hydro one

WAASIGAN
TRANSMISSION LINE

FINAL ENVIRONMENTAL ASSESSMENT

Section 6.4 Vegetation and Wetlands

November 2023

Acknowledgements

We wish to acknowledge that the Waasigan Transmission Line Project is located within lands that represent the traditional territories and homelands of the Robinson-Superior Treaty (1850) and Treaty #3 (1873) First Nations, and traverse the Red Sky Métis Independent Nation, Northwestern Ontario Métis Community and Northern Lake Superior Métis Community.

Hydro One also wishes to acknowledge Indigenous artist, Storm Angeconeb, for developing the covering page and wildlife designs throughout the Final Environmental Assessment. Storm is a highly recognized visual artist from Lac Seul First Nation in Treaty #3 and currently resides in Red Lake. Many of her works include animals and birds as representations of herself or those close to her. The artist's description of the covering page is presented below.

Hydro One Environmental Study Art:

What stands out in this art piece is the symbolic representation of solar rays as "Bringing Power"; we can see the environment represented through the wildlife and Ojibwe floral visuals. This artwork is an excellent representation of Hope, Life, and Opportunity, visually portrayed through the Black Bear and her two cubs. The colour theme of this artwork comes from the Waasigan Transmission Line Project brand identity.

Artist: Storm Angeconeb

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6.4 Vegetation and Wetlands

Netaawigigin gaye Mashkiig

This section describes and summarizes the vegetation and wetlands baseline characterization studies undertaken for the Project and presents an assessment of the effects of the Project on vegetation and wetlands.

The assessment follows the general approach and concepts described in Section 5.0.

6.4.1 Input from Engagement

Comments pertaining to vegetation and wetlands that were raised by Indigenous communities, Indigenous groups and stakeholders during engagement and how they are addressed in the environmental assessment (EA) are listed in Table 6.4-1. Comments and responses are provided in Section 4.0 – Engagement Summary. In addition, the Draft EA Report was provided to Indigenous communities, government officials and agencies, and interested persons and organizations for review and comment on May 17, 2023. A high-level summary of the key themes from the comments on the Draft EA Report and related engagement meetings are included in Table 6.4-1. The detailed responses to these comments are included in Appendix 4.0-A.

Table 6.4-1: Summary of Comment Themes Raised during Engagement Related to Vegetation and Wetlands

Comment Theme	How addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Concerns regarding the use of herbicides and pesticides.	Through engagement during the Draft EA Report review process, Hydro One heard feedback from Indigenous communities and stakeholders regarding concerns with the use of herbicides to remove and manage vegetation on the Project. After extensive consideration of this feedback, herbicides will not be used during construction of the Project or for future maintenance of this transmission line. The Final EA has been updated to reflect this.	Gwayakocchigewin Limited Partnership Grand Council Treaty #3 Lac des Mille Lacs First Nation Mitaanjigamiing First Nation NWOMC and Region 2 Members of the public MNRF

Comment Theme	How addressed in the Environmental Assessment	Indigenous Community or Stakeholder
The importance of wetlands as critical habitat for many of the species of concern, especially, Species at Risk (SAR).	A criterion for wetland ecosystems was included for the assessment of the Project footprint. Field surveys of wetlands were also completed to support the baseline characterization in the EA including ecological land classification (ELC) and botanical surveys in wetlands and wildlife surveys in wetlands, specifically: amphibian breeding surveys, turtle basking surveys, breeding bird surveys, marsh bird surveys, and least bittern (a SAR) surveys.	Gwayakocchigewin Limited Partnership Grand Council Treaty #3 Lac des Mille Lacs First Nation NWOMC and Region 2
Importance of protecting culturally significant vegetation, including provincially significant wetlands, wild rice, medicines, berries, and mosses.	Additional discussion on features of cultural importance have been added to Section 6.4.5 and Appendix 6.4-A. Potential effects to vegetation and wetlands, including example plants of traditional use and in related to evaluated provincially significant wetlands are assessed and appropriate mitigation measures are identified in this EA section.	Gwayakocchigewin Limited Partnership (including specific comments from Migisi Sahgaigan; Nigigoonsiminikaaning First Nation) Grand Council Treaty #3 Lac des Mille Lacs First Nation NWOMC and Region 2 Members of the public
Input to include additional information on non-native and invasive plant species management.	Additions details on timing and applicable areas of implementation for measures to monitor and prevent spread of invasive species will be detailed within the Vegetation Management Plan.	Gwayakocchigewin Limited Partnership Grand Council Treaty #3 Lac des Mille Lacs First Nation

Comment Theme	How addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Further clarification requested on process and plans for decommissioning, reclamation and recovery of temporary infrastructure sites; including seed selection, where natural recovery is preferred compared with active reclamation, and use of mulch.	Additional information on process, timing and planning for wetlands mitigation measures during decommissioning, reclamation and rehabilitation of temporary infrastructure has been added to Section 6.4.7, as well as Section 3.4.1.	Gwayakocchigewin Limited Partnership Lac des Mille Lacs First Nation NWOMC and Region 2 MNRF
Recognition of potential impacts of vehicle use during operations for generation of dust and potential for spread of invasive plant species.	Table 6.4-13 Project-Environment Interactions for Vegetation and Wetlands and Plant Species has been revised to recognize the potential for impacts of vehicle use during operations for generation of dust and potential for spread of invasive plant species, and the interaction characterized in Section 6.4.7.	Gwayakocchigewin Limited Partnership MNRF
Clarification of geographic scale for assumptions made calculation of areas of potential for traditional use plants.	Desktop-based analysis using Forest Resource Inventory (FRI) data to the 'primary ecosite' level was used to assist in the development of vegetation ecosite base mapping for the Project, which is the scale potential habitat for specific traditional use plants was discussed. FRI data has the primary objective of supporting Sustainable Forest Licence (SFL) holders' decisions making in Forest Management. It's limitations as a tool for Project usage were identified during the assessment through other desktop data sources (i.e., wetlands mapping) and ground truthing ecosites (i.e., accuracy of ecosite classification in FRI mapping was limited). Therefore, grouping ecosites into broader categories helped to reduce some of the uncertainty. Given the size of the Project, it was determined that being conservative in this manner on the areas within which traditional use plants may be located, was preferred to	Gwayakocchigewin Limited Partnership

Comment Theme	How addressed in the Environmental Assessment	Indigenous Community or Stakeholder
	underestimating the potential effects. Acknowledgement of the influence of these assumptions are included in Section 6.4.5.2.6 on how the use of habitat groupings in the assessment overestimates the distribution and abundance of traditional use plants.	
The importance of protecting Species at Risk beyond the requirements set out in Ontario's *Endangered Species Act, 2007* (ESA) and the federal *Species at Risk Act* (SARA).	All species at risk that were confirmed or determined to have potential to interact with the Project study area have been considered in the baseline characterization and effects assessment for the Project.	Grand Council Treaty #3
Inclusion in field surveys for black ash (*Fraxinus nigra*), a newly listed endangered species that occurs throughout the region.	The Terrestrial Field Work Plan included a botanical inventory for each station surveyed to confirm the presence/absence of black ash. Additionally, a Geographic Information System (GIS) analysis was used to identify 'candidate' black ash habitat for the balance of the LSA and RSA. Suitable habitat for black ash is presented in Appendix 6.4-A, and appropriate mitigation measures are considered as part of the EA in Section 6.4.7.5.	Lac des Mille Lacs First Nation
The request for sharing field data for that could be of particular interest to the First Nation.	A summary of the field survey results is presented in Appendix 6.4-A. The raw data from field surveys will be shared with Indigenous communities upon request,.	Lac des Mille Lacs First Nation
Recognition that while ecosystems may be resilient to change on a longer timescale, implications for the practice of Indigenous rights are more susceptible to short-term change.	Potential Project effects on vegetation and wetland communities or species that may affect use by Indigenous communities are discussed in further detail in Section 7.7 (First Nations Rights, Interests and Use of Land and Resources) and Section 7.8 (Métis Rights, Interests and Use of Land and Resources).	NWOMC and Region 2

Comment Theme	How addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Concerns related to capacity of naturally vegetated riparian systems to respond to Project related vegetation removal.	Between the Draft EA and the Final EA, improvements were made to the access plan and some other elements of the Project design. As well, revised EA metrics are based a more current disturbance layer (Section 6.4.5.1.1 of the Final EA), while also considering the most current footprint and access plan. Following updated analysis, it has been determined that >98% of riparian habitat within each of the LSA and RSA will be preserved (Section 6.4.7.4.1).	NWOMC and Region 2
Concerns regarding effects to local flora and fauna and protecting the health, well-being, and diversity of plants.	Potential effects to vegetation, are assessed and appropriate mitigation measures are identified in this EA section.	Mitaanjigamiing First Nation
The importance of ensuring the site is cleared of waste and garbage.	Section 10.2.2 notes that a Waste Management and Disposal Plan will be implemented for the Project during construction.	Red Sky Métis Independent Nation
Request to include additional information on clearing activities for non-compatible vegetation, specifically for treed swamp and riparian areas.	Additional information has been added to Section 6.4.8.3.1 to comment on how the EA accounts for protection of treed wetland habitats and establishment of a wire zone-border zone where vegetation closer to the ROW edge may be permitted to grow taller.	MNRF
Request to include additional details related to definitions for Plant Species at Risk and Plant Species of Conservation Concern, and Provincially Significant Wetlands.	Reference to specific PSWs have been added to Section 6.4.7.3.1 and additional information defining ranks for species of conservation concern have been added to Section 6.4.5.2.5. Additional information on monitoring programs for rare plants were added to Section 10.2.2	MNRF
Clarification requested on the use of Forestry Resource Inventory (FRI) information in ecosite classification.	Additional text has been added to Section 6.4 to clarify the primary role of FRI data as a tool for forestry and acknowledge limitations in its use for land cover mapping and ecosite classification.	MNRF

Comment Theme	How addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Clarification related to method and assumptions for considering areas of disturbance including "linear feature density (e.g., roads)", and how they were used to inform changes in ecosystem distribution and connectivity.	Section 6.4.3 revised to clarify that linear and non-linear infrastructure, including roads, utility lines, airports, and buildings, that are a result of human alteration contributed to creation of a single 'disturbance' layer. This layer was used to better understand areas within each of the Project footprint, LSA and RSA that do not contribute to the available ecosystem.	MNRF
Concerns regarding potential impacts of natural hazards (fire / flooding) on vegetation and wetlands.	Additional information related to natural disturbances have been added to Section 6.4.5.2.1.	MNRF

EA = environmental assessment; ELC = ecological land classification ROW = right-of-way; ToR = Terms of Reference; QA/QC = quality assurance/quality control; ESA = Ontario's Endangered Species Act, 2007; SARA = the federal Species at Risk Act; GIS = geographic information system; SAR = Species at Risk; LSA = Local Study Area; RSA = Regional Study Area.

6.4.2 Information Sources

Information for the vegetation and wetlands baseline characterization was collected from review of the following sources:

- Project Description (Section 3.0);
- Traditional ecological knowledge provided by Indigenous communities through existing reports and through engagement activities;
- Terrestrial Baseline Report (Appendix 6.4-A);
- Studies published in scientific journals and reports;
- Other EA reports for developments in northwestern Ontario;
- Forest Management Plans (FMPs);
- Forest Resource Inventory (FRI) data (MNR 2010c);
- electronic data obtained from the Ontario Ministry of Natural Resources and Forestry (MNRF) through Land Information Ontario (LIO) (MNRF 2022);
- Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 (MNR 2010a);

- Natural Heritage Information Centre (NHIC 2022);
- Thunder Bay Field Naturalists;
- Legislation and guidance provided by federal (e.g., Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2022), SARA, and provincial governments (e.g., *Endangered Species Act, 2007* [Government of Ontario 2007] under the Species At Risk in Ontario list developed by the Committee on the Status of Species at Risk in Ontario (COSSARO) (Government of Ontario 2022), NHIC species of conservation concern (MNRF 2022) authorities and expert committees);
- Environment and Climate Change Canada's (ECCC) SARA Public Registry (Government of Canada 2022); and
- Natural Resource Values Information System (NRVIS) (MNRF 2022a).

Some of these sources were also used to identify the locations of natural heritage features such as:

- Provincially significant wetlands (PSW) (MNRF 2022); and
- Areas of Natural and Scientific Interest (ANSI; including candidate ANSIs).

Additional information provided by Ministry of Natural Resources and Forestry (MNRF) consisted of:

- Locations of critical landform/vegetation associations; and
- Guidance on identifying rare vegetation communities.

For the purposes of the EA, sufficient information was deemed to be available from the references listed above to assess the potential effects of the Project footprint on vegetation and wetlands.

6.4.3 Criteria and Indicators

The criteria and indicators selected for the assessment of Project effects on vegetation and wetlands communities and species and the rationale for their selection, are provided in Section 5.0.

Criteria are components of the environment that are considered to have economic, social, biological, conservation, aesthetic, or ethical value, as described in Section 5.2. The selection of vegetation and wetlands criteria considered an approach to the assessment that examines biodiversity of the region at the broadest level. Ecosystems can be conceptually defined as the complex of interactions and fluxes of matter and energy among living (plants, animals, microorganisms) and non-living (minerals, water, air) components of an environment acting as a functional unit (Waring 1989, Austin et al. 2008). Assessing and managing biodiversity at the vegetation and wetlands ecosystems level means that large numbers of biodiversity elements are addressed together. This approach to selecting criteria for vegetation and wetlands captures the availability and composition of ecosites that contain listed species. In addition, the amount and distribution of rare vegetation communities, identified listed plants, and critical landform/vegetation associations that can support listed species are also assessed. For example, wildlife guilds (group of species using a common resource in a similar manner) and plant communities dependent on old live trees, standing dead trees, coarse woody debris, and natural disturbance processes (fire, insects, and disease) found in upland mature and older forests will be captured by the ecosystem level assessment. Similarly, analysis of the availability, distribution, and function of wetland and riparian ecosystems provides an assessment of common wetland plant species, amphibians, birds, and mammals. Assessment of riparian habitats also helps to determine effects on potential wildlife movement corridors connecting habitats across the landscape. Assessment of surface water quality flows and levels also provides an understanding of potential effects to plants and animals (and humans) that have life histories strongly tied to wetland and riparian ecosystems.

Accordingly, rather than selecting a number of plant species or communities as criteria for vegetation and wetlands, criteria were selected to provide an assessment of the broad-scale ecosystems that are likely to be influenced by the Project footprint. The broader ecosystem criteria would include the common plant species within those ecosites and as such assessing the potential Project effects to community specific plant species. A botanical inventory by survey stations is provided in Appendix A of the Terrestrial Baseline Report (Appendix 6.4-A).

The criteria are:

- Upland ecosystems: Open, shrub and treed communities containing mainly facultative upland (i.e., species that can grow in either upland ecosystems or other habitats), and obligate upland plant species (i.e., species that grow in upland ecosystems only). The water table is rarely above the substrate surface and pooling in spring is minimal. Substrates consist of parent mineral material, mineral soil, rock, bedrock, and organic material less than 40 cm in depth. Moisture regime refers to the available moisture supply for plant growth estimated in relative or absolute terms. The moisture regime of uplands is typically dry to moist, while less commonly wet (MNR 2001).
- Wetland ecosystems: Open, shrub, and treed communities consisting of mainly facultative and obligate wetland plant species. The water table is seasonally or permanently at, near or above the substrate surface. The substrate consists of flooded bedrock, hydric mineral soil, or organic materials greater than 40 cm in depth for peatlands or less than 40 cm for mineral wetlands (MNR 2001).
- Riparian ecosystems: A two-tiered approach was used to classify riparian ecosystems based on stream order. Ordering streams is a method of assigning a number to links in a stream network and assists in classifying stream types and their number of tributaries. The most upstream segment of a stream order network begins with an order of one. Each time stream orders of the same order intersect; the stream order increases. For stream orders five and above, riparian ecosystems consist of the vegetative assemblage

up to 80 m from the centreline of the stream. For stream orders less than five, riparian ecosystems were defined as the vegetative assemblage up to 30 m from the centreline of the stream.

- SAR: Plant SAR are protected as either Endangered or Threatened under the SARO as revealed during baseline characterization. An assessment of both individual plants and habitat were considered as part of the baseline characterization. Habitat was separated into two primary types: confirmed – where the species was confirmed during baseline characterization field studies, and candidate – where available ecosite information as obtained through Forest Resource Inventory (FRI) spatial data indicate habitat suitability.
- SOCC: Plant SOCC include those protected as Special Concern under the SARO, protected federally under SARA, provincially listed as rare (i.e., subnational rank of S1, S2 or S3); and regionally rare species as designated by the municipality, or other local planning agency. The habitat of SOCC is afforded protection as Significant Wildlife Habitat (SWH), as defined by the Provincial Policy Statement and carried forward to municipal planning documents. The SWH Criteria Schedules for Ecoregion 3W indicates habitat is defined by the ecosite.
- Plant Species of Traditional Use: Plant species that are valued by Indigenous communities as established through IK and review of literature as part of the baseline characterization efforts.

Assessments related to these criteria are representative of both common species and traditional use plants. Most rare plants are tracked by the province and available information related to their distribution provide a dependable baseline for how they occur within the entirety of the RSA, LSA and the Project footprint. Ecosite distribution was also assessed in terms of upland, wetland and riparian ecosystems. Species considered common are likely to occur across the study area, and changes to these plant populations are directly linked to change in respective ecosystem availability.

Information related to traditional use plants were obtained from background resources and consultation with Indigenous Communities. An extensive list of traditional use plant species was compiled and is located in Appendix 6.4-D. Species which were identified as a traditionally important species by more than one Indigenous Community has been highlighted in Section 6.4.5.2.6. From this list, representative species were carried forward as part of the assessment and include representative of species occurring in each of the three ecosystem types (upland, wetland and riparian). For example, the Métis Nation of Ontario (MNO) identified the importance of ‘mushrooms’ and also more specifically, ‘Chaga’. Mushrooms are known to inhabit moist environments. Paper Birch commonly occurs in moist environments and typically observed alongside mushrooms. Interestingly, the Chaga mushroom has been observed exclusively growing on the trunk of birch trees. In this case, Paper Birch is carried through the assessment and can be deemed representative of mushrooms.

Importantly, ecological attributes or features such as traditional use plant, species of concern (SAR and regionally rare plants) and rare vegetation communities with critical landform/vegetation associations are included in the assessment through the analysis of indicators. For example, if ecosites with black ash will be disturbed by the Project, the assessment quantitatively and/or qualitatively evaluated the changes in availability, distribution, and composition of this feature as part of effects to upland and wetland ecosystems (refer to the definitions of indicators below).

Indicators are an aspect or characteristic of a criterion that, if changed as a result of the Project, may demonstrate a physical, biological or socio-economic effect. The indicators for the vegetation and wetlands criteria are defined as follows:

- Ecosystem availability: The spatial representation (amount) of the ecosystem present for each criterion. Ecosystem availability is primarily affected by physical changes (e.g., mechanical vegetation clearing). Ecosystem availability is represented as the amount of area (i.e., hectares) of each ecosystem type.
- Ecosystem distribution: The way each ecosystem type is distributed on the landscape. Ecosystem availability and distribution are linked. Distribution focuses on the spatial configuration (or arrangement) and connectivity of ecosystems, whereas availability focuses on the amount of those ecosystems. Linear feature density (e.g., roads) was used to help inform changes in distribution and connectivity. Linear and non-linear infrastructure, including roads, utility lines, airports, and buildings, that are a result of human alteration contributed to creation of a single 'disturbance' layer. This layer was used to better understand areas within each of the Project footprint, LSA and RSA that do not contribute to the available ecosystem.
- Ecosystem composition: Refers to species richness (or diversity) and abundance. Ecosystem composition is primarily affected by changes in the amount of moisture and sunlight, competition with invasive species, and dust deposition.

Table 6.4-2: Vegetation and Wetland Habitat and Species Criteria and Indicators

Valued Component	Criteria	Rationale for Selection	Indicators	Measurement of Potential Effects

Vegetation and Wetland Ecosystems	• Upland ecosystems
	• Wetland ecosystems
	• Riparian ecosystems[a]
		• Indigenous Knowledge (IK) and Indigenous community feedback regarding the importance of vegetation and wetlands including, but not limited to, the protection of traditionally used plants important to Indigenous peoples for cultural, spiritual and medicinal values.
		• Commitment to avoid or minimize adverse effects to vegetation communities, and specifically to:
		  ◦ Under-represented landform/vegetation values;
		  ◦ Vegetation Significant Wildlife Habitat (SWH);
		  ◦ Sensitive vegetation features; and
		  ◦ Provincially significant wetlands (PSWs).
			• Ecosystem quantity considering:
			  ◦ Change to area (ha) of vegetation communities in the Project footprint, by type as appropriate (e.g., bog, marsh, fen, swamp wetlands).
			• Ecosystem distribution considering:
			  ◦ Change to spatial configuration of vegetation communities (e.g., fragmentation) in the study area.
			• Ecosystem condition considering:
			  ◦ Change to the integrity or naturalness of vegetation communities in the study area, including their ability to support the communities of organisms naturally associated with them.
				• The potential effect to ecosystem availability (for each type) is measured quantitatively by calculating the amount of each ecosystem unit and significant feature available at the baseline characterization compared to the ecosystem units that may be impacted by the Project.
				• The potential effect to ecosystem distribution is measured qualitatively using mapping to visually analyze the spatial configuration (or arrangement) and connectivity of ecosystems. Linear feature density (e.g., roads) is measured quantitatively to help inform changes in ecosystem distribution and connectivity.
				• Ecosystem availability, distribution and composition can also be impacted by fire and flooding, and other natural hazards (e.g., insect infestations).

