to preserve the existing vegetation barrier. While additional plantings could be installed, the most effective mitigation will be to limit RoW vegetation clearing to tall tree species only within 250m (or more) of Highway 304 and to preserve a visual barrier. Shrub cover will regenerate within these areas naturally and with careful management at these locations a visual barrier can be created and maintained.

5.0 Mitigation Recommendations

Overall the monitoring program conducted between 2016 and 2018 has been successful in collecting the data required to evaluate the effectiveness of the mitigation measures which were implemented.

Based upon the results of the surveys, the following actions are recommended for inclusion in the long-term management of the RoW:

General Mitigation

- Continue to perform any required clearing during winter months and on frozen ground conditions.
- The use of the existing access trails by equipment operating within the transmission corridor should be continued. That is, operation of equipment outside of the access trails (creating new trails) should be minimized to the extent possible.

Species of Conservation Concern

- Ensure that any future vegetation clearing retain a 5m vegetated buffer for populations of Hooker's Orchid and Dwarf Bilberry which are located within the RoW. These areas should be delineated prior to vegetation clearing by tall wooden stakes painted in blaze orange. The operator of the clearing machinery should be notified of these areas prior to commencing work. The 2 new populations of Hooker's Orchid should also be afforded the vegetated buffer.
- In the event a Species of Conservation Concern area has vegetation clearing done within the vegetated buffer, it is critical to reduce the depth of wood mulch in a manner which does not further harm the plants (i.e. avoid scraping the native substrates should machinery be used to remove accumulated wood mulch).
- Retain low-growing shrubs to the extent possible to protect herbaceous species from sun scald and smothering by wood chips.

Invasive and Non-Native Species

- All construction and maintenance equipment and vehicles should arrive to the site clean and free of plant materials (including soil on tracks, buckets and blades, truck boxes, etc.). Similarly, all equipment and vehicles leaving the site should be clean and free of soil and plant materials.
- To the extent possible, equipment operating within the RoW should use any existing trails and stay out of intact, regenerating sections of the RoW. This applies as well to access trails from Provincial Road #304 in that no new access trails should be established and equipment operators should use only the existing access points.
- The period when most invasive non-native plants are dispersing viable seeds is August through September. Avoiding invasive species concentrations (areas where the access trail intersects the road or ATV trails etc.) during this period will help to limit their spread.
- Where possible, 'retiring' sections of access trail and allowing shrub cover to regenerate will limit the potential for invasive species to spread through the site by breaking up the access trail to smaller, separate components as opposed to a 70km pathway through which invasive species can spread.
- To the extent possible, allowing the re-growth of woody species will suppress or greatly reduced the number of invasive species present within the RoW. It can be expected that following periodic vegetation control these species will become more abundant and widespread, followed by periods where these species are less prevalent and producing fewer seeds.
- In general, the operation of equipment within the RoW between July and September presents the highest risk for dispersing viable seeds of invasive, non-native species. Where possible, completion of work outside of this timeframe will help to control the spread of invasive species.

Highway Crossing Locations

- A buffer which includes all existing shrub vegetation (within the ROW and adjacent to Provincial Road #304) should be maintained and excluded from future transmission line clearing activities. The width of the buffer should be at least 50m from the road RoW and extending down the transmission line RoW. A larger buffer width will provide a more effective visual barrier and allowing a buffer of 100-250m (or more) would be ideal for this intent. Given the undulating topography at some of the crossing locations, the ability to establish shrub cover may be limited in areas of exposed bedrock (lacking soil) or within wetlands (aquatic areas or areas of peat/muck soils). A larger buffer will help to account for some of these areas which cannot easily be revegetated by providing cover adjacent to these habitats.
- At highway crossings where machinery accesses the RoW, a 'diagonal' entry should be implemented to maintain a visual barrier of shrubs. In other words, equipment should avoid accessing the ROW in a route which is perpendicular to the highway which allows an open sight line down the ROW. Where a diagonal entry is not feasible, a narrow entry at the road edge of approximately 10m (or as required by maintenance equipment) should be considered. At a distance of 50-100m or more from the road this access trail may transition to grubbing which spans the entire RoW. While a narrow access path may still allow for a sight line down the RoW from the road, it allows for a large proportion of shrub cover which limits sight lines.
- To the extent possible, re-vegetation should utilize the existing shrub re-growth within the RoW.
- No further planting of Willow cuttings is recommended.

6.0 References

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MAPS

Redacted

APPENDIX I
Site Photographs

IMG_20180727_111437 – Blueberry monitoring plot with healthy, fruit-bearing plants.



IMG_20180727_101815 – Regrowth of herbaceous vegetation among decaying wood mulch.



IMG_20180726_121910 – Hooker's Orchid (*Platanthera hookeri*) plant with 2017 and 2018 growth.



IMG_20180726_134106 – Large stand of Sweetflag/Weekay (*Acorus americanus*) along the Black River.



IMG_20180725_141256 – Poor establishment of Willow (*Salix* sp.) cuttings at a road crossing location. Survival was estimated to range from 1-7% with patchy establishment overall.



IMG_20180724_161247 – Highway crossing with no woody vegetation cover and encroaching White Sweet Clover (*Melilotus albus*).