Vegetation and Wetlands – Plant Species	• Plant Species at Risk (SAR)
	• Plant Species of Conservation Concern (SOCC)
	• Plant Species of Traditional Use
		• IK and Indigenous community feedback regarding the importance of protecting plants, including but not limited to traditionally used plants important to Indigenous peoples for cultural, spiritual and medicinal values.
		• Commitment to avoid or minimize adverse effects to plant SAR or plant SOCC, and traditional use plants and/or habitat.
		• Need to comply with legal protections for plant SAR.
			• Habitat quantity considering:
			  ◦ Change to amount (ha) of mapped suitable habitat with high potential to support plant SAR, plant SOCC, traditional use plants in the study area.
			• Habitat distribution considering:
			  ◦ Change to spatial configuration of habitat in the study area, including the effects on plant dispersal and population distribution.
			• Survival and reproduction considering:
			  ◦ Change to plant SAR, plant SOCC populations or traditional plant populations through changes in survival and recruitment, as well as changes in the number of documented occurrences of plant SAR, plant SOCC or traditional use plants in the study area.
				• The potential effect to habitat quantity is measured by calculating the amount of suitable habitat available for various plant SAR, plant SOCC, or traditional use plants.
				• The potential effect to habitat distribution is measured qualitatively using mapping to visually analyze the spatial configuration (or arrangement) and connectivity of required habitats (including critical habitat).
				• Survival and reproduction are measured qualitatively and assessed based on persistence in the study area and their recruitment characteristics, as well as the estimated size of existing populations.

Note: A botanical inventory and Ecological Land Classification (ELC) assessment is provided in Appendix A and B of the Terrestrial Baseline Report (Appendix 6.4-A).

a) Riparian habitat is a transition zone between aquatic and terrestrial ecosystems (Austin et al. 2008)

IK = Indigenous Knowledge; SAR = Species at Risk; SOCC = Species of Conservation Concern.

6.4.4 Assessment Boundaries

6.4.4.1 Temporal Boundaries

The Project is planned to occur in three stages:

- **Construction stage**: the period from the start of construction to the start of operation (in-service date).
- **Operation and maintenance stage**: the period from the start of operation and maintenance activities through to the end of the Project life.
- **Retirement stage**: the period from the end of the Project life and start of retirement activities through to the end of final reclamation of the Project.

As described in Section 5.3.2, the Project will be operated for an indefinite period and the timing of retirement, or decommissioning, is not known at this time as it is anticipated that upgrades to reinforce or rebuild portions of the Project may occur over its lifetime to maintain its longevity. Further, potential effects and mitigation measures to be identified during the EA for the construction of the Project will likely equally apply to the potential removal of the Project at a future point in time, should it ever be required. Therefore, the construction scenario assessed as part of the EA is considered bounding and potential effects and mitigation measures for retirement are not identified separately in this EA.

The assessment of the Project on upland, wetland and riparian ecosystems considers effects that occur during the construction and operation and maintenance stages. These periods are sufficient to capture the effects of the Project.

6.4.4.2 Spatial Boundaries

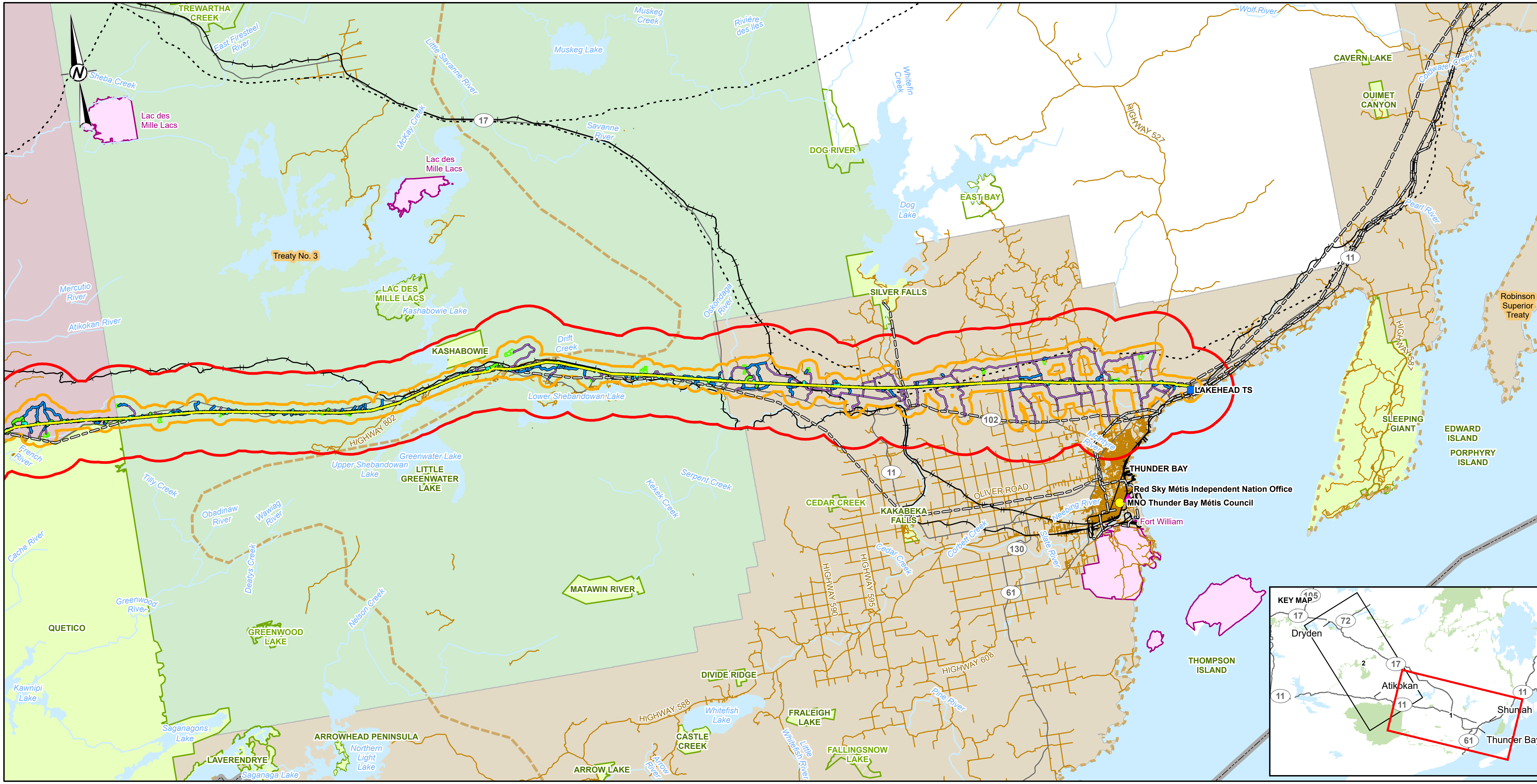
Spatial boundaries for the assessment of the Project are provided in Table 6.4-3 and shown on Figure 6.4-1.

Table 6.4-3: Ecosystems Spatial Boundaries for the Assessment of the Project on Vegetation and Wetlands Ecosystems

Spatial Boundaries	Area (ha)	Description	Rationale
Project footprint	4,072	The Project footprint includes: • Typical 46 m wide transmission line ROW; • Widened ROW for the separation of circuits F25A and D26A for 1 km; • Modification of the Lakehead TS, Mackenzie TS, and Dryden TS;	To capture the potential direct effects of the physical footprint of the Project.

Spatial Boundaries	Area (ha)	Description	Rationale
		• Access roads (improved existing roads and new roads); • Temporary supportive infrastructure associated with construction including fly yards, construction/stringing pads, laydown areas, construction camps, and helicopter pads; and • Aggregate pits and quarries.	
Local Study Area	164,787	Includes the Project footprint and a 1 km buffer.	Defined to capture local effects of the Project on vegetation criteria that may extend beyond the footprint (e.g., dust).
Regional Study Area	548,120	Extends 4 km from the LSA.	Provides a large enough area to assess the cumulative effects on ecosystems that are likely to be distributed inside but extend outside the vegetation and wetlands RSA, and is the scale at which significance is determined.

LSA = local study area; ROW = right-of-way; RSA = regional study area; TS= transformer station; km = kilometre; m = metre.



LEGEND

- MNO COUNCIL OFFICE
- RED SKY MÉTIS INDEPENDENT NATION OFFICE
- 230 kV TRANSFORMER STATION (TS)
- RAILWAY
- LOCAL ROAD
- SECONDARY HIGHWAY
- WATERCOURSE
- NATURAL GAS PIPELINE
- EXISTING TRANSMISSION LINE
- INTERNATIONAL BORDER
- EXISTING ACCESS ROAD - NO IMPROVEMENTS REQUIRED
- EXISTING ACCESS ROAD - POTENTIAL IMPROVEMENTS
- NEW ACCESS ROAD - PREFERRED
- NEW ACCESS ROAD - ALTERNATE
- PREFERRED ROUTE TRANSMISSION LINE RIGHT-OF-WAY
- AGGREGATE SITE
- FLY YARD
- LOCAL STUDY AREA
- REGIONAL STUDY AREA
- FIRST NATIONS RESERVE
- TREATY BOUNDARY
- CONSERVATION RESERVE
- PROVINCIAL PARK
- WATERBODY

FOREST MANAGEMENT UNIT

- BOUNDARY WATERS FOREST
- DOG RIVER-MATAWIN FOREST
- LAKEHEAD FOREST

0 20 40

1:500,000 KILOMETRES

REFERENCE(S)

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PROJECTION: NAD 1983 CSRS UTM ZONE 15N

CLIENT
HYDRO ONE NETWORKS INC.

PROJECT
WAASIGAN TRANSMISSION LINE

CONSULTANT

YYYY-MM-DD	2023-10-26
DESIGNED	JR
PREPARED	DB
REVIEWED	HK
APPROVED	CS

TITLE
LOCAL AND REGIONAL STUDY AREAS FOR VEGETATION AND WETLANDS

PROJECT NO.	CONTROL	REV.	FIGURE
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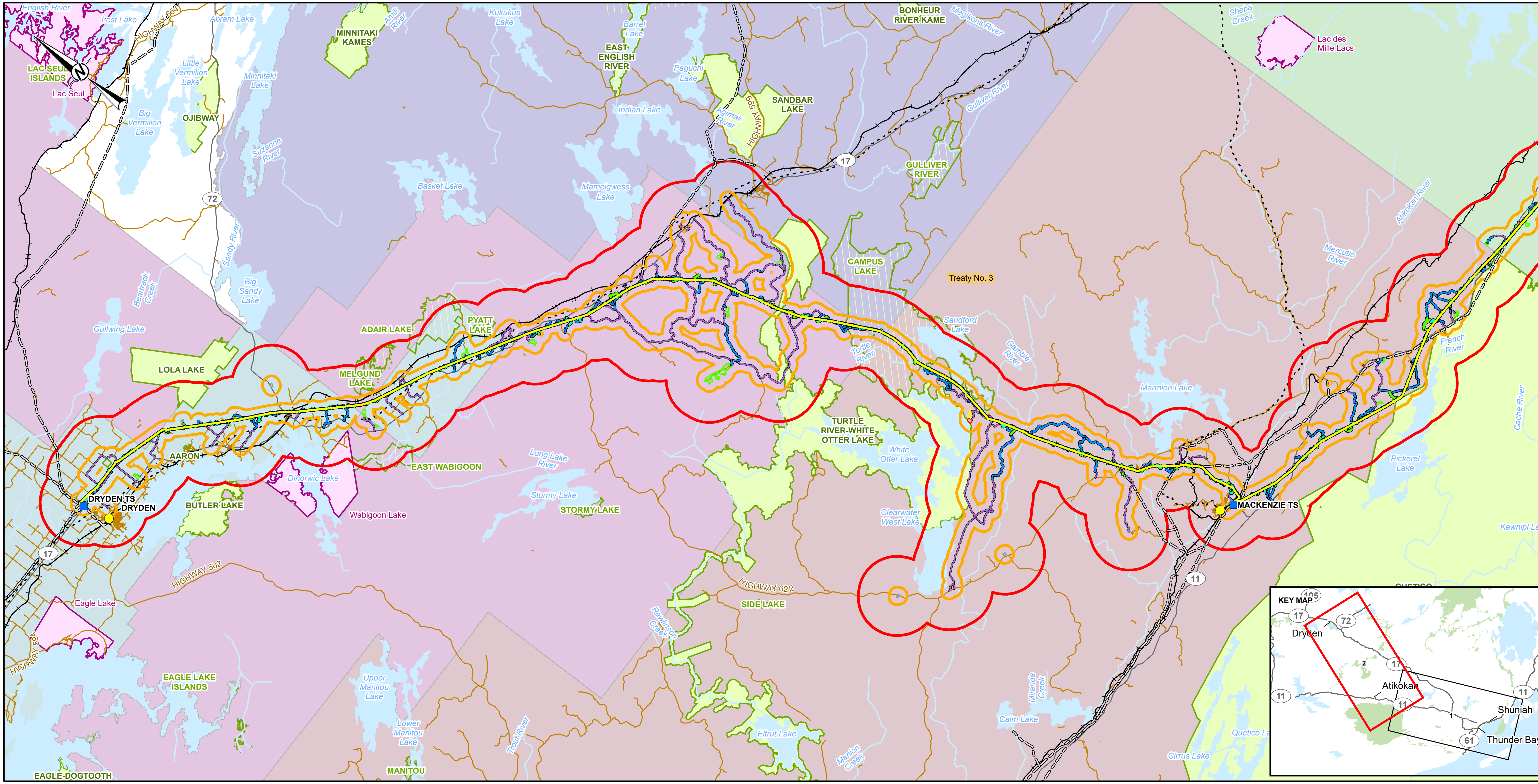

LEGEND

- MNO COUNCIL OFFICE
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- WATERCOURSE
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- EXISTING TRANSMISSION LINE
- EXISTING ACCESS ROAD - NO IMPROVEMENTS REQUIRED
- EXISTING ACCESS ROAD - POTENTIAL IMPROVEMENTS
- NEW ACCESS ROAD - PREFERRED
- NEW ACCESS ROAD - ALTERNATE
- PREFERRED ROUTE TRANSMISSION LINE RIGHT-OF-WAY
- D26A / F25A CIRCUIT SEPARATION
- AGGREGATE SITE
- FLY YARD
- CAMP / LAYDOWN
- CONSTRUCTION CAMP (NO LONGER TO BE USED)
- FLY YARD / CAMP / LAYDOWN
- LOCAL STUDY AREA
- REGIONAL STUDY AREA
- FIRST NATIONS RESERVE
- TREATY BOUNDARY
- CONSERVATION RESERVE
- PROVINCIAL PARK
- WATERBODY

FOREST MANAGEMENT UNIT

- BOUNDARY WATERS FOREST
- DOG RIVER-MATAWIN FOREST
- DRYDEN FOREST
- ENGLISH RIVER FOREST
- WABIGOON FOREST

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1:500,000 KILOMETRES

REFERENCE(S)

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CLIENT
HYDRO ONE NETWORKS INC.

PROJECT
WAASIGAN TRANSMISSION LINE

CONSULTANT

wsp

YYYY-MM-DD	2023-10-26
DESIGNED	JR
PREPARED	DB
REVIEWED	HK
APPROVED	CS

TITLE
LOCAL AND REGIONAL STUDY AREAS FOR VEGETATION AND WETLANDS

PROJECT NO.	CONTROL	REV.	FIGURE
20137728	0019	1	6.4-1-2

6.4.5 Description of the Existing Environment

6.4.5.1 Methods

For each vegetation and wetlands criterion, a description of the existing environment was used to provide context for the assessment. Existing conditions identified in the baseline characterization are the outcome of past and present developments and activities, and natural factors that cause environmental change (Section 4.3). Consequently, the baseline characterization describes the current environmental conditions of each criterion given the cumulative effects of past and present developments and activities.

The baseline characterization considered each indicator for each criterion. The importance of cumulative changes from past and present developments depends on how they have affected the integrity of each ecosystem. The assessment seeks to understand the status of upland, riparian, and wetland ecosystems in the LSA and RSA, which provides context for understanding the sensitivity of each criterion to future development. The status of each criterion was considered using the known or inferred ability of the criterion to tolerate disturbance.

The ability of a criterion to accommodate disturbance was evaluated using the concept of ecological resilience. Ecosystem resilience is the capacity of an ecosystem to cope with disturbances without shifting into a qualitatively different state (Holling 1973). A resilient ecosystem can tolerate change and, if disturbed, can renew itself. This renewal can be accelerated with reclamation practices if biodiversity is considered during the planning process. If an ecosystem has limited resilience, it is vulnerable to the effects of disturbance such that it may shift into a different state and become functionally different (Folke et al. 2004). Ecosystem resilience can vary by criterion and this variation has important implications for assessing effects on ecosystem function (Elmqvist et al. 2003, Folke et al. 2004, Peterson et al. 1998).

Most ecosystems can adapt to or otherwise accommodate some changes without effects on the functional state of the system, and some changes to ecosystem availability, distribution, or composition would have little effect on self-sustaining and ecologically effective ecosystems (Swift and Hannon 2010). For example, ecosystem function could be maintained with the loss of species (i.e., substantial effect on the species) if there is redundancy in the contribution that species makes to the system (i.e., compensation by other members of a functional group) (Folke et al. 2004, Peterson et al. 1998). Changes to other species may have strong effects on ecosystem structure and function (Elmqvist et al. 2003, Folke et al. 2004, and Soulé et al. 2003). Potential Project effects on vegetation and wetland communities or species that may affect use by Indigenous communities are discussed in further detail in Section 7.7 (First Nations Rights, Interests and Use of Land and Resources) and Section 7.8 (Métis Rights, Interests and Use of Land and Resources). While one protected vegetation species (i.e., species designated as either threatened or endangered under the provisions of the ESA) has been identified in the RSA, black ash's protection under the ESA is temporarily suspended until

January 2024 (MECP 2022). Mitigation measures have been identified to help avoid or minimize Project effects to rare vegetation species, such as ragged fringed orchid (*Platanthera lacera*).

Ideally, effect threshold values and resilience limits of an ecosystem are known, and changes in indicators can be quantified accurately with a high degree of confidence to evaluate whether or not a threshold has been exceeded. However, critical thresholds such as amount or distribution of ecosystems required to maintain function, or the ability of an ecosystem to accommodate changes in composition, are rarely available for ecosystem criteria. Moreover, ecological thresholds vary by species, landscape type, and spatial scale (Environment Canada 2013, Swift and Hannon 2010). Consequently, a detailed and transparent account of predicted effects associated with estimated combined changes to each indicator were provided for each criterion using available scientific literature, data collected in the LSA and RSA, and logical reasoning (i.e., a weight of evidence, or reasoned narrative approach).

6.4.5.1.1 Baseline Field Surveys and Regional Data Collection

Existing conditions are characterized using vegetation baseline characterization botanical field surveys, data available from the MNRF, FMPs published in 2022 and 2023 (MNRF 2022a,b,c,d,e, MNRF 2023), FRI mapping (MNR 2010c), and through available literature relevant to upland, wetland, and riparian ecosystems in the LSA and RSA. Baseline characterization botanical field surveys were primarily conducted on the Project footprint and LSA, while some stations occur within the RSA (Appendix 6.4-A). The following field programs were completed between June and August 2022: Ecological Land Classification (ELC), botanical inventory (including traditional use plant species, SAR, regionally rare plant species), and Significant Wildlife Habitat (SWH) assessments (rare vegetation communities and specialized habitat for wildlife). Data collected during the 2022 field programs were assumed to represent conditions present along the corridor alternatives. It is predicted that information from botanical field surveys completed within the LSA are representative of conditions found within the Project footprint.

For vegetation and wetland ecosystems, the assessment method assumes that all suitable habitat (i.e., the indicator) is necessary to meet a plant species criterion's life history requirements. Therefore, all suitable habitats (or ecosites) are important to vegetation and wetland ecosystems under examination regardless of whether a particular ecosite is occupied by listed plant species or other sensitive environmental features, as may be determined during a baseline characterization field study. This is important because all field studies contain limitations, particularly at a scale such as the Project. This approach was used to manage the uncertainty in field data limitations and gaps, general habitat types, FRI data, and the riparian habitat model so that effects from the Project footprint would not be underestimated and could be compared confidently with no to little bias (see also the Prediction Confidence Section 6.4.11).

Previous and Existing Disturbances

Disturbance (area and percentage) in the LSA and RSA for the Project footprint were calculated using existing FRI data (discussed below), from two general types:

- Unclassified - commercial industrial (U997), utilities (U998), and residential (U999); and
- Constructed - aggregate sites, landfills, pavement/concrete surface (B189-B200).

FRI data is as current as of 2008 and it was therefore accepted that disturbance footprints associated with unclassified and constructed types have since increased. To account for landscape alteration since publication of the FRI data, more current provincial spatial data (i.e., airports, buildings, Ontario road network and utility lines) was used in place of FRI data. This area, in combination with the unclassified and constructed layers, were used to create a single *disturbance* layer.

Other disturbance data that were used as available from the MNRF, Ministry of Mines, Ministry of Northern Development, and Provincial Land Cover 2000 (MNR 2002). Disturbances were classified as either linear, polygonal, or points. To calculate the area and percentage of human disturbance, point and linear anthropogenic disturbances were buffered to create footprints for each disturbance type.

The list of linear feature types that were included in the linear density analysis are as follows:

- ORN Road Segment
- OTN Trail Segment
- Trail Segment (Restricted data layer)
- Utility Line.

The list of disturbance features that were included in the total habitat disturbance analysis are as follows:

- FRI Polytype: UCL
- Aggregate Site – Authorized Active
- Intersections between ORN Highways and OHN Watercourse
- Fire Disturbance
- AR Harvest Depletions
- ORN Road Segment
- ORWN Track
- OTN Trail Segment

- Trail Segment (Restricted data layer)
- Utility Line
- Hydro One existing transmission line ROWs

The list of buffers applied to the disturbances classified as points or lines, for the purposes of the total disturbance analysis are as follows:

- 200 m on point intersection between ORN Highways and OHN Watercourse
- 500 m buffer on ORN Highways and Track
- 10 m buffer on ORN Roads (excluding highway)
- 1.5 m buffer on Trails
- 5 m buffer on Utility Lines

6.4.5.1.2 Ecosystem Mapping

Ecosystem mapping was completed for the LSA in accordance with the ELC system for Ontario. ELC is a standardized method of defining landscapes from broadscale ecoregions down to refined *ecosites*. Ecosites of the LSA and RSA were assessed and analyzed as part of the baseline characterization. Ecosite information is not only valuable in understanding the vegetation resources within the area, but also contributes to the understanding of wildlife and aquatic habitats.

Through the province's effort to inventory forest resources across most of northern Ontario, existing ecosite information is available for the LSA through the FRI modelling work completed between 2007 and 2011. The primary objective of this data is to support forest management practices. Although FRI data can serve as a useful ecosystem analysis tool, this was not the intent for the capture of the data and as used in this EA. When using this data for purposes outside of forest management programs, some deficiencies are observed. FRI mapping was completed individually for each forest management unit (FMU), which has resulted in a narrow overlap area where ecosite polygons extend outside of the respective FMUs. The overlap areas contain two ecosites assigned to any one area. In most cases, overlapping areas were assigned different ecosite identifiers, which may be attributed to the timing of when each FRI mapping effort was completed for each FMU.

FRI ecosite data was mapped by various methods, a combination of aerial imagery interpretation via Digital Surface Models and stereo imagery analysis, and LiDAR. The multi-analysis approach has resulted in a variety of information for each ecosite, including vegetation types, heights and soil moisture, which has allowed for a *best estimate* of the ecosite type (MNR 2009). The FRI has served as an extremely useful resource for this Project, not only for the Project-specific ELC analysis, but also to support wildlife and aquatic assessment work.

Not all FRI ecosites have been field-verified, so some level of error should be considered when used. In particular, the existing ROW corridor was mapped as unknown or unclassified among various segments. While the ROW is considered part of an area that was anthropogenically disturbed at one point, it has generally recovered and now aligns with meadow habitat.

Associated wildlife species were documented in and surrounding the ROW and it is therefore considered an area of habitat availability. For the purpose of completing quantitative analysis included herein and within the wildlife habitat assessments (Section 6.5), this area was reclassified as Dry to Fresh, Coarse: Meadow (B045).

WSP field staff completed visits during the early and late growing seasons in 2022 and further description of this effort is provided in the Terrestrial Baseline Report (Golder 2023).

Upland Ecosystem Mapping

Upland ecosystems (or ecosites) for the LSA were mapped in accordance with the ELC system for Ontario. The ecosites were categorized into general habitat types, as follows:

- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Shrub
- Field
- Meadow
- Barren

Wetland Ecosystem Mapping

Wetland ecosystems (or ecosites) were mapped for the LSA in accordance with the ELC system, categorized into four general habitat types:

- Bog
- Fen
- Marsh
- Swamp

Riparian Ecosystem Mapping

Riparian habitat is a transition zone between aquatic and terrestrial ecosystems (Austin et al. 2008) and is defined as areas adjacent to rivers and lakes, or ephemeral, intermittent, or perennial streams that differ from surrounding uplands in plant and animal diversity and productivity (Environment Canada 2013). Riparian areas support important biodiversity functions as they provide unique habitat for plants, invertebrates, fish, amphibians, birds and mammals. Riparian zones often function as regional wildlife movement corridors linking otherwise unconnected habitats. While these areas represent a small portion of a given watershed and are not listed as a specific fish habitat, they provide "natural features, functions and conditions that support fish life processes and protect fish habitat as defined by the *Fisheries Act*" (MNR 2010a).

The Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement (MNR 2010a) and the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR 2010b) recommends a minimum distance of 15 to 30 m of naturally vegetated cover adjacent to fish habitat to maintain ecosystem function.

The Department of Fisheries and Oceans (DFO) has also indicated that the riparian zone is influenced by various biophysical processes, such as erosion, filtration, and shading (Collison & Gromack 2022); as such, application of a standardized buffer may not reflect the true area of riparian habitat. In these buffers, vegetation communities maintain aquatic ecosystems by moderating temperature through shading, filtering sediments and nutrients, providing food through leaf litter and organic matter, and influence the structure of watercourses and waterbodies through fallen woody material (Environment Canada 2013). Riparian habitat wider than 30 m may be required for the protection of movement corridors for certain wildlife species (Environment Canada 2013).

Stream order is a measure of the relative size of a natural watercourse. The smallest watercourse is referred to as a first order stream and generally comprises the headwaters of a river system. The stream order increases in the downstream direction as one watercourse joins another in a river system. For this assessment, riparian areas were defined as all naturally vegetated areas next to waterbodies and watercourses. The approximate 30 m buffer criterion was assumed to represent an appropriate riparian zone width and is consistent with scientific literature and recommendations outlined by MNR (2010) and Environment Canada (2013). Because stream orders five and six are wider, a larger buffer was used to capture the expected riparian areas associated with these streams and potential wildlife movement corridors. Therefore, a 30 m buffer from the edge of waterbodies was considered for lakes and ponds. Riparian areas of watercourses were considered within a 30 m buffer of the edges for streams of stream order 1, 2, 3, and 4. For stream orders 5 and 6, riparian buffers of 80 m were applied to account for the placement of the buffer from the centreline of the watercourse.

Potential riparian habitat was mapped across the LSA and RSA for the Project footprint using available MNRF data and applying 30 m and 80 m buffers, as described above. All watercourses (i.e., rivers and streams) and lakes available from the MNRF waterbody dataset were buffered at the centerline of watercourses and the edge of lakes using the applicable buffer widths. The buffer zone was then overlaid onto the LSA and RSA ELC mapping. All naturally vegetated ecosites within the buffer zone were classified as having riparian habitat potential and captured all upland and wetland general habitat types described above.

Some areas with low amounts of disturbance would likely provide some riparian function in buffers. For the purposes of the assessment, Developed Agricultural Land and road ROW codes were conservatively classified as non-riparian. In reality, these areas of the landscape would provide some riparian function, such as water filtration and erosion control along streambanks.

6.4.5.1.3 Regional-Level Description of Existing Soils

Soil types across the LSA are broadly consistent with distributions that follow the surficial geology of the region. Common soil orders include (dystric) brunisols, (gray) luvisols and (humo-ferric) podzols.

Brunisol and podzol soils in the region tend to be found on areas of coarse-textured material, such as moraines or glaciofluvial deposits, while the luvisol soils of the region tend to be found on areas of fine-textured, well-drained and often calcareous material, such as glaciolacustrine deposits. Other soil order types are scattered throughout the region in local pockets of organic, poorly-drained (mesisol or gleysol) or poorly-developed soils (regosol).

Agriculture is practiced in the areas around Thunder Bay and Dryden, often in association with the fine-textured glaciolacustrine deposits in these areas. Soil productivity based on the Canada Land Inventory (CLI) capability ratings tend to be low (CLI rating of 4 or higher) in much of the LSA with limitations related to shallow bedrock and soils with low fertility and excessive droughtiness. Moderately extensive areas of CLI class 3 soils with capability limitations due to poor soil structure or drainage and topography are encountered by the LSA northwest of the Thunder Bay area. In the Dryden area, the LSA crosses limited areas of CLI class 2 and 3 soils. Capability limitations noted for these soils are related to poor soil structure or drainage, topography, and adverse climate (OMAFRA 2022).

6.4.5.2 Results

6.4.5.2.1 Upland Ecosystems

Ecosystem Availability

Upland ecosystems provide a diversity of ecological structure and function for plants and wildlife occupying the landscape. The majority of the landscape across the LSA and RSA for the Project footprint is composed of coniferous, hardwood, and mixed-wood forests, and smaller amounts of barren, field, meadow, and shrub habitats. Coniferous forests are typically dominated by black spruce (*Picea mariana*), Jack pine (*Pinus banksiana*), and white spruce (*Picea glauca*) (Crins et al. 2009, MNRF 2014). Deciduous forests are composed primarily of trembling aspen (*Populus tremuloides*) and sometimes balsam poplar (*Populus balsamifera*) in richer lowland areas (Crins et al. 2009, MNRF 2014). Other tree species found within the region include eastern white cedar (*Thuja occidentalis*), balsam fir (*Abies balsamnea*), red pine (*Pinus resinosa*), white pine (*Pinus strobus*), paper birch (*Betula papyrifera*), and tamarack (*Larix laricina*). The areas of ecosites in the upland ecosystem in the baseline characterization are provided in Appendix 6.4-A.

Table 6.4-4: Upland Ecosystems Availability in the Baseline Characterization of Local and Regional Study Areas

Ecosite Grouping/Ecosystem	General Habitat Type	LSA[a] Area (ha)	LSA[a] Percent (%)	RSA[a] Area (ha)	RSA[a] Percent (%)
Upland Ecosite	Coniferous Forest	59,995	50.97%	184,137.3	51.82%
Upland Ecosite	Deciduous Forest	51,233	43.53%	156,667.6	44.09%
Upland Ecosite	Mixed Forest	1,652	1.40%	6,460.236	1.82%
Upland Ecosite	Shrub	946	0.80%	1,968.422	0.55%
Upland Ecosite	Field	527	0.45%	1,869.292	0.53%
Upland Ecosite	Meadow[b]	2,394	2.03%	2,735.75	0.77%
Upland Ecosite	Barren	957	0.81%	1,516.155	0.43%
Upland Total	**Total**	117,706	**100.0%**	**355,355**	**100.0%**

a) Total area/percentage of available upland habitat type, as comprised by the general habitat types identified in the table. This does not include anthropogenic/disturbed (e.g., commercial, residential, unvegetated areas such as waterbodies) areas.

b) This type includes B045, of which 193 ha (0.16%) of the LSA and 2,303 ha (0.65%) of the RSA is comprised of the reclassified ROW.

LSA = Local Study Area; RSA = Regional Study Area; ha = hectare; % = percent.

Table 6.4-5: Summary of Upland Ecosystem Features for the Local and Regional Study Areas

Feature	LSA	RSA
Upland Ecosystem Availability (% of study area)	71	64
Most Common Upland General Habitat Type	Coniferous Forest	Coniferous Forest
Least Common Upland General Habitat Type	Field	Barren
Proportion of upland ecosystems made up of forested areas (% of upland areas)	95	97
Existing Anthropogenic Disturbance (% of study area)[(a)]	5%	4%
Most common age[(b)]	Mature	Mature
Least common age[(c)]	Late-successional	Late-successional
Rare upland vegetation communities (%)	19%	18%

a) Including commercial, industrial, residential, unvegetated areas such as waterbodies.

b) Mature (81-110 years). Note: No information is available for the pre-sapling (0-10 year) stage.

c) Late-successional (>111 years). Note: No information is available for the pre-sapling (0-10 year) stage.

LSA = Local Study Area; RSA = Regional Study Area; % = percent.

Below is a summary of availability of upland ecosystems in the LSA and RSA (Table 6.4-4, Table 6.4-5, Figure 6.4-B in Appendix B, Appendix 6.4-A):

- Total upland ecosites in the LSA comprise 117,706 ha or 71.4%. Anthropogenic/disturbed ecosites (commercial, industrial, residential, constructed types [e.g., landfills, paved/gravel surfaces], waterbodies) represent 8,313 ha (5%) of the LSA.
- Forested upland areas in the LSA account for 112,880 ha (68.5% of the LSA; 95.9% of upland ecosystems in the LSA), while non-forested areas (i.e., bedrock, meadows) account for 4,824 ha (2.9% of the LSA; 4.1% of upland ecosystems in the LSA).
- Total upland ecosites in the RSA comprised 355,355 ha or 64.8%. Anthropogenic/disturbed ecosites comprise 22,052 ha (4%) of the RSA.
- Forested upland areas in the RSA account for 347,264 ha (63.4% of the RSA; 97.7% of upland ecosystems in the RSA), while non-forested areas (i.e., bedrock, meadows) account for 8,088 ha (1.5% of the RSA; 2.3% of upland ecosystems in the RSA).
- Most common general habitat type in the LSA and RSA is coniferous forest at 59,995 ha (51.0% of the LSA) and 184,137 ha (51.8% of the RSA), respectively. Comparatively, the most common single ecosite is – Aspen - Birch Hardwood (B055) – a deciduous forest at 1,605 ha (1.5%) in the LSA and 5,719 ha (1.0%) in the RSA.
- Least common general habitat type in the LSA is field habitats at 527 ha (0.5%).
- Least common general habitat type in the RSA is barren habitats at 1,516 ha (0.4%).
- Natural disturbance, specifically fire disturbance, comprises 199 ha (0.03%) of available ecosystem within the RSA.

For upland ecosystems, ecosystem availability will be described using forest management units (FMU), seral stages, and Significant Wildlife Habitat (SWH).

A unique Forest Management Plan (FMP) is prepared for each FMU and updated every 10 years. FMPs are prepared by a registered forester and outline a plan for a 10-year period with the goal of achieving a healthy and sustainable forest ecosystem. Ecological values and long-term targets are identified in each plan, including intended harvesting areas. These plans consider current conservation programs, wood material demands, and ecosystem stressors.

The following FMUs are found in the RSA: Boundary Waters Forest, Dog River-Matawin Forest, Dryden Forest, English River Forest, Lakehead Forest and Wabigoon Forest (Figure 6.4-1). In 2020, two former FMU areas, Sapawe FMU and Crossroute FMU, were combined into the single, Boundary Waters FMU. Quetico Provincial Park serves as its own FRI unit. Below is a combined summary of the FMPs that overlap the RSA, which provides natural forest structure patterns and the influences of human disturbance over approximately the past 150 years.

Upland forests are typically dominated by black spruce and Jack pine conifer stand or dominated by deciduous species. White spruce is also commonly a dominant component of coniferous forests in some FMUs (e.g., Dryden and English River). Northern FMUs are largely composed of black spruce stands, while Jack pine is more common in burned areas of the south. Hardwood stands (e.g., poplar, trembling aspen and paper birch) and hardwood-dominated mixed stands are less common than coniferous stands and tend to occur along lakeshores and drainage areas where fire is less frequent. Other tree species found within the FMUs that are present but less common include eastern white cedar, balsam fir, black ash, red pine, white pine and tamarack.

Historically the composition and structure of the boreal forest was primarily driven by wildfire, insect outbreaks, windthrow and disease, while more recently large-scale harvesting and controlled fire suppression play key roles in forest composition and structure. The fire cycles in the ecoregions are variable across the RSA depending on stand type. In coniferous pine stands, cycles range from 50 to 187 years, and fires are typically stand-replacing events (Crins et al. 2009). Mixed forest fire cycles range from 63 to 210 years, with variable intensities (Crins et al. 2009). Fire suppression over the last 70 years has prolonged the forest fire return cycle, leading to changes in the average age of the forest. Before fire suppression, the boreal forest complex of northwestern Ontario was approximately 30 years younger than it was during the 1970s (based on comparisons from Pikangikum to Pickle Lake between 1915 and 1974) (Carleton 2001).

Changes to forest composition and structure over more than 100 years have been greatly influenced by forest harvesting operations. The creation of forestry logging roads for access has contributed to increased forest fragmentation. Management practices have been introduced that have reduced the size of harvest blocks and provided forest buffer strips surrounding waterbodies. However, these management practices have also resulted in fragmented forest blocks and strips that are susceptible to windthrow damage.

Overall, fire suppression and selective harvesting practices lead to fragmented conditions and smaller, dispersed disturbances compared to larger burned areas that would have resulted historically. Thus, there tends to be fewer conifer species on the landscape and more mixed wood and broad-leaved forest. For example, white pine forests have converted to more shade tolerant broad-leaved species from a less frequent fire renewal. Climate change may exacerbate this scenario because longer summers favour the persistence of broad-leaved species and limit invasion of poplar stands by conifers (Carleton 2001). Species such as red oak and hemlock are also less frequent on the landscape as they do not regenerate easily. Even with an increased effort to plant or seed clearcuts with conifers, there is a shift from conifer to deciduous forests in Ontario (Carleton 2001).

Mining for gold, iron and base metals were historically important in the region. In most of the FMUs, there are relatively few active mines, while historic metal production has occurred and exploration is still ongoing. Aggregate extraction has and currently takes place in the majority of FMUs.

Other previous and existing disturbances to upland ecosystems include railways, towns and highways/roads, which increase access to natural resources. Fur traders from Europe established in the region in the late 1600s. With the construction and opening of the Canadian Pacific Railway in 1881 and the National Transcontinental Railway in 1907, large-scale development came to the region and established several communities. Non-industrial uses of Ontario forests include tourism, snowmobiling, fishing, hydro-electric generation facilities, hunting, trapping and traditional uses by Indigenous peoples. Prior to European settlement, the upland ecosystems were under traditional use and management by Indigenous communities.

Below is a summary of FMUs in the LSA and RSA (Table 6.4-6; Figure 6.4-1):

- Total area in the LSA under an FMU comprise 146,202 ha or 88.7%.
- Total area in the RSA under an FMU comprise 529,587 ha or 96.6%.
- FMU under Boundary Waters Forest covers the largest portion of the LSA and RSA, comprised of 45,012 ha (27.3%) and 156,100 ha (28.5%), respectively.

The following describes the effects of upland ecosystem availability as based on forest age, also described as serial stage. The age of forests across the study areas are variable. For this analysis, the amount of each forest seral stage (i.e., forest stand age [stage] and structure) found in the study areas includes upland and wetland ecosystems. Seral stage totals include only those portions of land with the potential to be treed and do not account for areas of the land where forest would not form (e.g., human infrastructure and sites with conditions that do not favour forests such as bedrock). These portions of the landscape without potential for forests are not suitable for tree growth often because conditions are either too dry to feed tree roots or too wet for trees to establish as is the case with open water areas. Data for seral stages were not available over the entire LSA and RSA. Therefore, values reported are for those areas with FRI coverage only.

Table 6.4-6: Forest Management Unit Coverage within Local and Regional Study Areas

Forest Management Unit	Total Area (ha)	LSA Area (ha)	LSA Percent (%)	RSA Area (ha)	RSA Percent (%)
Boundary Waters Forest	1.9 million	45,012	27.32%	156,100	28.48%
Dog River-Matawin Forest	1.1 million	22,512	13.66%	89,940	16.41%
Dryden Forest	307,016	22,081	13.40%	70,126	12.79%
English River Forest	1.2 million	3,509.280401	2.13%	18,513	3.38%
Lakehead Forest	762,982	18,268	11.09%	94,373	17.22%
Wabigoon Forest	732,486	34,820	21.13%	100,536	18.34%
Total	**6.0 million**	146,202	88.72%	529,587	96.62%

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

LSA = Local Study Area; RSA = Regional Study Area; ha = hectare; % = percent.

Below is a summary of the availability of seral stages in the LSA and RSA for the Project footprint (Table 6.4-7).

- From available FRI data, the most common age is mature seral stage (81 to 110 years) at 53,683 ha (32.58% of the LSA; 41.4% of seral stages) in the LSA and 168,030 ha (30.6% of the RSA; 42.2% of seral stages) in the RSA.
- The least common age is late-successional seral stage (111 years and older) at 10,670 ha (6.5% of the LSA; 8.2% of seral stages) in the LSA and 35,997 ha (6.6% of the RSA; 9.0% of seral stages) in the RSA.

Table 6.4-7: Seral Stages of the Upland Ecosites in the Baseline Characterization for the Local and Regional Study Areas

Seral Stage	LSA Area (ha)	LSA Percent (%)	RSA Area (ha)	RSA Percent (%)
Pre-Sapling (0 to 10 years)	-	-	-	-
Sapling (11 to 30 years)	28,287	17.17%	75,710	13.80%
Immature (31 to 80 years)	36,977	22.44%	118,650.2	21.62%
Mature (81 to 110 years)	53,682	32.58%	168,030.2	30.62%
Late-successional (111 years and older)	10,670	6.48%	35,996.88	6.56%
Total	**129,618**	**78.7%**	**398,387.3**	**72.59%**

Note: This summary is derived only from 'Overstory of Origin' metadata from the FRI data package. Most data was collected in 2008 and therefore in the absence of recent data, 'pre-sapling' data is not available.

LSA = Local Study Area, RSA = Regional Study Area; ha = hectare; % = percent.

The following describes the effects of upland ecosystem availability as based on established SWH criteria. The draft SWH Criteria Schedule for Ecoregion 3W (MNRF 2017) was used as the criteria to evaluate the habitat of vegetation SWH as part of the baseline characterization. SWH is categorized into two types: rare vegetation communities and specialized habitat for wildlife. Both types were mapped as part of the baseline characterization for both the LSA and RSA and were generally part of the upland ecosystem and historically common (Appendix 6.4-A). Table 6.4-8 identifies the type and availability throughout both the LSA and RSA (Figure 6.4-B in Appendix B).

Table 6.4-8: Significant Wildlife Habitat Types within the Baseline Characterization for the Local and Regional Study Areas

SWH Community	SWH Type[a]	LSA (ha)	LSA (%)	RSA (ha)	RSA (%)
Rare vegetation community	Cliff and Rim	32	-	49	-
Rare vegetation community	Rare Tree: Elm (*Ulmus* spp.)	50	0.1%	253	-
Rare vegetation community	Rare Tree: Red and Sugar Maple (*Acer rubrum; Acer saccharum)*	457	0.3%	1073	0.2%
Rare vegetation community	Rare Tree: Red and White Pine	5,589	3.4%	18,538	3.4%
Rare vegetation community	Rock Barren	7	-	32	-
Rare vegetation community	Sand Dunes	4,311	2.6%	12,083	2.2%
Rare vegetation community	Arctic-Alpine	N/A	-	N/A	-
Specialized habitat for wildlife	Milkweed (*Asclepias syriaca*) Patch	24,948	15.1%	79,218	14.5%
Total	**Total**	**35,394**	21.5%	**111,246**	20.3%

a) Reference for SWH: OMNR 2000, MNRF 2017.

LSA = Local Study Area, N/A = not applicable; RSA = Regional Study Area; ha = hectare; % = percent.

Ecosystem Distribution

Most upland ecosystems are common and well distributed across the landscape within the LSA and RSA of the Project footprint (Figures 1 to 30 in Appendix 6.4-B, Appendix 6.4-A), despite the presence of past and existing human disturbances that fragment and disconnect habitats. Human development activities have resulted in a more fragmented forest landscape compared to natural patterns. For example, there are existing linear disturbances on the landscape (e.g., roads, rails). Fragmentation also results from fire suppression and selective harvesting practices, which have led to smaller scattered disturbances compared to historic larger burned areas. Other disturbances such as active mining, mineral exploration, transmission lines, urban settlements and recreational activities have also contributed to the fragmentation of forested uplands.

Changes to the upland ecosystem from development influences such as tree harvesting activities, linear development, mining and urban settlement are documented within both the LSA and RSA. These activities may have some role in fragmentation of the upland ecosystem; however, the SWH that were identified or predicted to occur within the LSA and RSA as part of the baseline characterization are expected to be resilient to and are unlikely to undergo significant changes.

Ecosystem Composition

In the LSA and RSA, there have been changes to forested upland composition as a result of forest harvesting. For example, the creation of forestry logging roads for access has contributed to increased forest fragmentation, which changes light and moisture regimes.

In FMUs, such as Boundary Waters Forest and Dryden Forest, spruce budworm (*Choristoneura fumiferana*) outbreaks continue. In many areas, the damage has not been recognized as it may take a few years until the budworm complete kills and the tree and forest loss is evident. Methods to manage the outbreaks, including spray control, were paused during the COVID-19 pandemic.

Uplands with undisturbed soils that are located away from disturbed sites are generally resistant to invasion by non-native plant species. In contrast, upland habitat edges adjacent to disturbance are more prone to invasion. Human disturbances, such as logging and mining, have the potential to accelerate the establishment of invasive plant species in native ecosystems through the introduction of seeds or disturbance of soils (Ministry of Forests Research Program 1998).

The Terrestrial Baseline Report's (Appendix 6.4-A) botanical inventory identified one introduced and invasive species, the Canada thistle (*Cirsium arvense*), according to The Early Detection & Distribution Mapping System Ontario (University of Georgia 2022). However, it is not listed under the prohibited invasive species or restricted invasive species of the *Invasive Species Act* (Ontario 2015). Canada thistle grows in full sun in various soil types and thrives in disturbed areas. This species is highly competitive with surrounding forb/grass species due to its extensive root system and aggressive growth of shoots (University of Georgia 2022). Canada thistle was identified at three locations within the LSA. This species was found in meadows (B030, B078, B110) representing approximately 152 ha (0.1%) of the LSA and 378 ha (0.1%) of the RSA. In addition, twelve introduced species were also confirmed during the botanical field survey: common buttercup (*Ranunculus acris*), common dandelion (*Taraxacum officinale*), common timothy (*Phleum pratense*), common yarrow (*Achillea millefolium*), coralberry (*Symphoricarpos orbiculatus*), creeping buttercup (*Ranunculus repens*), European red currant (*Ribes rubrum*), garden bird's-foot trefoil (*Lotus corniculatus*), large bird's-foot trefoil (*Lotus uliginosus*), oxeye daisy (*Leucanthemum vulgare*), red clover (*Trifolium pratense*), and sweet-scented bedstraw (*Galium odoratum*).

As further discussed herein, existing landscape disturbance and climate change are expected to continue to influence habitat conditions and changes to ecosystem type and availability. Mitigation measures are designed to limit impacts where possible and include measures to maintain moisture conditions. Further discussion is provided in Section 6.4.10. Provincial programs are in place to assess resource conditions, such as newly updated FRI mapping, tracking species distribution to monitor spread of invasive species, and rare and SAR species. These monitoring techniques will allow for monitoring changes of habitat condition at a broader scale.

With respect to the Project, changes in ecosystem composition are likely well within the resilience and adaptability limits for this criterion. However, small ecosites such as Bedrock in the LSA may be approaching limits of resilience and adaptability. Rock outcrops often have rare plant species; thus, if bedrock is disturbed, these species would have a lower capacity to adapt to changes.

6.4.5.2.2 Wetland Ecosystems

Ecosystem Availability

Wetlands are ecosystems containing soils that are saturated with moisture either permanently or seasonally and are further characterized by the presence of hydrophytic (water adapted) vegetation (National Wetlands Working Group 1988). Wetlands contribute to fish and wildlife habitat and recreational activities, such as birding, store carbon from the atmosphere and act as natural filters. Wetlands with late successional old growth stands provide structure, promote biodiversity and are used for a variety of recreational activities (Land Owner Resource Centre 1999). Within the LSA and RSA, bog, fen, marsh, and swamp habitats make up the wetland landscape. Open water wetlands were not differentiated from other waterbodies, but also exist in the LSA and RSA.

Although the amount of wetland ecosystems available before industrial development in the RSA is not precisely known, availability has almost certainly changed due to disturbances such as forest harvesting, roads, rail, mining and recreational activities. The areas of ecosites associated with wetland ecosystems in the baseline characterization are provided in Appendix 6.4-A.

Wetland ecosystems have historically been common in the LSA and RSA. In the past, boreal forest composition (including treed wetlands) has primarily been affected by wildfire, insect outbreaks and disease. More recently, large-scale harvesting and controlled fire suppression play key roles in forest composition and structure of wetlands. Fire suppression over the last 60 years and logging have decreased the forest fire return cycle, leading to changes in the forest composition (Carleton 2001). Forest harvesting is one of the key recent disturbances to wetlands in the LSA and RSA. Logged wetlands eventually return to dominance by black spruce but will often go through successional stages following harvesting where the site is characterized by alder swales and swamp like conditions (Carleton 2001).

The industrial period in the early 1900s established some of the linear infrastructure such as roads and rail that currently exists in the RSA and would have contributed to negative effects on wetlands. Construction of transportation routes may have reduced the availability of wetland ecosystems in the RSA because of draining or filling of small wetlands along road ROWs, and potential redirection or channelization of local water flow.

Five Provincially Significant Wetlands (PSWs) occur within the LSA and RSA, namely, McVicars Creek and Little Falls, Neebing River, Basin A, and Kivikoski. These, and two additional PSWs – Sawmill Bay and Mills Block, occur within the RSA.

Two of these PSWs, McVicars Creek PSW and Little Falls, occur within 120 m of the Project.

McVicars PSW occurs northeast of Thunder Bay- generally occurring north of Highway 11 and west of Haselwood Drive. It was evaluated in 2015, is 578 ha in size and dominated by swamp (91%), with small amounts of marsh (7%), open water (1%) and fen (<1%). It is dominated by palustrine (74%), followed by riverine (18%) and isolated (8%) wetland types. Palustrine and isolated types are dependent on nutrient input from rainfall and overland flow, suggesting low productivity. The wetland is complexed, comprised of several wetland components bisected by several roads (e.g., Hilldale Road, Onion Lake Road, Balsam Street, Melbourne Road, Hazelwood Drive, Gorevale Road), transmission line corridors, and areas comprised of anthropogenic disturbances (e.g., backyard, storage areas).

Little Falls PSW was evaluated in 2004 and occurs northwest of Atikokan, east of Eye Lake and generally south of Highway 622. This wetland is complexed, with a small fragment occurring north of Highway 622. Portions of the wetland are bisected by a transmission line corridor. This wetland is 374 ha in size, with half of the wetland comprised of marsh (51%), followed by swamp (21%), fen (18%), and open water (10%). The site type, or physiographic position of the wetland, is not included among the spatial metadata; however, aerial imagery suggests that much of the wetland is comprised of lacustrine type, occurring within the shallow depths of lakes and shorelines, with some riverine type associated with small channels feeding into or out of the associated lakes.

Table 6.4-9: Wetland Ecosystems Availability within the Baseline Characterization for the Local and Regional Study Areas

Ecosite Grouping/Ecosystem	General Habitat Type	LSA Area (ha)	LSA Percent (%)	RSA Area (ha)	RSA Percent (%)
Wetland Ecosite	Bog	111	0.45%	605.68	0.77%
Wetland Ecosite	Fen	3,777	15.17%	16,096.08	20.37%
Wetland Ecosite	Marsh	3,188	12.80%	10,399.12	13.16%
Wetland Ecosite	Swamp	1,7829	71.59%	51,909.56	65.70%
Wetland Total	**Total**	24,905	**100.0%**	79,010.44	**100.0%**

LSA = Local Study Area, RSA = Regional Study Area; ha = hectare; % = percent.

Below is a summary of availability of wetland ecosystems in the LSA and RSA (Table 6.4-9, Figures 1 to 30 in Appendix 6.4-B, Appendix 6.4-A):

- Total wetland ecosites comprise 24,905 ha (15.1%) in the LSA and 79,010 ha (14.4%) in the RSA.
- Most common general habitat type in the LSA and RSA is swamp ecosystems at 17,829 ha (10.8%) and 51,910 ha (9.5%), respectively.
- Least common general habitat type in the LSA and RSA are bog habitats at 111 ha (0.1%) and 606 ha (0.1%), respectively.

Ecosystem Distribution

The distribution of wetland ecosystems has changed from pre-industrial conditions for many of the same reasons that availability has changed. Wetlands are abundant in the LSA and RSA and are found distributed across the area (Figures 1 to 30 in Appendix 6.4-B, Appendix 6.4-A). Wetlands are often associated with lakes, rivers, and streams, making them important movement corridors for many wildlife species. Prior to forest harvesting and other human development activities and features such as roads, mining, urban settlements and recreation, wetlands likely had greater connectivity.

The effects of forestry activities on wetland ecosystem distribution likely have been caused mostly by clearing, water flow interception and culverts for roads, and changes in water quantity, which may have caused smaller wet areas to dry out, thereby reducing wetland connectivity in the LSA and RSA. It is assumed that early logging in the early and mid-1900s would not have followed guidelines specific to riparian areas. The Code of Practice for Timber Management Operations in Riparian Areas was published in 1991 (MNR 1991). Therefore, timber harvesting during these time periods may have cleared riparian areas, resulting in erosion and sedimentation in downstream waterbodies and watercourses, potentially reducing availability and distribution of wetlands.

Aside from forest harvesting, existing winter roads are moderate linear disturbances on the landscape. Some fragmentation would also have been caused by the mining of metals and these disturbances would have created gaps in the distribution of wetlands in the baseline characterization. Some wetlands downstream of mining operations may have been affected by changes in the catchment areas due to altered topography in mine footprints. Changes in the catchment area would affect flows of headwater streams, which may have reduced wetland availability and distribution.

Overall, most wetland ecosystems are well distributed in the RSA, and small localized reductions in connectivity due to past cumulative changes in the baseline characterization are likely within the resilience and adaptability limits of this assessment criterion. Some wetland types that are less common on the landscape (i.e., Bog) are likely approaching the limits of resilience and adaptive capacity to changes in distribution.

Ecosystem Composition

The hydrologic regime is one of the most important factors determining wetland ecosystem function and the health of associated wetland plants (Carter 1997, Sheldon et al. 2005, Welsch et al. 1995). The composition and richness of species in a wetland plant community is influenced by the duration and frequency of saturation and depth of water (Sheldon et al. 2005). Disturbance to one or all of these factors can result in changes to the distribution and richness of plant and wildlife species in wetlands, although individual species will respond differently to changes in the hydrologic regime. The baseline characterization botanical field surveys in the LSA identified a wide range of wetland dependent plant and wildlife species (e.g., Sphagnum spp, bluejoint reedgrass [*Calamagrostis canadensis*], boreal bog sedge *[Carex magellanica]* as well as various other sedges, birds, and moose) (Appendix 6.4-A).

The extent of effects from historical developments on wetland ecosystem composition and hydrology is poorly understood. However, available information indicates that wetland ecosystem composition has likely been altered by historical disturbances and developments in the RSA of the Project footprint since the late 1800s due to forest harvesting, roads, rail, mining and recreational activities. Disturbance can lead to increased invasive species on the landscape. Wetland ecosystems can be particularly sensitive to invasive species, and changes in species composition can affect local wetland structure and function (Zedler and Kercher 2004).

Through much of the 1900s, forestry practices in the RSA would have included clearing trees from riparian areas, which would have caused increased water flow, erosion and siltation in the downstream receiving wetlands. These effects would have altered local hydrologic and abiotic conditions. Plant species composition (i.e., biotic conditions) and habitat conditions for aquatic invertebrates and wetlands dependent wildlife would also have changed. Construction of transportation routes including roads, culverts and bridges likely degraded wetland ecosystems in the RSA through vegetation clearing and removing riparian forests, destabilizing banks and altering upstream and downstream geomorphology.

Wetlands located near anthropogenic disturbance are more likely to be affected by invasive species because of increased exposure to primary vectors for the spread of invasive species such as vehicles and equipment. More remote wetlands can also be affected by invasive species that are transported via waterways and wind; however, native wetlands located beyond 50 m from anthropogenic disturbance are less likely to have been substantially altered by invasive plants in the LSA and RSA (Hamberg et al. 2008).

Within the LSA and RSA, agricultural lands are low in abundance (LSA: 283 ha or 0.3%; RSA: 1,512 ha or 0.3%). In these areas, livestock can affect wetland ecosystem conditions by treading in wetlands, transporting invasive plant seeds, depositing urine and fecal material and foraging on wetland plants. These processes can alter ecological attributes that affect wetland condition, and can lead to changes in water quality, water regime, soil properties, physical form and vegetation health, structure and species composition (Morris and Reich 2013).

Botanical field surveys conducted within the LSA opportunistically documented introduced and invasive plants according to The Early Detection & Distribution Mapping System Ontario (Appendix 6.4-A; University of Georgia 2022); one wetland species was identified, the narrow-leaved cattail (*Typha angustifolia*). However, it is not listed under the prohibited invasive species or restricted invasive species of the *Invasive Species Act* (Ontario 2015). Narrow-leaved cattail grows in wetlands with new plants emerging from established rhizomes in the substrate. This species' rhizomes compete with native wetland plants and are able to populate in open water, thus forming dense vegetated monocultures (University of Georgia 2022). Narrow-leaved cattail was identified at one location within the LSA. This species was found in a shallow marsh (B148) representing approximately 29 ha (<0.1%) of the LSA and 29 ha (<0.1%) of the RSA. In addition, three introduced species were confirmed during the botanical field survey: common buttercup, creeping buttercup and red clover.

Although wetland ecosystem condition probably has been degraded due to anthropogenic disturbances in the LSA and RSA, wetland composition within the baseline characterization is anticipated to be within the resilience and adaptability limits of this criterion.

6.4.5.2.3 Riparian Ecosystems

Ecosystem Availability

Riparian ecosystems are distributed throughout the LSA and RSA, and are associated with streams, rivers, and lakeshores. Historically, disturbance to riparian areas would have been from natural factors such as fires, floods, wildlife and disease. Since the late 1800s to early 1900s, disturbances from many sources including forest harvesting, roads, rail, mining, agriculture and recreational activities have been the primary factors contributing to changes in riparian habitat availability. The construction of transportation routes, including roads and culverts, would have altered riparian habitat in the region through vegetation clearing and the removal of riparian forests. Much of the disturbance to riparian areas would have been associated with logging. The Code of Practice for Timber Management Operations in Riparian Areas was published in 1991 (MNR 1991). It is assumed that early logging in the late 1800s to mid-1900s would not have followed guidelines specific to riparian areas. Thus, historical logging in riparian areas may have led to more erosion, sedimentation, soil compaction, rutting and water pooling than more recent logging in areas surrounding lakes, streams and rivers. The areas of ecosites in the riparian ecosystem in the baseline characterization are provided in Appendix 6.4-A.

Table 6.4-10: Riparian Ecosystems Availability within the Baseline Characterization for the Local and Regional Study Areas

Riparian Habitat / Ecosite Grouping	General Habitat Type	LSA[(a)] Area (ha)	LSA[(a)] Percent (%)	RSA[(a)] Area (ha)	RSA[(a)] Percent (%)
Upland Ecosites	Coniferous Forest	4,712	64.3%	15,072	63.1%
Upland Ecosites	Deciduous Forest	2,292	31.3%	7,809	32.7%
Upland Ecosites	Mixed Forest	87	1.2%	549	2.3%
Upland Ecosites	Shrub	74	1.0%	172	0.7%
Upland Ecosites	Field	15	0.2%	58	0.2%
Upland Ecosites	Meadow	117	1.6%	136	0.5
Upland Ecosites	Barren	36	0.5%	77	0.32%
Upland Total	**Total**	7,334	100.0%	23,873	100%
Wetland Ecosites	Bog	7	0.1%	19	0.1%
Wetland Ecosites	Fen	1,027	19.8%	3,295	21.4%
Wetland Ecosites	Marsh	1,708	32.9%	5,339	34.7%
Wetland Ecosites	Swamp	2,444	47.1%	6,725	43.7%
Wetland Total	**Total**	5,186	100.0%	15,378	100%
Upland and Wetland Ecosites	**Total**	12,520	100%	42,301	100%

a) Total area/percentage of available riparian habitat. This does not include areas of unavailable habitat (anthropogenic/disturbed areas).

LSA = Local Study Area, RSA = Regional Study Area; ha = hectare; % = percent.

Below is a summary of availability of riparian ecosystems in the LSA and RSA (Table 6.4-10; Figures 1 to 30 in Appendix 6.4-B; Appendix 6.4-A):

- Total riparian in the LSA comprised of 12,520 ha (7.6%). Anthropogenic/disturbed ecosites (commercial, industrial, residential, constructed types [e.g., landfills, paved/gravel surfaces], waterbodies) represent 8,313 ha (5.0%) of the LSA.
- Riparian upland areas in the LSA account for 7,334 ha (4.5% of the LSA). Riparian forested areas account for 7,093 ha (4.3% of the LSA; 96.7% of riparian upland ecosystems in the LSA), while riparian non-forested areas (i.e., bedrock, meadows) account for 242 ha (0.1% of the LSA; 3.3% of riparian upland ecosystems in the LSA).
- Riparian wetland areas in the LSA account for 5,186 ha (3.1% of the LSA).
- Total riparian in the RSA comprised 39,252 ha (7.2%). Anthropogenic/disturbed ecosites comprise 22,052 ha (4.0%) of the RSA.
- Riparian upland areas in the RSA account for 23,873 ha (4.4% of the RSA). Riparian forested areas account for 23,430 ha (4.3% of the RSA; 98.1% of riparian upland ecosystems in the RSA), while riparian non-forested areas (i.e., bedrock, meadows) account for 443 ha (0.1% of the RSA; 1.9% of riparian upland ecosystems in the RSA).
- Riparian wetland areas in the RSA account for 15,378 ha (2.8% of the RSA).
- Most common general habitat type in the LSA and RSA is coniferous forest at 4,713 ha (2.9%) and 15,072 ha (2.7%), respectively. Comparatively, in the LSA and RSA the most common single ecosite is Aspen – Birch Hardwood (B055) – a deciduous forest habitat at 38,572 ha (23.4%) and 120,260 ha (21.9%).
- Least common riparian general habitat type in the LSA and RSA is bog representing 7 ha (<0.01%) and 19 ha (<0.01%), respectively.

Overall, 93.0% of habitat adjacent to watercourses and waterbodies in the LSA is naturally vegetated in the baseline characterization, which is above the resource management criterion of 75.0% naturally vegetated stream length recommended by Environment Canada (2013) to prevent degradation of these ecosystems. Within the RSA, 92.7% of the area adjacent to watercourses and waterbodies is naturally vegetated. Changes to ecosystem availability appear to be within the resilience and adaptability limits of this criterion in the baseline characterization despite historical losses to riparian areas.

Ecosystem Distribution

Changes to riparian distribution are caused by the same disturbances as those described in Ecosystem Availability. Regional connectivity of riparian habitat is important for dispersal of plants, and for movement of fish and wildlife species. In the LSA and RSA, an extensive network of streams, rivers, and waterbodies are bordered by riparian vegetation (Figures 1 to 30 in Appendix 6.4-B, Appendix 6.4-A). The distribution of riparian habitat in the RSA is likely within the range of natural historical conditions (where natural events such as flooding would have caused regular shifts in distribution), except in areas affected by forest harvesting, roads, urban settlements and mines, where riparian systems have been lost or permanently altered.

The LSA and RSA contain similar distribution of general ecosite types within riparian habitat areas; however, deciduous forest does have a higher distribution within the RSA's riparian habitat. Changes to riparian habitat distribution that occurred in the baseline characterization are predicted to be within the resilience and adaptability limits of this criterion.

Ecosystem Composition

Riparian trees provide habitat for wildlife and shade to buffer temperature within watercourses. Inputs of fallen woody debris increase fish habitat and inputs of organic matter from leaf litter provide food for invertebrates and fish. Riparian habitat also maintains water quality of watercourses by filtering out nutrients and contaminants.

Riparian areas with undisturbed soils that are distant from disturbances are resistant to invasion by non-native plant species. However, riparian habitat edges adjacent to disturbances are more prone to invasion. Human disturbances such as logging, urban areas and mining have the potential to accelerate the establishment of invasive plant species in native ecosystems through the introduction of seeds or disturbance of soils (Hamberg et al. 2008, Watkins et al. 2003).

Riparian habitat in the region has been and continues to be altered by human activities such as vegetation clearing. Through much of the 1900s, forestry practices would have included clearing trees from riparian areas. This practice altered local hydrological and abiotic conditions, and plant species composition and habitat conditions for fish, aquatic invertebrates, and wildlife. Disturbance near riparian habitat can increase the potential for invasive species and noxious species. They both have the potential to out compete native plants and become permanently established. Large changes in species composition can alter the function of ecosystem processes and change the dynamic of how other species interact within the ecosystem (Naeem et al. 1999). Other disturbances such as roads, urban settlements and mining likely increased access to previously remote areas and caused habitat fragmentation and barriers or partial barriers to wildlife movement, especially along riparian corridors.

Baseline characterization botanical field surveys were conducted within the LSA and RSA. Invasive and noxious species were detected within the LSA, of which have potential to occur within riparian ecosystems.

The riparian habitats in the RSA and LSA of the Project footprint have maintained overall function in terms of ability to support the variety of wildlife that use them for foraging, nesting, and dispersal. Therefore, changes to the condition of riparian habitat in the baseline characterization are predicted to be within the resilience and adaptability limits of this criterion.

6.4.5.2.4 Plant Species at Risk

Baseline characterization botanical field surveys conducted within the LSA and RSA identified one plant SAR, black ash. Therefore, this criterion will focus and discuss its indicators for this species only.

Habitat Quantity

Black ash is commonly found in moist ecosystem and in northern Ontario, particularly swampy woodlands (MNRF 2022b); however, is also known to inhabit fresh to moist forest upland communities. It typically grows on mucky or peaty soils and is considered a facultative wetland species (Reznicek et al. 2011). Wetland ecosystems have historically been common within the LSA and RSA (Section 6.4.5.2.2). In the past, boreal forest composition (including treed wetlands) has primarily been affected by wildfire, insect outbreaks and disease. Treed wetland availability has changed since industrial development in the RSA due to anthropogenic disturbances such as forest harvesting, controlled fire suppression, roads, rail, mining and recreational activities. Construction of transportation routes may have reduced the availability of all wetland ecosystems in the RSA because of draining or filling of small wetlands along road ROWs, and potential redirection or channelization of local water flow. Any changes to treed wetland ecosystems containing black ash have the potential to negatively impact this species.

Black ash was identified at ten separate locations within the RSA, and incidentally observed on six occasions during targeted wildlife and aquatic field assessments (Figures 1, 2, 5, 9, and 10 in Appendix 6.4-C; Appendix 6.4-A). This species was found in thicket swamp (B134, B135), deciduous forest (B104), and treed swamp (B130, B131) ecosites.

The draft SWH Criteria Schedules for Ecoregion 3W (MNRF 2017a) identifies twelve ecosite types within the 3W-1 ecodistrict area that may provide candidate habitat for black ash. The candidate ecosites consist of mixed and deciduous forest types. Of the twelve types, three (B059, B071, B108) occur within the LSA and six additional types (B056, B059, B071, B105, B108, B120) occur within the RSA (Appendix 6.4-C; Appendix 6.4-A).

There is 122 ha (<0.1%) of confirmed black ash habitat within the LSA and 141 ha (<0.1%) within the RSA. There is additionally 50 ha (<0.1%) of candidate black ash habitat within the LSA and 253 ha (<0.1%) within the RSA.

Black ash is a facultative wetland species and although they are typically found in habitats with high moisture level, they were on occasion identified in drier habitats in the RSA. Therefore, they have the capacity to be resilient to changes in moisture regime. However, in combination with other disturbances (e.g., invasive species), they would be likely less resilient to negative habitat changes.

Habitat Distribution

Black ash habitat, including ecosites in which the species was confirmed, in addition to ecosites determined to be candidate habitat, were limited to the southern half of the LSA, extending approximately 40 km north of Atikokan and east to Thunder Bay (Appendix 6.4-C; Appendix 6.4-A).

Habitat is generally scattered across the area, associated with wetland and moist upland habitats and is not considered limited.

It is anticipated that some fragmentation has occurred in the past, particularly in areas of greater development, including the City of Thunder Bay. However, it is not evident that development outside of the city has had any major impact on the distribution of this species. The spatial distribution of this species suggests that existing development may not have had significant impacts on distribution of this species.

Survival and Reproduction

Black ash is designated as endangered under the ESA and threatened under SARA. It was recently listed on the Species at Risk in Ontario (SARO) list due to the susceptibility of Ontario's black ash population to infestation by the emerald ash borer; however, there is a temporary suspension of protection under the ESA until January 2024 (MECP 2022). It is estimated 53 to 99% of the Ontario range is susceptible to infestation and predicted population declines of mature trees will occur over the next 80 years (MECP 2022).

Alteration to the existing population of black ash may not only be directly influenced by anthropogenic activities, as discussed above, but also from more selective impacts, particularly from invasive species. Emerald ash borer continues to ravage ash trees throughout the province. Emerald ash borer has been documented within the Thunder Bay region and is therefore presumed to have already impacted trees within the LSA and RSA. Impacts may not be visible until eight to ten years after first infesting a tree and it is therefore anticipated a larger number of trees have already been infested within the LSA and RSA than what has been documented.

The spread of the emerald ash borer is thought to be primarily due to anthropogenic means by movement of infested material (e.g., firewood) between regions or not adequately removing emerald ash borer individuals from equipment prior to leaving an infected area.

Management measures to prevent the spread of emerald ash borer have already been implemented at the provincial level, including restricting the movement of specific wood materials (e.g., firewood) across various regions.

6.4.5.2.5 Plant Species of Conservation Concern

Habitat Quantity

SOCC plants capture various species that are not protected as Threatened or Endangered by the SARO, and are considered rare at the federal, provincial and/or regional level. The habitat associated with special concern and provincially rare species with a subnational rank (Srank) of the following as SWH:

- S1 – Extremely rare in Ontario with fewer than five occurrences in the province, or very few remaining hectares.
- S2 – Very rare in Ontario with between five and twenty occurrences in the province, or few remaining hectares.
- S3 – Rare to Uncommon in Ontario with between twenty and one hundred occurrences in the province, may have fewer occurrences but with some extensive examples remaining.
- SH – Indicates that an element has been known from the province historically, but has not been seen in many years, although it is not known to be conclusively extirpated.

The NHIC (MNRF 2022) maintains records of fourteen rare plants within the RSA with an Srank of S1 through S3 and SH, and are identified in Table 6.4-11 (Appendix 6.4-C). Five additional species were revealed to occur within the greater area and included: blind's bryum (*Bryum blindii*; S2), coralloid foam lichen (*Stereocaulon subcoralloides*, S2?), prairie sagebrush (*Artemisia frigida*; S3), sieve-tooth moss (*Grimmia cribrosa*; S1) and small yellow pond-lily (*Nuphar microphylla*; S3?). The habitat of these plants also constitute SWH, specifically special concern and rare (S1, S2 and S3) plant and animal species.

Table 6.4-11: NHIC Summary of Rare Species Known to Occur within the LSA and RSA

Species	Srank[(a)]	LSA (ha)	RSA (ha)
Scabrous black sedge (*Carex atratiformis*)	S2S3	315	324
Clinton's clubrush (*Trichophorum clintonii*)	S2S3	6	6
Vasey's rush (*Juncus vaseyi*)	S2S3	249	317
Slender bulrush (*Schoenoplectus heterochaetus*)	S3?	176	316
Long-leaved arnica (*Arnica lonchophylla*)	S3?	515	631
Pale moonwort (*Botrychium pallidum*)	S1S2	-	76

Species	Srank[(a)]	LSA (ha)	RSA (ha)
Woolly beach-heather (*Hudsonia tomentosa*)	S3	3	3
Water awlwort (*Subularia aquatica*)	S2S3	-	1
Western wheatgrass (*Pascopyrum smithii*)	S2	3	6
Franklin's Phacelia (*Phacelia franklinii)*	S2	225	506
Limestone oak fern (*Gymnocarpium robertianum)*	S2	1	1
Auricled twayblade (*Neottia auriculata)*	S3	281	315
Quill spikerush (*Eleocharis nitida)*	S2?	<1	<1
Ryegrass sedge *(Carex loliacea)*	S1S2	<1	<1
Total	**N/A**	**1,774**	**2,502**

a) Srank is the subnational rank assigned by NHIC representing the conservation status of a species or plant community within Ontario.

LSA = Local Study Area; RSA = Regional Study Area; N/A = not applicable; ha = hectare.

Most of these species occur within wetland and upland ecosites common throughout the LSA and RSA. Based on the NHIC data points, the corresponding FRI ecosite polygons were identified as the respective area of occurrence for each rare plant species listed above (Appendix 6.4-C). The total area for these rare plant species represents 1.1% (1,774 ha) of the LSA and 0.5% (2,502 ha) of the RSA.

Four species were determined to occur in more specialized habitats or habitats that represent a small percentage of the LSA:

- Ryegrass sedge exclusively occurs in bog or muskeg habitat, which represents 0.1% of wetlands within the LSA, and <1% of the RSA; and
- Coralloid foam lichen, sieve-tooth moss and scabrous black sedge prefer rock barren sites, which comprise <1% (36 ha) of the LSA, and <1% (77 ha) of the RSA.

In addition to the provincially rare species, one species – Ragged fringed orchid, was confirmed within the LSA during baseline characterization (Figures 11 and 12 in Appendix 6.4-C; Appendix 6.4-A). Ragged fringed orchid is commonly found in moist ecosystems that have full or partial sun, and acidic soil composed of sand, silt-loam, peaty material or some gravel (North Carolina State University 2022). It is commonly found in moist prairies, sand prairies, sandy swamps, moist open woodlands, shrubby bogs, low areas along streams, sandy fields and ditches (North Carolina State University 2022). Ragged fringed orchid was confirmed within a fen (B139) ecosite 1.8 ha in size, comprising <1% of the LSA and <1% of the RSA. The habitat associated with the ragged fringed orchid also represents a vegetation SWH type known as diverse and sensitive orchid communities. This SWH type comprises 21,087 ha (12.8%) of the LSA and 65,756 ha (3.8%) of the RSA, the largest vegetation SWH (Appendix 6.4-C).

Habitat Distribution

Habitat of the diverse and sensitive orchid community type spans the LSA and RSA. In general, there is not one particular area of the LSA or RSA that supports these species; rather, they are well distributed across the LSA and RSA and occur among the upland and wetland ecosystems (Appendix 6.4-C).

Two habitats, bog and barren, comprise a small area of the LSA and RSA and given that four rare species (i.e., ryegrass sedge, coralloid foam lichen, sieve-tooth moss and scabrous black sedge) are dependent on these habitats for survival, therefore have reduced distribution throughout the LSA and RSA.

Survival and Reproduction

Is it expected that the greatest threats to ecosystem composition are from impacts that would otherwise alter the current habitat characteristics. Changes to drainage patterns and alteration of moisture regimes would otherwise result in dieback of many species, particularly those that may be obligate or almost always found in either wetland or upland ecosystems. Facultative species, or those species that may occur within both wetland and upland ecosystems or are more tolerant of some changes to moisture regime, will be more resilient to change.

Introduction of invasive or noxious species into habitat of SOCC and diverse and sensitive orchid community SWH type may directly impact habitat needs of resident species. Both invasive and introduced species were confirmed within the LSA during baseline characterization botanical field surveys.

The presence of these species in upland and wetland habitats throughout the LSA and RSA can otherwise impact existing native vegetation by up-taking available nutrients and leaving native species deficient, or more directly shadowing and smothering native species. For example, narrow-leaved cattail is identified as an invasive species and is known to form dense cover through establishment of rhizomes. Colonization of this species would ultimately impact native species, such as slender bulrush, and has the potential to completely eliminate this species from a wetland ecosite.

6.4.5.2.6 Plants of Traditional Use

Plants of traditional use include species collected for sustenance, cultural and medicinal purposes. Section 7.7.8.4 highlights the importance of traditional use plants for each First Nation community and section 7.8.8.4 highlights the importance of traditional use plants for Métis communities. The information shared by community members is discussed herein; however, is not considered a comprehensive list.

Habitat Quantity

Traditional use plant species that were documented as part of the baseline characterization (Appendix 6.4-A), and through correspondence with First Nation and Métis communities, are considered in this assessment. Appendix 6.4-D contains an extensive list of traditional use plant species and names. The appendix is comprised of traditional use plants identified by Indigenous communities, shared by Fort William First Nation and reflecting species also noted by other communities including Migisi Sahgaigan First Nation, Lac des Mille Lacs First Nation, and NWOMC and Region 2. These plants of traditional use have been identified in Section 7.7 and Section 7.8.

The following list of traditional use plants represent species identified as important to more than one community, and are representative of various upland, wetland and riparian plants and habitat types known to occur within the RSA, LSA and the Project. It is understood that some of the species listed below may be better represented by a subset of ecosites comprising the general habitat type. The general habitat method may overestimate habitat available and lost associated with the Project. Due to considerations discussed in the prediction of confidence (Section 6.4.12), particularly the high discrepancy between ecosites ground-truthed versus existing FRI ecosite, and intent of the EA to look at broadscale change, consideration of general habitat types remain valuable at providing an estimate of representative habitat change. Species identified as important to more than one community include:

- Eastern white cedar (*Thuja occidentalis*);
- Beaked hazelnut (*Corylus cornuta*);
- Paper birch;
- Showy mountain ash (*Sorbus decora*);
- Chokecherry (*Prunus virginiana*);
- Chaga (*Inonotus obliquus*);
- Common bearberry (*Arctostaphylos ura-ursi*);
- Early lowbush blueberry (*Vaccinium angustifolium*);
- Highbush cranberry (*Viburnum opulus*);
- Labrador tea (*Rhododendron groenlandicum*);
- Sage (*Artemisia frigida*);
- Saskatoon berry (*Amelanchier alnifolia*);
- Canada wild ginger (*Asarum canadense*);

- Common yarrow (*Achillea millefolium*);
- Pin cherry (*Prunus pensylvanica*);
- Prickly rose (*Rosa acicularis*); and
- Various grasses, including sweetgrass (*Hierochloe odorata*).

These species were carried through to a representative assessment of ecosystem availability. The assessment was designed to consider the three primary ecosystems types (i.e., upland, wetland and riparian) which occur within the boreal forest region that support the variety of traditional use plants.

The report, *Traditional Knowledge, Land and Resources Use Study for the Waasigan Transmission Line Project* (2022) provided by Migisi Sahgaigan First Nation notes concerns regarding potential Project effects on the availability of wild foods for Migisi Sahgaigan First Nation harvesters. The report indicates the presence of wild rice, berries, and plants (including medicinal plants of cultural importance) in areas near the Project footprint (Migisi Sahgaigan 2022).

Northwestern Ontario Métis Community (NWOMC) and Region 2 offered information related to general habitats commonly harvested by their members (MNP LLP 2021). In accordance with the feedback received, mixed forest offers the most important type to members for harvesting, followed by coniferous forest, sparse forest, wetland, deciduous forest and then grassland. These habitat types appear to correspond to a former classification system used to describe landcover across northern Ontario. To support quantitative analysis in this EA, ecosites were grouped into 'general habitat types' according to key vegetation characteristics as based on the FRI data. FRI data represents a more current classification system and better accuracy.

In most cases, the EA general habitats correspond with the habitats used by NWOMC and Region 2, with some differences. Sparse forest may best correspond with shrub communities that contain occasional trees and/or forest communities with open canopy, while grassland may best correspond to meadow and field habitats. For the purpose of this EA, forest communities were characterized by species dominance (i.e., coniferous, deciduous, mixed), and not structure or coverage. Similarly, field and meadow habitats may support native grassland species, particularly if field habitat has been left to go fallow.

Upland and wetland habitats are host of the aforementioned plant species, and both have historically been common in the LSA and RSA. Their availability, specifically general habitat types, has almost certainly changed over time across the study areas. Common upland ecosites are expected to have the capacity to adapt and be resilient to existing natural and human related disturbances and associated variations in availability. Less commonly found upland ecosystems are likely less resilient and more susceptible to change. Upland ecosystems are discussed in Section 6.4.5.2.1. Wetland availability has changed since industrial development in the RSA due to anthropogenic disturbances such as forest harvesting, controlled fire suppression, roads, rail, mining and recreational activities. Construction of transportation routes may have reduced the availability of all types of wetland ecosystem in the RSA because of draining or filling of small wetlands along road ROWs, and potential redirection or channelization of local water flow. Wetland ecosystems are discussed in Section 6.4.5.2.2.

Table 6.4-12: Summary of Baseline Characterization of Plants of Traditional Use and Related Habitats in the Local and Regional Study Area

General Habitat Type	LSA[a] (ha)	RSA[a] (ha)	Eastern White Cedar	Paper Birch/Chaga	Showy Mountain Ash	Chokecherry	Common Bearberry/Pin Cherry	Early Lowbush Blueberry	Highbush Cranberry	Labrador Tea	Saskatoon Berry	Canada Wild Ginger/ Beaked hazelnut	Common Yarrow/Sage	Prickly Rose	Sweetgrass	Wild Rice*
Coniferous Forest	59,995	184,137	**Confirmed[b]**	**Confirmed[e]**	**Confirmed**	**Confirmed**	**Confirmed**	**Confirmed**	**Confirmed**	**Confirmed**	**Suitable[c]**	**Suitable**	Not suitable	**Confirmed**	Not suitable	Not suitable
Deciduous Forest	51,233	156,667	**Suitable**	**Confirmed[e]**	**Confirmed**	**Confirmed**	**Suitable**	**Suitable**	**Confirmed**	**Confirmed**	**Suitable**	**Confirmed[e]**	Not suitable	**Confirmed**	Not suitable	Not suitable
Mixed Forest	1,652	6,460	**Suitable**	**Confirmed[e]**	**Confirmed**	**Suitable**	**Suitable**	**Suitable**	**Suitable**	Not suitable	**Suitable**	**Suitable**	Not suitable	**Suitable**	Not suitable	Not suitable
Shrub	946	1,968	Not suitable	Not suitable	**Suitable**	**Suitable**	**Suitable**	**Confirmed**	**Suitable**	**Confirmed**	**Suitable**	Not suitable	**Suitable**	**Confirmed**	Not suitable	Not suitable
Field	527	1,869	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable
Meadow	2,394	2,735	Not suitable	**Suitable**	Not suitable	**Suitable**	**Suitable**	**Confirmed**	Not suitable	**Suitable**	Not suitable	Not suitable	**Confirmed[e]**	**Suitable**	**Suitable**	Not suitable
Barren	957	1,516	**Suitable**	**Suitable**	**Suitable**	**Suitable**	**Suitable**	**Suitable**	Not suitable	Not suitable	**Suitable**	Not suitable	Not suitable	**Suitable**	Not suitable	Not suitable
Bog	111	605	**Suitable**	Not suitable	Not suitable	Not suitable	Not suitable	**Suitable**	**Suitable**	**Suitable**	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable
Fen	3,777	16,096	**Suitable**	**Confirmed[e]**	Not suitable	Not suitable	Not suitable	**Confirmed**	Not suitable	**Confirmed**	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable
Marsh	3,188	10,399	**Suitable**	**Confirmed[e]**	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	**Confirmed**	Not suitable	Not suitable	Not suitable	**Confirmed**	**Suitable**	**Suitable**
Swamp	17,829	51,909	**Confirmed**	**Confirmed[e]**	Not suitable	**Confirmed**	Not suitable	**Confirmed**	**Confirmed**	**Confirmed**	**Confirmed**	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable
LSA Confirmed			77,824	137,674	112,880	111,228	59,995	84,941	129,057	136,968	17,829	51,233	2,394	115,362	0	15
LSA Suitable			60,918	3,351	946	23,778	57,182	53,953	2,709	2,505	114,783	61,647	2,309	5,003	5,582	2,161
LSA Total[d]	**142,609**	**-**	**138,742**	**141,025**	**113,826**	**135,006**	**117,177**	**138,894**	**131,766**	**139,473**	**132,612**	**112,880**	**4,703**	**120,365**	**5,582**	**2,176**
RSA Confirmed			236,046	425,668	347,264	392,713	184,137	256,845	392,713	421,176	51,909	156,667	2,735	353,171	0	686
RSA Suitable			191,743	4,251	1,968	12,679	169,346	165,853	9,033	3,340	350,748	190,597	1,968	10,711	13,134	7,747
RSA Total[d]	**-**	**427,789**	**427,789**	**429,919**	**349,232**	**405,392**	**353,483**	**422,698**	**401,746**	**424,516**	**402,657**	**347,264**	**4,703**	**363,882**	**13,134**	**8,433 ha**

a) Area summary of general habitat type for upland ecosites (Table 6.4-4) and wetland ecosites (Table 6.4-9).
b) Confirmed = Presence confirmed in general habitat type from botanical field surveys. e) First species listed were confirmed through field studies.
c) Suitable/Not suitable was determined from general habitat types identified in Farrar 1995; Soper 1982; Newmaster 1997.
d) Using habitat groupings to represent measures of traditional use plant presence overestimates the availability and distribution of these plants throughout the study areas.
LSA = Local Study Area, RSA = Regional Study Area; ha = hectare.
* Wild rice subject to supplementary assessment, where marsh habitat must occur within or adjacent to open water.

Eastern white cedar

Eastern white cedar, traditionally used for medicinal and ritual purposes (Davidson-Hunt et al. 2005; Wabigoon Lake Ojibway Nation monitor, personal communication, July 30, 2022; Marles et al. 2000), is commonly found in conifer forest, deciduous forest, mixed forest, marsh, fen, bog, swamps, shoreline, cliff and bluff habitats in northwestern Ontario. These ecosystems have historically been present within the LSA and RSA, some less common than others. In the field, this species was identified in a conifer forest (B012), conifer swamp (B129) and hardwood swamp (B133).

- Eastern white cedar was confirmed in habitat types which represent 55% (77,824 ha) of LSA's general habitat types and 43% (236,046 ha) of RSA's general habitat types.
- Additional 43% (60,918 ha) of the LSA characterized as suitable habitat for Eastern white cedar.
- Additional 44% (191,743 ha) of the RSA characterized as suitable habitat for Eastern white cedar.

Paper birch/Chaga

Paper birch, traditionally used for food, medicinal, technological and ritual purposes (Davidson-Hunt et al. 2005; Marles et al. 2000), is commonly found in deciduous forest, conifer forest, mixed forest, meadow, swamp, shoreline, cliff, bluff, rock barren, and talus habitats.

These ecosystems have historically been present within the LSA and RSA. In the field, this species was identified in coniferous forest (B037, B049, B050), deciduous forest (B055 B070, B104), mixed forest (B059), treed swamp (B129), treed fen (B136) and marsh (B148).

- Paper birch was confirmed in habitat types which represent 97% (137,674 ha) of the general habitat types in the LSA and 98% (425,668 ha) of RSA's general habitat types.
- Additional 2% (3,351 ha) of the LSA characterized as suitable habitat for Paper birch.
- Additional 1% (4,251 ha) of the RSA characterized as suitable habitat for Paper birch.

A fungus that grows almost exclusively on birch trees in the circumboreal forests of the northern hemisphere, chaga is used for medicinal and ceremonial purposes (Marles et. al. 2000). It is anticipated that any potential impacts from the Project, as discussed later in this report, will be similar for both Paper birch and Chaga.

Showy mountain ash

Showy mountain ash, traditionally used for food and ritual purposes (Davidson-Hunt et al. 2005; Wabigoon Lake Ojibway Nation monitor, personal communication, August 20, 2022), is commonly found in open forests, thickets, and rocky shores of rivers and lakes. These ecosystems have historically been present within the LSA and RSA. In the field, this species was identified in coniferous forest (B049, B050, B114), deciduous forest (B055, B119), and mixed forest (B059).

- Showy mountain ash was confirmed in in habitat types which represent 79% (112,889 ha) of LSA's general habitat types and 80% (347,264 ha) of RSA's general habitat types.
- Additional 1% (946 ha) of the LSA characterized as suitable habitat for Showy mountain ash.
- Additional 0.5% (1,968 ha) of the RSA characterized as suitable habitat for Showy mountain ash.

Chokecherry

Chokecherry, traditionally used for food, medicinal and technological purposes (Davidson-Hunt et al. 2005; Lac des Mille Lacs First Nation monitor, personal communication, August 24, 2022), is commonly found in forest edge, swamp, on hillside, talus slope, rocky ridge, open ledge, and open habitats. These ecosystems have historically been present within the LSA and RSA. In the field, this species was identified in coniferous forest (B037), deciduous forest (B119), and thicket swamp (B134).

- Chokecherry was confirmed in in habitat types which represent 78% (111,228 ha) of LSA's general habitat types and 90% (392,713ha) of RSA's general habitat types.
- Additional 17% (23,778 ha) of the LSA characterized as suitable habitat for Chokecherry.
- Additional 3% (12,679 ha) of the RSA characterized as suitable habitat for Chokecherry.

Common bearberry/Pin cherry

Common bearberry, traditionally used for food and medicinal purposes (Lac des Mille Lacs First Nation monitor, personal communication, August 24, 2022), is commonly found in semi-open coniferous forests, as well as dry, sandy, open, and rock barren habitats. These ecosystems have historically been present within the LSA and RSA. In the field, this species was identified in coniferous forest (B049).

- Common bearberry was confirmed in habitat types that represent 42% (59,995 ha) of LSA's general habitat types and 42% (184,137 ha) of RSA's general habitat types.
- Additional 40% (57,182 ha) of the LSA characterized as suitable habitat for Common bearberry.
- Additional 39% (169,346 ha) of the RSA characterized as suitable habitat for Common bearberry.

Pin cherry is a small tree that grows in dry woods, clearings, sand and gravel banks, rocky ridges and barrens and is used as food, medicine or to make dye (Soper and Heimburger 1982; Marles et. al. 2000). It is anticipated that any potential impacts from the Project, as discussed later in this report, will be similar for both Common bearberry and Pin cherry.

Early lowbush blueberry

Early lowbush blueberry, traditionally used for food, medicinal, technological, and ritual purposes (Davidson-Hunt et al. 2005; Lac des Mille Lacs First Nation monitor, personal communication, August 24, 2022), is commonly found in open coniferous forest, deciduous forest, mixed forest, meadow (including ROW and roadsides), rock barren, and bog habitats. These ecosystems have historically been present within the LSA and RSA. In the field, this species was identified in coniferous forest (B035, B037, B049, B050, B054, B098, B101), sparse shrub (B046), meadow (B008, B030), treed fen (B136), and treed swamp (B046).

- Early lowbush blueberry was confirmed in in habitat types which represent 60% (84,941 ha) of LSA's general habitat types and 59% (256,845 ha) of RSA's general habitat types.
- Additional 38% (53,952 ha) of the LSA characterized as suitable habitat for Early lowbush blueberry.
- Additional 38% (165,853 ha) of the RSA characterized as suitable habitat for Early lowbush blueberry.

Highbush cranberry

Highbush cranberry, traditionally used for food and medicinal purposes (Davidson-Hunt et al. 2005; Lac des Mille Lacs First Nation monitor, personal communication, August 24, 2022), is commonly found in moist forest, bog, swamp, and thicket habitats. These ecosystems have historically been present within the LSA and RSA. In the field, this species was identified in conifer forest (B114), deciduous forest (B119), and thicket swamp (B134).

- Highbush cranberry was confirmed in in habitat types which represent 91% (129,057 ha) of LSA's general habitat types and 97% (421,176325,367 ha) of RSA's general habitat types.
- Additional 2% (2,709 ha) in the LSA of suitable habitat for Highbush cranberry.
- Additional 4% (19,430 ha) in the RSA of suitable habitat for Highbush cranberry.

Labrador tea

Labrador tea, traditionally used for food, medicinal and ritual purposes (Davidson-Hunt et al. 2005; Wabigoon Lake Ojibway Nation Monitor, personal communication, August 9, 2022; Marles et al. 2000), grows in upland and wetland habitats. In northwestern Ontario, it is commonly found in conifer forest, shrub, meadow, swamp, bog and fen habitats, ecosystems that have historically been common within the LSA and RSA. In the field, it was identified in conifer forest (B012, B049, B050, B054, B114), deciduous forest (B055), shrub (B046), thicket swamp (B135), treed swamp (B128, B129, B133), fen (B136) and marsh (B142) general habitat types.

- Labrador tea was confirmed in habitat types which represent 96% (136,968 ha) of LSA's general habitat types and 97% (421,176 ha) of RSA's general habitat types.
- Additional 2% (2,505 ha) in the LSA of suitable habitat for Labrador tea.
- Additional 1% (3,340 ha) in the RSA of suitable habitat for Labrador tea.

Saskatoon berry

Saskatoon berry, traditionally used for food, medicinal, and technological purposes (Davidson-Hunt et al. 2005; Lac des Mille Lacs First Nation monitor, personal communication, August 24, 2022), is commonly found in thicket, edge of forest, and rock barren habitats. These ecosystems have historically been present within the LSA and RSA. In the field, this species was identified in a treed swamp (B133).

- Saskatoon berry was confirmed in habitat types which represent 13% (17,829 ha) of LSA's general habitat types and 12% (51,909 ha) of RSA's general habitat types.
- Additional 80% (114,783 ha) in the LSA of suitable habitat for Saskatoon berry.
- Additional 81% (350,748 ha) in the RSA of suitable habitat for Saskatoon berry.

Canada wild ginger/ Beaked hazelnut

Canada wild ginger, traditionally used for food and medicine (Davidson-Hunt et al. 2005), is commonly found in rich deciduous, coniferous, and mixed habitats. Similar to wild ginger, Beaked hazelnut is a shrub that grows in woods, thickets and moist hillsides and is traditionally used for food (nuts), medicine and dyes (Marles et al. 2000).

These ecosystems have historically been present within the LSA and RSA. In the field, this species was identified in a deciduous forest (B119).

- Canada wild ginger was confirmed in in habitat types which represent 36% (51,233 ha) of LSA's general habitat types and 36% (156,667 ha) of RSA's general habitat types.
- Additional 43% (61,647 ha) in the LSA of suitable habitat for Canada wild ginger.
- Additional 44% (190,597 ha) in the RSA of suitable habitat for Canada wild ginger.

It is anticipated that any potential impacts from the Project, as discussed later in this report, will be similar for both Canada wild ginger and Beaked hazelnut.

Common yarrow/Sage

Common yarrow, traditionally used for medicinal properties (Wabigoon Lake Ojibway Nation monitor, personal communication, August 15, 2022), is commonly found in open forest and moist meadow habitats. Sage is a species that grows in pastures and meadows in western Canada, however, was introduced into eastern Canada. It is traditionally used for medicinal and ceremonial purposes (Marles et. al. 2000).

These ecosystems have historically been present within the LSA and RSA. In the field, this species was identified in a meadow (B008).

- Common yarrow was confirmed in in habitat types which represent 2% (2,394 ha) of LSA's general habitat types and 1% (2,735 ha) of RSA's general habitat types.
- Additional 2% (2,309 ha) in the LSA of suitable habitat for Common yarrow.
- Additional 0.5% (1,968ha) in the RSA of suitable habitat for Common yarrow.

It is anticipated that any potential impacts from future development, as discussed later in this report, will be similar for both Common yarrow and Sage.

Prickly rose

Prickly rose, traditionally used for food and for medicinal purposes (Lac des Mille Lacs First Nation monitor, personal communication, August 24, 2022), is commonly found in open forest, meadow, and rock barren habitats. These ecosystems have historically been present within the LSA and RSA. In the field, this species was identified in conifer forest (B049, B050, B101, B114), deciduous forest (B055, B088, B104), sparse shrub (B046), and marsh (B148).

- Prickly rose was confirmed in in habitat types which represent 81% (115,362 ha) of LSA's general habitat types and 81% (353,171 ha) of RSA's general habitat types.
- Additional 4% (5,003 ha) in the LSA of suitable habitat for Prickly rose.
- Additional 2% (10,711ha) in the RSA of suitable habitat for Prickly rose.

Sweetgrass and wild rice

Although sweetgrass and wild rice were not identified during the field program, they are identified as important traditional use plants in the northwest region of Ontario and are known to occur within the LSA and RSA. The whole aboveground plant structure of sweet grass is utilized traditionally for rituals (Davidson-Hunt et al. 2005). It is commonly found in open moist habitat such as meadow marshes, moist meadows, edge of lakes and rivers and wetlands. Meanwhile, the seed of wild rice is traditionally used for food (Davidson-Hunt et al. 2005). This species is associated with open water marsh, riverine and lacustrine habitats. Wild Rice is considered a SWH type, specifically specialized habitat for wildlife.

- Suitable sweetgrass habitat was identified in habitat types which represent 4% (5,582 ha) of LSA's general habitat types and 3% (13,134 ha) of RSA's general habitat types.
- Approximately 0.01 ha (15 ha) of provincially confirmed wild rice habitat occurs within the LSA, while candidate habitat comprises 1.5% (2,161 ha) of LSA's general habitat types. Wild rice is confirmed in provincially mapped data in 0.16% of the RSA, while candidate habitat comprises 1.8% of the RSA's general habitat types. Indigenous communities have confirmed presence of wild rice in some areas defined as candidate, as described below.

Habitat Distribution

Most plant species of traditional use are common and well distributed across the landscape within the LSA and RSA (Appendix 6.4-A), despite the presence of past and existing human disturbances that fragment and disconnect habitats (e.g., roads, rails). Other disturbances such as active mining, mineral exploration, transmission lines, urban settlements and recreational activities have also contributed to the fragmentation of habitat, upland and wetland alike, and affected species distribution. However, many of these species remain present in a multitude of different ecosystems with different characteristics.

Wild rice is typically associated with wetland ecosystems and activities that have otherwise caused impacts to drainage regimes may result in alteration of wetland conditions, ultimately impacting wetland species. As part of the baseline assessment, wild rice habitat was mapped using two different sources:

- The first from the province's spatial database as based on documented records, known as 'Wild Rice Stand'; and
- The second generated using nine separate ecosites associated with marsh habitat (i.e., B142, B143, B144, B145, B148, B149, B150, B151, B152) and considered as possible or candidate habitat (i.e., not confirmed).

Further analysis has been completed since the baseline assessment, particularly to look at ecosites in which the confirmed habitat areas (wild rice stand) occur. The analysis was completed for the RSA and determined that confirmed wild rice habitat is closely tied to open water (87%), while the balance is related to fen (7%) and marsh (6%). Given that wild rice grows within shallow depths of open water, particularly along the shoreline, a new analysis was completed to support candidate wild rice habitat. Open water areas greater than 2 ha that overlaps areas of marsh or are adjacent to marsh were considered *candidate wild rice habitat*, or marsh wetlands adjacent to open water (potentially suitable for wild rice). This change will better represent areas that are most suitable to support this habitat type, while attempting to reduce overestimate of habitat. Candidate areas for wild rice are distributed throughout the LSA and RSA. It is anticipated that small, localized reductions in candidate habitat may be within resilience and adaptability limits for this habitat type.

Within the LSA, input from First Nations communities have identified areas supporting wild rice crossed by the ROW southeast of Thunder Lake and near Dinorwic. Additional areas within the RSA identified provincially as candidate habitat for wild rice were also confirmed by communities, including in the Shebandowan Lake area. Areas of wild rice currently used for harvest have been identified by communities to represent areas of importance where potential effects as a result of the Project should be reduced or avoided. Indigenous communities have shared through engagement that changes in draining regimes as a result of historic development of hydroelectric dams within the region have affected areas that previously supported wild rice harvest.

Overall, most plant species of traditional use are well distributed in the RSA, and small localized reductions in connectivity due to past cumulative changes identified in the baseline characterization are likely within the resilience and adaptability limits of this assessment criteria.

Survival and Reproduction

It is expected that the greatest threats to the survival and reproduction are from impacts that would alter the current habitat characteristics. As many plant species of traditional use are present in various ecosystem types, it is expected that even though changes to drainage patterns and alterations of moisture regimes from past anthropogenic activities might dieback some surrounding species, they would be able to adapt to the ecosystem characteristic change and likely maintain their presence.

Changes in survival and reproduction are likely well within the resilience and adaptability limits for this criterion. However, plant species of traditional use with limited suitable habitats may be approaching limits of resilience and adaptability. Specifically, wild rice is heavily dependent on water levels and drainage patterns to current habitats, and this species would have a lower capacity to adapt to changes. As well, sweet grass, which is located in limited habitats, would have a lower capacity to adapt to changes; loss of its habitat may result in further presence declines.

6.4.6 Potential Project-Environment Interactions

Potential Project-environment interactions were identified through a review of the Project Description and existing environmental conditions. The linkages between Project components and activities and potential effects to vegetation and wetlands are identified in Table 6.4-13. The assessment of the following Project interactions and their potential effects, mitigation measures and net effects described in Section 6.4.7.1 applies for all ecosystems listed in upland, wetland, and riparian general habitat types; this is not repeated for each vegetation components to avoid redundancy.

- **Ecosystem Loss or Alteration** – the loss or alteration of vegetation and topography that may change ecosystem availability, composition, and connectivity of upland, wetland, and riparian ecosystems and the quantity and connectivity of habitat that supports the growth of criteria plants and influence plant abundance and distribution;

- **Reduced Soil Quantity and Quality** – soil disturbance and stockpiling during earth moving activities can reduce soil quantity and quality through changes to physical, chemical, or biological properties of soil, and increase in erosion potential, in turn impacting vegetation growth and ecosystem availability, distribution and composition;
- **Changes to hydrology** may alter drainage patterns and increase/decrease drainage flows and surface water levels, which could cause changes to soils and upland, wetland, and riparian ecosystems and the growth and health of plants;
- **Chemical or hazardous material spills** (e.g., petroleum products, ammonium nitrate) can affect soil quality and in turn upland, wetland, and riparian ecosystems and the growth and health of Plant SAR, plant SOCC and traditional use plants;
- **Dust and air emissions, and subsequent deposition** can affect upland, wetland, and riparian ecosystems and the growth and vigor of plant SAR, plant SOCC and traditional use plants through changes in soil quality and direct contact with plants; and
- **Introduction and spread of noxious and invasive plant species** can affect upland, wetland, and riparian ecosystem and the growth of plant SAR, plant SOCC and traditional use plants.

Table 6.4-13: Project-Environment Interactions for Vegetation and Wetlands and Plant Species.

Criteria	Indicator(s)	Project Phase Construction	Project Phase Operation	Retirement Phase	Description of Potential Project-Environmental Interaction
• Upland Ecosystem • Wetland Ecosystem • Riparian Ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	✓	✓	✓	**Ecosystem Loss or Alteration** – the loss or alteration of vegetation and topography that may change ecosystem availability, composition, and connectivity.
• Upland Ecosystem • Wetland Ecosystem • Riparian Ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	✓	–	✓	**Reduced Soil Quantity and Quality** – soil disturbance and stockpiling during earth moving activities can reduced soil quantity and quality through changes to physical, chemical, or biological properties of soil, and increase in erosion potential, in turn impacting vegetation growth and ecosystem availability, distribution and composition.
• Upland Ecosystem • Wetland Ecosystem • Riparian Ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	✓	✓	✓	**Changes in Hydrology** – can alter drainage patterns and increase/decrease drainage flows and surface water levels, which could cause changes to soils and upland, wetland, and riparian ecosystems.

Criteria	Indicator(s)	Project Phase Construction	Project Phase Operation	Retirement Phase	Description of Potential Project-Environmental Interaction
• Upland Ecosystem • Wetland Ecosystem • Riparian Ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	✓	✓	✓	**Chemical or Hazardous Material Spills** (e.g., petroleum products) can affect soil quality and upland, wetland, and riparian ecosystems.
• Upland Ecosystem • Wetland Ecosystem • Riparian Ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	✓	✓	✓	**Dust and Air Emissions, and Subsequent Deposition** can affect upland, wetland, and riparian ecosystems through changes in soil quality and direct contact with plants.
• Upland Ecosystem • Wetland Ecosystem • Riparian Ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	✓	✓	✓	**Introduction and Spread of Noxious and Invasive Plant Species** can affect upland, wetland, and riparian ecosystems.
• Plant Species at Risk • Plant Species of Conservation Concern • Plants of Traditional Use	• Habitat quantity • Habitat distribution • Survival and reproduction	✓	✓	✓	**Plant Loss or Alteration** – the loss or alteration of vegetation and topography that may change the quantity and connectivity of habitat that supports the growth of criteria plants and influence plant abundance and distribution.

Criteria	Indicator(s)	Project Phase Construction	Project Phase Operation	Retirement Phase	Description of Potential Project-Environmental Interaction
• Plant Species at Risk • Plant Species of Conservation Concern • Plants of Traditional Use	• Habitat quantity • Habitat distribution • Survival and reproduction	✓	–	✓	**Reduced Soil Quantity and Quality** – soil disturbance and stockpiling during earth moving activities can reduced soil quantity and quality through changes to physical, chemical, or biological properties of soil, and increase in erosion potential, in turn impacting plant growth and health.
• Plant Species at Risk • Plant Species of Conservation Concern • Plants of Traditional Use	• Habitat quantity • Habitat distribution • Survival and reproduction	✓	✓	✓	**Changes in Hydrology** can alter drainage patterns and increase/decrease drainage flows and surface water levels, which could cause changes to soils and the growth and health of plants.
• Plant Species at Risk • Plant Species of Conservation Concern • Plants of Traditional Use	• Habitat quantity • Habitat distribution • Survival and reproduction	✓	✓	✓	**Chemical or Hazardous Material Spills** (e.g., petroleum products) can affect soil quality in turn the growth and health of Plant SAR, plant SOCC, and traditional use plants.

Criteria	Indicator(s)	Project Phase Construction	Project Phase Operation	Retirement Phase	Description of Potential Project-Environmental Interaction
• Plant Species at Risk • Plant Species of Conservation Concern • Plants of Traditional Use	• Habitat quantity • Habitat distribution • Survival and reproduction	✓	–	✓	**Dust and Air Emissions, and Subsequent Deposition** can affect the growth and vigor of plant SAR, plant SOCC, and traditional use plants through changes in soil quality and direct contact with plants.
• Plant Species at Risk • Plant Species of Conservation Concern • Plants of Traditional Use	• Habitat quantity • Habitat distribution • Survival and reproduction	✓	–	✓	**Introduction and Spread of Noxious and Invasive Plant Species** can affect the growth of plant SAR, plant SOCC, and traditional use plants.

✓ = A potential Project-environment interaction could result in an environmental or socio-economic effect.

_ = No plausible interaction was identified.

6.4.7 Potential Effects, Mitigation Measures, and Net Effects

This section presents the potential effects, appropriate mitigation measures and predicted net Project effects for vegetation and wetlands of the Project footprint. A summary of the potential effects, mitigation measures, and net effects are presented in Table 6.4-20.

While Hydro One always strives to avoid and mitigate potential effects to the natural and socio-economic environment, and restore areas that are affected by the Project, Hydro One acknowledges that there may be adverse effects that cannot be avoided, or that occur even when appropriate mitigation and restoration measures are employed. Because these net effects cannot be further avoided or mitigated, they are typically compensated for by undertaking positive environmental activities (e.g., the creation of new naturalized habitats or enhancement of existing habitats at outside of the Project footprint). For more information on how Hydro One will be offsetting net effects of the Project, see Section 10.0 of the Final EA.

6.4.7.1 All Vegetation and Wetland Criteria

The following Project interactions and associated potential effects are common to all Vegetation and Wetland criteria. These effects will be sufficiently mitigated such that they are not expected to cause net effects to these criteria and thus there were no net effects to be carried forward to the net effects characterization.

6.4.7.1.1 Reduced Soil Quantity and Quality

Potential Effects

Site clearing and preparation during Project construction can cause soil compaction, admixing and erosion, and result in changes to soil quantity (and distribution) and quality. Soil stockpiling can also change soil quality by mixing the upper topsoil layer with underlying soils, as well as causing changes in soil chemistry, and can increase erosion potential. These changes in soil quantity and quality can negatively influence the success of revegetation (reclamation) activities of upland, wetland and riparian ecosystems as well as influence local surrounding plant SAR, SOCC, and species of traditional use survival.

Linear infrastructure improvements will be limited to existing access roads. Improvements may include enhancing existing access roads to have an average width of 6 m and 20 m vegetation clearing area. Selection has been made to maintain existing access roads to within corridors previously disturbed to support original construction.

Soil compaction decreases soil quality and occurs primarily from heavy equipment or repeated passes of equipment across the soil surface. Soil compaction increases soil density and reduces soil porosity, influences drainage and structure, and alters soil strength, water content, and temperature (Corns 1988, Tuttle et al. 1988, Busse et al. 2006, Blouin et al. 2008). Areas most prone to compaction are low lying, poorly drained areas with fine textured soils. To mitigate changes in soil quality (and quantity), the Project would use equipment with low ground pressure tracks or tires, which would reduce surface disturbance, soil compaction and topsoil loss.

Stripping, admixing, and stockpiling upper soil materials can cause physical changes to soil such as disturbing soil structure. Loss of soil structure may result in a reduction in the amount of soil organic matter and soil organic carbon present within the soil and influences the bulk density, pore size distribution, microbial community structure and resistance of soil to erosion (Wick et al. 2009). However, by salvaging the upper soil horizons, where possible, soil organic materials can be maintained, which is important for ecosystem resilience (Baldock and Broos 2012). Soil salvage and stockpiling are advantageous because topsoil is a more productive vegetation medium than subsoil (Abdul Kareem and McRae 1984).

Chemical changes occur in stockpiled soils. As oxygen decreases because of overall bulk, the stockpile can become anaerobic, which inhibits the nitrogen cycle, thereby increasing ammonium nitrogen (Abdul Kareem and McRae 1984, Williamson and Johnson 1994). A decrease in potential for hydrogen (pH) also has been recorded in stockpiled soil, mostly because of ammonia build up from anaerobic conditions (Abdul Kareem and McRae 1984). In some studies, extractable potassium, phosphorus and magnesium increased in clayey stockpiles and decreased in sandy and loamy textured stockpiles (Abdul Kareem and McRae 1984). Other studies have found that nutrients for plants, such as nitrogen, phosphorus and potassium declined over time in stockpiles, which is likely a result of the loss of clays and silts to erosion (Ghose 2001, Kundu and Ghose 1997). Perhaps the largest potential change in soil chemistry in stockpiled soil is alterations in organic matter content, especially in sandy textured soil (Abdul Kareem and McRae 1984). Soil organic matter content influences the rates of microbial decomposition and nutrient availability for plant uptake (Wick et al. 2009), and its loss or reduction can decrease the ability of soil to support vegetation. Biological soil properties include the diversity and activity of soil microorganisms (e.g., bacteria, fungi, microbial biomass, and community structure [Ewing and Singer 2012]) and soil organisms (e.g., protozoa, nematodes, earthworms, and arthropods). Biological changes arise because of physical and chemical changes to soils. Initial soil stripping causes large decreases in soil microbial activity, microbial biomass and mycorrhizal fungi abundance (Abdul Kareem and McRae 1984, Stark and Redente 1987, Wick et al. 2009). Negative effects on soil biology may result in decreased rates of nutrient cycling and reduced nutrient availability, but this effect is dependent on the depth of the stockpile, length of time soil remains in the stockpile, and whether the stockpile has been revegetated (Abdul Kareem and McRae 1984, Stark and Redente 1987, Wick et al. 2009). Vegetation maintained on stockpiles tends to sustain populations of bacteria and fungi over time at the surface of the stockpile.

Mitigation Measures

The Project will provide direction on topsoil stripping, stockpiling, salvage and prioritized placement on the landscape, which is expected to mitigate changes to soil quality and quantity further discussed in Physiography and Geology (Section 6.1). The Project will also implement mitigation measures to limit erosion of soil from wind and water, such as selectively cutting vegetation and restricting clearing within areas with steep slopes in a Soil Management Plan. Temporary access roads and waterbody crossings, temporary laydown areas, staging areas and temporary construction camps will be decommissioned and reclaimed throughout and after completion of the construction stage.

Clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss (e.g., equipment with low ground pressure tracks or tires, blade shores, and brush) will be used to the extent practicable. Restriction of grubbing within areas with steep slopes or soils with risk of erosion will be practiced. Compatible vegetation, coarse woody plants, and other sensitive plants (e.g., black ash, SOCC, SWH communities) identified during clearing activities will be retained where feasible as practicable and will be considered for further mitigation action as appropriate. Erodible soils will be stabilized as soon as practicable by seeding, spreading mulch or installing erosion control blankets.

Reclamation and clean up activities will occur progressively throughout the construction of the Project. These activities will include, but not be limited to, removing refuse, grading disturbed areas, contouring disturbed slopes to a stable profile, and re-establishing natural drainage patterns.

A post-construction assessment process will be established, to assess and respond to reclamation needs within the ROW following completion of construction. Seeding will be completed during the spring and/or summer months when conditions are most favorable.

Mitigation measures will be outlined in the Environmental Protection Plan (EPP) to address items such as re-grading, subsoil compaction, subsoil and topsoil replacement, seeding and revegetation, and temporary watercourse structure removal as it pertains to Final Reclamation.

Compacted areas will be ripped or otherwise treated to loosen soil and facilitate natural revegetation. Reclamation activities are anticipated to occur immediately after construction, which would decrease the negative effects to physical, chemical and biological properties of soil from stockpiling (i.e., stockpiling would happen only over the short-term). Prior to reclamation activities, a reclamation plan will be developed and can be provided to the MNRF. The plan will consist of a map depicting the level of reclamation for each segment of road and a corresponding description of the reclamation activities to be undertaken for each level of reclamation.

Mulch will be generated in areas that have minimal salvageable timber. In these locations, generated mulch will be spread across the ROW to avoid accumulation of flammable material and comply with the *Forest Fires Prevention Act*. Mulch chips depth will not exceed a depth of 18 cm. Generally, mulch depths in wetland areas are minimal since there is insufficient fibre to generate large mulch depths.

In-situ mulch may also be used to help stabilize soils prone to erosion in combination with other erosion control measures.

Additional mitigation measures are listed in Table 6.4-20.

Net Effect

Project activities are expected to not influence broad scale soil quantity and quality. Some localized changes to physical, chemical or biological properties of soil, erosion potential, and low revegetation is predicted during construction. However, with reclamation activities anticipated to occur immediately after construction, there is no net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20.

6.4.7.1.2 Changes in Hydrology

Potential Effect

Changes in drainage patterns and increases and decreases in drainage flows and surface water levels beyond the natural range of variation could lead to a loss of soils through increased erosion and affect the quality and quantity (and distribution) of vegetation. Wetland and riparian vegetation distribution is a result of water regime and plant species tolerance to flooding and saturation (Casanova and Brock 2000, Odland and del Moral 2002). Natural water fluctuations result in cyclic vegetation changes. Alternating wet and dry patterns determine plant establishment and composition by stimulating or inhibiting germination of seeds in the soil seed bank (Casanova and Brock 2000) and water depth is the primary influence on seed bank composition (Lu et al. 2010). Prolonged flooding or drying eliminates some plant species while favouring others because of changes in soil oxygen levels, nutrients, and species tolerance to saturated or dry soil conditions (Casanova and Brock 2000). A potential change in the surface water levels from the Project-related construction activities is assessed in the Surface Water Assessment (Section 6.2).

A change in local water flows could alter the distribution of wetland, riparian and upland areas in relation to the changes in soil moisture (Nilsson and Svedmark 2002, Odland and del Moral 2002, Shafroth et al. 2002, Leyer 2005). Additionally, as soil moisture levels change because of changes in surface flows and water levels, species that thrive in drier soil moisture regimes can out compete traditional use species that rely on fluctuations in soil moisture, as well as plant SAR (i.e., black ash) and SOCC (Shafroth et al. 2002, Leyer 2005). A potential change in the near-surface groundwater levels in wetlands due to groundwater extraction to support the Project is assessed in the Groundwater Assessment (Section 6.3).

Mitigation Measures

Mitigation measures have been included in the Project design to limit changes in hydrology and include installing culverts or temporary bridges using best management practices and following environmental approval conditions. Additional mitigation measures described for surface water (Section 6.2) and groundwater (Section 6.3) are also applicable in this assessment and further discussed in Table 6.4-20.

Net Effect

Project activities are expected to not influence broad scale drainage patterns. Some measurable changes to localized soil moisture regimes (and erosion) adjacent to smaller drainages are predicted during construction and into operation and maintenance until vegetation cover is restored in the surrounding area (Section 5.2). Overall, minor and local changes in the abundance and distribution of soils and plant communities are predicted.

There is no net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20.

6.4.7.1.3 Chemical or Hazardous Material Spills

Potential Effect

Spills that occur in high enough concentrations could potentially contaminate soils and cause effects on soil organisms, vegetation, and ecosystems. Direct contact of spills on plants (e.g., SAR, SOCC, species of traditional use) can also result in injury or mortality.

Mitigation Measures

Transport and handling of hazardous materials will be carefully managed by Hydro One with their contractor. Procedures for transportation, storage, and handling chemicals and fuels will be implemented for the Project. A Waste Management and Disposal Plan will be prepared and will describe the procedures for the handling, storage and disposal of wastes such as used oil, filter and grease cartridges, lubrication containers, construction -related debris and surplus materials, and domestic garbage and camp wastes (e.g., food and grey water). If chemical or fuel spills occur as a result of the Project, contaminants will be contained and cleaned up according to the procedures outlined in the project-specific Spill Prevention and Emergency Response Plan and a Soil Management Plan. Individuals working on-site and handling hazardous materials will be trained in the transportation of dangerous goods. Emergency spill kits will be available near fuel and hazardous materials handling locations (e.g., spill kits at temporary laydown areas and/or temporary construction camps) and in vehicles. Construction equipment and vehicles will be regularly maintained to minimize leaks. Additional mitigation measures described for surface water (Section 6.2) are also applicable in this assessment and further discussed in Table 6.4-20.

Net Effect

The implementation of a Spill and Emergency Preparedness and Response Plan, and training of personnel in safe handling of chemicals and hazardous materials are anticipated to minimize the frequency, spatial extent and severity of spills. Given implementation of the mitigation measures described above, spills in the Project footprint are not expected to result in measurable changes to soil quality and plants.

There is no net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20.

6.4.7.2 Upland Ecosystems

6.4.7.2.1 Ecosystem Loss or Alteration

Potential Effects

Ecosystem Availability

Below is a summary of the Project footprint related changes to upland ecosystem availability in the LSA and RSA (Table 6.4-14; Figures 1 to 19 in Appendix 6.4-B; Appendix 6.4-A):

- Upland ecosystems loss of 3,443 ha (2.9% upland ecosystem loss within the LSA; 1.0% upland ecosystem loss within the RSA) within the Project footprint.
- Field and barren types represent the smallest percentage of landcover within the LSA and RSA. There is expected to be a 523 ha loss (0.7% of field loss in the LSA) of field habitat type and an 882 ha loss (% of barren loss in the LSA) to the barren habitat type.
- Coniferous and deciduous forest types comprise the largest percentage of landcover within the LSA and RSA. Loss of 58,330 ha (2.8%) coniferous forest and 49,911ha (2.6%) of deciduous forest expected within the LSA.
- Ecosites comprised of compatible vegetation that extend into the Project footprint, including shrub, field, meadow and barren, may not be permanently lost as suggested in Table 6.4-14, and rather, may reestablish through natural regeneration. Additionally, vegetation management practices will be used to maintain vegetation within the transmission line ROW. For example, implementation of a “wire zone – border zone” approach to vegetation management where appropriate in the ROW which allows taller vegetation to grow closer to the edge of the ROW, including tree species. All metrics contained within the EA do not account for natural regeneration or a wire zone – border zone, and therefore represents the worst-case-scenario.
- One conservation reserve – Campus Lake Conservation Reserve, and one Provincial Park – Turtle River – White Otter Lake Provincial Park extends into the Project. Of the 36,084 ha of available upland ecosystem associated with these parks, a total of 85 ha (0.2%) overlaps the Project footprint.

Table 6.4-14: Predicted Changes to Upland Ecosystem Availability in the Local and Regional Study Area

Upland Ecosites: General Habitat Type	LSA Baseline Characterization (ha)	LSA Net Effects(2) (ha)	LSA Change in Area (ha)	LSA Percent Change (%)	RSA Baseline Characterization (ha)	RSA Net Effects2 (ha)	RSA Change in Area (ha)	RSA Percent Change (%)
Coniferous Forest	59,995	-1,665	58,330	2.8%	184,137	-1,665	182,472	0.9%
Deciduous Forest	51,233	-1,322	49,911	2.6%	156,668	1,322	155,346	0.8%
Mixed Forest	1,652	-59	1,593	3.6%	6,460	-59	6,401	0.9%
Shrub	946	-26	920	2.7%	1,968	-26	1,943	1.3%
Field	527	-4	523	0.7%	1,869	-4	1,866	0.2%
Meadow(1)	2,394	-292	2,102	12.2%	2,736	-292	2,444	10.7%
Barren	957	-75	882	7.8%	1,516	-75	1,441	4.9%
Total	**117,704**	**-3,443**	**114,261**	**2.9%**	**355,355**	**-3,443**	**351,912**	**1.0**

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. The total percent change is calculated relative to the total area and therefore this value will not equal the sum of the individual values.

LSA = Local Study Area, RSA = Regional Study Area; ha = hectare; % = percent.

1) Available meadow habitat includes areas previously disturbed for anthropogenic purposes and may not accurately reflect natural occurring habitat.

2) The net effects in the LSA and RSA are a result of the Project footprint (i.e., direct impact to upland ecosites)

Below is a summary of changes in availability of seral stages due to the Project footprint (Table 6.4-15; Appendix 6.4-A).

- Late successional (111 years and older) represents the least common type – loss of 10,422 ha in the LSA (2.3% seral stage loss within the LSA).
- Mature (81-110 years) represents the most common type – loss of 52,298 ha in the LSA (2.6% seral stage loss within the LSA).
- Table 6.4-14 considers a 20 m access road ROW. It is noted that approximately 30% of access roads will be maintained as permanent.
- Available upland ecosystem is dominated by coniferous forest (173 ha; 40%); deciduous forest (148 ha; 34%), and meadow (95 ha; 22%) with mixed forest, shrub, field and barren each comprising approximately 1 ha or less.

Table 6.4-15: Seral Stages in the Net Effects Assessment of the Local and Regional Study Area

Seral Stage	LSA Baseline Characterization (ha)	LSA Net Effects (ha)[1]	LSA Change in Area (ha)	LSA Percent Change (%)	RSA Baseline Characterization (ha)	RSA Net Effects (ha)	RSA Change in Area (ha)	RSA Percent Change (%)
Pre-Sapling (0 to 10 years)	-	-	-	-	-	-	-	-
Sapling (11 to 30 years)	28,288	-879	27,408	3.1%	75,710	-879	74,831	1.2%
Immature (31 to 80 years)	36,977	-861	36,117	2.3%	118,650	-861	117,789	0.7%
Mature (81 to 110 years)	53,683	-1,385	52,298	2.6%	168,030	-1,385	166,645	0.8%
Late successional (111 years and older)	10,670	-248	10,422	2.3%	35,997	-248	35,748	0.7%
Total	**129,618**	**-3,373**	**126,245**	**2.6%**	**398,387**	**-3,373**	**395,014**	**0.8%**

Note: This summary is derived only from 'Overstory of Origin' metadata from the FRI data package. Most data was collected in 2008 and therefore in the absence of recent data, 'pre-sapling' data is not available.

Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. The total percent change is calculated relative to the total area and therefore this value will not equal the sum of the individual values.

LSA = Local Study Area, RSA = Regional Study Area; ha = hectare; % = percent.

1) The net effects in the LSA and RSA are a result of the Project footprint (i.e., direct impact to seral stages)

Below is a summary of changes in availability of candidate upland SWH due to the Project footprint (Table 6.4-16; Appendix 6.4-B; Appendix 6.4-A).

- Cliff and rim and rock barren candidate SWH types will not be impacted.
- Rare tree: elm type represents the largest percent loss from existing LSA ecosystem availability, at 7.5%.
- Rare tree: red and white pine represent the largest candidate upland SWH type that occurs within the footprint, at 5,405 ha, with a 3.3% loss within the LSA and 1.0% loss in the RSA.
- Milkweed candidate SWH loss of 24,543 ha (1.6% loss within the LSA; 0.5% loss within the RSA) to the Project footprint.

Table 6.4-16: Candidate Upland Significant Wildlife Habitat in the Net Effects Assessment of the Local and Regional Study Area

Candidate SWH: Rare Vegetation Communities and Specialized Habitat for Wildlife[(a)]	LSA Baseline Characterization (ha)	LSA Net Effects (ha)[1]	LSA Change in Area (ha)	LSA Percent Change (%)	RSA Baseline Characterization (ha)	RSA Net Effects (ha)	RSA Change in Area (ha)	RSA Percent Change (%)
Cliff and Rim	32	0	-32	1.6%	49	0	48	1.0%
Rare Tree: Elm	50	4	-47	7.5%	253	-4	249	1.5%
Rare Tree: Red and Sugar Maple	457	8	-449	1.8%	1073	-8	1065	0.8%
Rare Tree: Red and White Pine	5,589	183	-5,405	3.3%	18,538	-183	18,355	1.0%
Rock Barren	7	0	7	0.0%	32	0	32	0.0%
Milkweed Patch	24,947	404	-24,543	1.6%	79,218	-404	78,814	0.5%
Total	**31,082**	**600**	**-30,482**	**1.9%**	**99,163**	**-600**	**98,563**	**0.6%**

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. The total percent change is calculated relative to the total area and therefore this value will not equal the sum of the individual values.

LSA = Local Study Area, RSA = Regional Study Area; ha = hectare; % = percent.

1) The net effects in the LSA and RSA are a result of the Project footprint (i.e., direct impact to SWH ecosites)

Ecosystem Distribution

Below is a summary of Project-related changes to upland ecosystem distribution (Table 6.4-14; Figures 1 to 19 in Appendix 7.4-B; Appendix 6.4-A):

- The greatest loss of upland habitat loss within the LSA consists of coniferous forest (58,330 ha; 2.8% of change within the LSA).
- The smallest loss of upland habitat loss within the LSA consists of field (523 ha; 0.7% of change within the LSA).
- The Project footprint overlaps 193 ha (2.0%) of the 8,313 area of disturbance within the LSA.

Despite some increase in fragmentation, overall most upland ecosystems are expected to remain abundant and well connected across the LSA and RSA to support healthy and functioning ecosystems.

Ecosystem Composition

Forested areas in closer proximity to the Project footprint may be affected by removal of wildlife trees and other edge effects (e.g., sensory disturbance, ingress of generalist or invasive species, changes in moisture and sunlight) that can negatively influence conditions. Wildlife species associated with upland ecosystems, including species dependent on mature forest (e.g., blackburnian warbler [*Setophaga fusca*]) and wildlife tree users such as northern flickers (*Colaptes auratus*) were identified during baseline characterization botanical field surveys (Appendix 6.4-A). It is possible that these species may be negatively affected by changes in the condition of upland ecosystems due to the Project footprint. Moreover, woodpeckers excavate cavities in wildlife trees that can subsequently be used by secondary cavity users, which are species that do not excavate their own cavities (Martin et al. 2004). Secondary cavity users include a large variety of species such as common goldeneye (*Bucephala clangula*), northern saw-whet owl (*Aegolius acadicus*), tree swallow (*Tachycineta bicolor*), red squirrel (*Sciurus vulgaris*) and American kestrel (*Falco sparverius*). Therefore, negative effects on woodpeckers can indirectly affect various other wildlife species as well.

Native habitat edges are prone to ingress by non-native invasive species near disturbance. Baseline characterization botanical field surveys detected two non-native weed species, one classed as noxious. Canada thistle was observed within the RSA in meadow and forest depletion – cuts habitat and is classed as noxious under the *Ontario Weeds Act* Schedule of Noxious Weeds (OMAFRA 2017).

During operation, the transmission line ROW will be routinely accessed for maintenance and repairs. Weeds will be managed through mechanical practices. Herbicides will not be used on this Project.

Upland SWH is established based on specific criteria related to one or more indicator species. Encroachment into SWH habitat may result in direct loss of the indicator species. Additionally, indirect impacts caused from construction activities, such as degradation of soil quality, drainage and introduction of invasive species, can inadvertently degrade habitat, which may cause tree mortality or interfere with regeneration.

Mitigation Measures

During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails. Mechanical vegetation removal is the preferred method of clearing for initial removal. Clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss will be used to the extent practicable. Compatible vegetation, coarse woody debris and plants, and other sensitive plants (e.g., SAR, SOCC, SWH communities) identified during clearing activities will be retained where feasible and will be considered for further mitigation action as appropriate. To minimize encroachment on the edges of the Project footprint, vegetation should be clearly delineated between areas to be retained and cleared.

Hydro One will use vegetation management practices to maintain vegetation within the transmission line ROW. For example, implementation of a “wire zone – border zone” approach to vegetation management (Ballard et al. 2007) where appropriate in the ROW. This method manages vegetation in the two zones, where herb/grass/forb species are promoted in the wire zone, and shrub/short tree species are promoted in the border zone. This approach allows for the safe delivery of electricity while also fostering wildlife habitat and biodiversity, and simultaneously developing overall aesthetics and decreased long-term vegetation management costs.

Areas that have had aggregate placed will be recontoured as necessary to return hydrology and drainage to pre-construction conditions. The stored topsoil and organic material will be spread over the surface. All sites will be left in a stable and self-sustaining condition though areas that may be prone to erosion will be seeded in accordance with MNRF, or other applicable regulatory agency, requirements to ensure prompt revegetation.

Prior to reclamation activities, a reclamation plan will be developed and can be provided to the MNRF. The plan will consist of a map depicting the level of reclamation for each segment of road and a corresponding description of the reclamation activities to be undertaken for each level of reclamation.

Unless directed otherwise by the MNRF, new access roads will be recontoured and stored topsoil and organic material will be spread across the disturbed road width. Natural drainage will be restored. Existing access roads may be stabilized and left in place depending on feedback from appropriate stakeholders (e.g., MNRF, MTO, municipalities and road users).

Reclamation and clean up activities will occur progressively throughout the construction of the Project. These activities will include, but not be limited to, removing refuse, grading disturbed areas, contouring disturbed slopes to a stable profile, and re-establishing natural drainage patterns.

A post-construction assessment process will be established to enable construction ROW and workspace turnover following completion of construction. Final reclamation activities will be completed outside of frozen conditions as soon as weather and soil conditions permit. Reclamation efforts will commence within and near wetlands as soon as reasonably possible to reduce the potential impact and to take advantage of access.

Re-vegetation efforts will be timed to take advantage of favourable moisture and temperature conditions.

Mitigation measures will be outlined in the EPP to address items such as re-grading, subsoil compaction, subsoil and topsoil replacement, seeding and revegetation, and temporary watercourse structure removal as it pertains to Final Reclamation.

Residual logging debris and timber not reserved for landowner use may be mulched in place and spread on the ROW or piled and burned contingent on the approval of a burn plan. Designated tree species (if applicable) will be disposed of in accordance with local or provincial regulations.

If burning is the chosen method of disposal, care will be taken to ensure piles are pushed up properly to promote adequate drying and to minimize the inclusion of dirt. Any residual material following burning will be buried or spread on the ROW. Appropriate burning permits will be acquired from the provincial and/or municipal regulatory agencies. Burning operations will adhere to the *Forest Fires Prevention Act*, R.S.O. 1990, c. F.24.

Unless to be used to meet other environmental objectives, chips are to be spread as soon as reasonably possible and are not to exceed a spread depth of 18 cm. Other slash and debris resulting from mechanical clearing operations will be spread to ensure depths do not exceed 0.3 m or will be piled and burned. In areas that are hand felled only, trees will be bucked and delimbed to lie close to the ground.

Additional mitigation measures are listed in Table 6.4-20.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Site preparation, construction and operation activities can result in the loss or alteration of upland ecosystems and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.2.2 Dust and Air Emissions, and Subsequent Deposition

Potential Effects

Construction and operation of the Project is predicted to generate air and dust emissions such as carbon monoxide (CO), oxides of sulphur (SO_x, including sulphur dioxide [SO_2]), oxides of nitrogen (NO_x), particulate matter (e.g., PM2.5) and total suspended particulate matter (SPM). Air emissions such as SO_x and NO_x can result from the use of fossil fuels in generators, vehicles, machinery and the use of explosives during the Project. The use of explosives will be limited to Project construction and to specific geological conditions that do not allow for an alternative method of removing material to create level areas for transmission structures and foundations for the anchoring of towers. For example, ripping will be selected over blasting where rock is encountered.

The dominant contributor to dust emissions (SPM) is from vehicles travelling on roads (Farmer 1993, Harrison et al. 2003, Peachey et al. 2009, Liu et al. 2011).

Air emissions can change soil quality by altering soil pH and nutrient content, and soil fauna composition (Jung et al. 2011, Rusek and Marshall 2000). Changes in soil fauna and soil quality can lead to effects on vegetation when they alter rates of organic matter decomposition and nutrient cycling (Rusek and Marshall 2000). Changes to soil from atmospheric inputs are determined by several complex geochemical factors, which include nutrient uptake by plants, decomposition of vegetation, cation and anion exchange in soil, soil sensitivity to acidification and duration and quantity of atmospheric inputs (Jung et al. 2011, Turchenek et al. 1998). The alteration of soil pH from deposition of SO_2 and NO_2 can cause acidification. However, the potential for acidification depends on the buffering capacity of the soil and the vegetation cover present in the receiving environment (Bobbink et al. 1998, Barton et al. 2002, Jung et al. 2011, Jung et al. 2013). Soils in the LSA are anticipated to exhibit a low to moderate ability to buffer the effects of acidic inputs (Crins et al. 2009, Holowaychuck and Fessenden 1987).

Accumulation of dust produced from the Project may result in local and direct changes to vegetation. Dust that falls directly on plants can have a physical effect by smothering plant leaves or blocking stomata openings (Farmer 1993). Crusts forming on leaves can reduce net photosynthesis (Brandt and Rhoades 1973). After many cycles of crusting, the annual growth rate of plants can be reduced or cease, and crusting can even lead to death. Walker and Everett (1987) and Everett (1980) reported that few vascular plant species showed physiological effects from dust, except where vegetation was subject to very high dust loading. Auerbach et al. (1997) found that although plant species composition may change and aboveground biomass may be reduced by dust deposition, ground cover is still maintained.

In addition to changes from the deposition of SO_x and NO_x, chemical changes can occur from the deposition of dust. Rates of dust deposition and accumulation are dependent on the rate of supply from the source, wind speed, precipitation events, topography and vegetation cover (Rusek and Marshall 2000, Liu et al. 2011). The indirect responses of vegetation to changes in soil quality depend on the chemical compositions of dust and the source (Grantz et al. 2003).

Dust deposition can also cause chemical loading in soils and plants if dust emissions include elevated concentrations of metal particles. Metal particle deposition can result in increased metals concentrations in plant leaves (Grantz et al. 2003, Peachey et al. 2009). Metal particle deposition can also affect soil biota composition (Grantz et al. 2003), which could indirectly affect vegetation. Although additions of metals through dust deposition can change vegetation chemistry, Peachy et al. (2009) found that vegetation that received metals from dust deposition did not cause direct toxicity to plants.

In addition to metals, dust can contain other cations and anions. The presence of cations, such as calcium in dust emissions, can reduce the acid generating potential of the SO_2 and NO_x because they tend to react with bases (e.g., carbonates) found in dust (McNaughton et al. 2009). When cations (e.g., ammonium) are deposited into an ecosystem, the vegetation present can take up the cation; however, hydrogen [H+] can be released into the environment and decrease soil pH (Turchenek et al. 1998). When anions (e.g., chloride) are deposited into an ecosystem, anions such as hydroxide [OH-] can be released. Although OH- increases pH, cation and anion uptake has generally been shown to result in a net production of acidity. The net effect is acidification because the cations are generally retained in the plant biomass and are therefore not mineralized. Ultimately, the concentrations and duration of air and dust emissions and the sensitivity of the ecosystems determine the overall influence that emission deposition will have on vegetation (Bobbink et al. 1998).

Bryophytes and lichens can be sensitive to the chemical effects of dust because they obtain moisture and nutrients from the atmosphere and immediate surroundings, including substances that are trapped or deposited directly on the surface of the bryophyte leaf or lichen thalli (Farmer 1993). Bryophytes and lichens may experience the largest effects close to roads where the greatest amount of deposition frequently occurs. Some lichens have been found to incorporate the dust into their tissue; however, this is dependent on the growth form of the lichen (Farmer 1993). Direct effects on lichen are likely more important in ground dwelling lichen species that normally receive all of their nutrients directly from the atmosphere. However, fruticose lichens, such as *Usnea sp.*, have been shown to have sensitivity to atmospheric contaminant deposition (Beckett 1995). Mosses such as Sphagnum are sensitive to dust deposition. Sphagnum along a gravel road has been observed to have decreased photosynthetic rates and a decline in cover when dust deposition was 1.0 to 2.5 $g/m^2/d$ (equivalent to 10 to 25 $mg/dm^2/d$) (Farmer 1993). Although there was a decline in Sphagnum cover, it was replaced by more tolerant mosses such as haircap moss (*Polytrichum* spp.) and Bryum moss (*Bryum* spp.) (Farmer 1993).

Background data obtained from the Thunder Bay and Winnipeg, Manitoba monitoring stations indicate that air quality surrounding the Project is below the relevant provincial and federal ambient air quality guidelines, criteria and standards (Section 6.7).

The potential sources of air and fugitive dust emissions are from equipment, vehicles and activities associated with construction and operation of the Project. Specifically, construction activities have the potential to temporarily affect local air quality in the immediate vicinity of the Project. Emissions from construction are primarily comprised of fugitive dust (i.e., particulate matter that is suspended in air by wind action and human activity) and tailpipe emissions (i.e., criteria air contaminants; CAC) from the movement and operation of construction equipment and vehicles.

Potential effects associated with construction are anticipated to be minimal due to their short duration and intermittent frequency. Construction activities are not static and will only occur at one location for a short period before they progress along the ROW. Some activities may occur simultaneously at the same location for a short period, but typically different activities will occur at different locations (e.g., land clearing and stringing).

It is acknowledged that the Project will also generate short-term emissions from workers travelling between local communities and either the ROW or construction camps in personal vehicles, but these are not expected to be significant compared to the emissions from construction vehicles, which are subject to less stringent emission standards than personal vehicles and would typically only occur at the start/end of a shift. Vehicle emissions from pick-up trucks travelling along access roads are considered in the assessment.

It is also understood that slash pile burning may be required as part of the construction activities. Slash pile burning may result in the release of particulate matter, including SPM, PM_{10} and $PM_{2.5}$ (see Section 6.7). Slash pile burning is expected to be very localized and would not be expected to overlap with the main ROW construction activities.

Mitigation Measures

Mitigation measures planned to further reduce the effects of air emissions associated with the Project include practices to control dust and other air emissions (e.g., maintenance of vehicles and equipment, wetting areas). In areas where there are residences or sensitive receptors located within approximately 200 m of the Project footprint, emphasis will be placed on comprehensive implementation of mitigation measures, in particular dust suppression activities such as watering and dust suppressants (i.e., calcium chloride). Fugitive dust controls on unpaved roads and material handling activities range from a 10% to 90% control (Western Governors' Association 2006).

Construction will implement effective dust suppression techniques, such as on-site watering, as necessary to minimize fugitive dust at worksites and access roads as required.

Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland.

A Dust Control/Air Quality Plan will also be included as part of the EPP that will be provided to affected Indigenous communities for review and input at least 90 days in advance of construction.

A Blasting and Communications Management Plan will be prepared and implemented to limit the amount of chemical residue in the environment. The Blasting and Communication Management Plan will include measures to address the following items:

- Stakeholder notification;
- Storage, Transportation and Use;
- Security;
- Environmentally Sensitive Areas; and
- Waterbodies.

All mitigation measures applicable to dust and air emissions, and subsequent deposition, are further described in the air quality assessment in Section 6.7 (Table 6.7-21) and in Table 6.4-20.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above, in Section 6.7, Table 6.7-21, and summarized in Table 6.4-20. Dust and air emissions, and subsequent deposition associated with the construction and maintenance phases can affect upland ecosystems through changes in soil quality and direct contact with plants and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.2.3 Introduction and Spread of Noxious and Invasive Plant Species

Potential Effects

Construction and operation and maintenance activities have the potential to introduce non-native invasive plant species into new areas, especially when entering areas with known populations of non-native invasive plant species. Construction and operations equipment and personnel have the potential to introduce non-native invasive plant species into new areas by transporting seed or plant parts on equipment or clothing. The introduction of these species can disrupt plant communities and decrease habitat quality by affecting plant community structure and species diversity directly through competition, and indirectly through alterations to soil microorganisms, nutrients, and soil moisture (Mack et al. 2000, Carlson and Shepherd 2007, Truscott et al. 2008).

The majority of non-native invasive plant species introductions arise from human transport (Mack et al. 2000, Reichard and White 2001). Roads also act as dispersal routes and habitat for non-native invasive plant species establishment (Parendes and Jones 2000). Transportation corridors to and from construction areas provide a means of ingress for non-native invasive plant species through direct dispersion of plant propagules (seeds and/or vegetative parts) from vehicles and machinery, and indirectly through the formation of suitable sites for non-native invasive plant species in the form of disturbed areas. Many non-native invasive plant species are able to spread more easily in landscapes that have been fragmented, and often become established along edge habitats, such as disturbed road edges associated with transportation corridors (Lafortezza et al. 2010).

Preventing noxious and invasive species from entering an area is often more efficient and cost effective than dealing with their removal once established (Polster 2003, Carlson and Shepard 2007). One upland species, which is considered to be introduced (NHIC 2022), was observed during the botanical field surveys, Canada thistle. Canada thistle was observed at three sites in meadow and forest depletion – cuts habitat (Appendix 6.4-A). This species is not listed under the prohibited invasive species or restricted invasive species of the *Invasive Species Act* (Ontario 2015). However, Canada thistle is classed as "noxious" under the *Ontario Weeds Act* Schedule of Noxious Weeds (OMAFRA 2017).

Mitigation Measures

Hydro One will implement suitable vegetation management procedures to avoid and minimize the introduction and spread of noxious and invasive plants during construction and operation and maintenance as a result of the Project. All equipment and vehicles destined for the Project will arrive in clean condition (i.e., free of soil and/or plant material) and will adhere to the Clean Equipment Protocol for Industry (Halloran, et al., 2013). Biosecurity planning for the Project follows with an assessment of the potential pathogens, invasive species, and the areas of risk, overlain by the Project footprint, the access plan, and the access points from public roadways.

Best practices will be employed to limit the potential for spread of invasive weed species and soil-borne pathogens throughout the Project, as well as consideration of more intensive measures on a site-specific basis, as needed. The contractor will minimize the number of vehicles and equipment travelling across lands within areas of concern as much as reasonably possible. All ROW traffic will be restricted to a single, established travel lane and only use approved access routes.

Natural recovery is the preferred method over seeding of reclamation on level terrain where erosion is not expected. Enhanced vegetation recovery methods (e.g., seeding, planting seedlings) will be implemented where these enhanced methods are appropriate. For example, Hydro One will plant seedlings along new off-ROW access roads in conservation reserves and provincial parks. Further, waterbody crossing locations that have been removed after construction will be seeded in accordance with MNRF, or other applicable regulatory agency, requirements. Seeding is required in erosion prone areas and as such these areas will be seeded with a native cover crop and certified seed mix approved by the applicable regulatory agency for appropriate ecosystems (e.g., seeds of plant species that prefer humid/wet conditions are to be spread in wetlands) to promote plant species establishment during reclamation, as soon as feasible after construction. Areas that have had aggregate placed will be recontoured as necessary to return hydrology and drainage to pre-construction conditions. The stored topsoil and organic material will be spread over the surface. All sites will be left in a stable and self-sustaining condition though areas that may be prone to erosion will be seeded in accordance with MNRF, or other applicable regulatory agency, requirements to ensure prompt revegetation.

Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal or weather conditions (i.e., in a timely manner following construction activities, preferably as soon as the vegetation is removed while considering the seasonality of seed mix application). Additional mitigation measures are discussed in Table 6.4-20; however, a comprehensive approach to mitigation measures will be discussed in the vegetation management portion of the EPP

Net Effect

It is expected that with implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor, and result in negligible net effects to availability, distribution, and composition of upland ecosystems.

There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Introduction and spread of noxious and invasive plant species can affect upland ecosystems during the construction and operation phase and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.3 Wetland Ecosystems

6.4.7.3.1 Ecosystem Loss or Alteration

Potential Effect

Ecosystem Availability

Below is a summary of Project footprint-related changes to wetland ecosystem availability in the LSA and RSA (Table 6.4-17; Figures 1 to 19 in Appendix 6.4-B; Appendix 6.4-A):

- Approximately 402 ha of wetland ecosystems occurs within the Project Footprint.
- Largest predicted loss by percent change and absolute value (ha) is Swamp habitat with 1.9% change from baseline characterization of wetland ecosystems and a predicted direct loss of 17,498 ha in the LSA (0.6% swamp habitat loss in the RSA).
- The Project footprint is not expected to disturb the least common and available general wetland habitat type in the study areas (i.e., Bog habitat). Ecosites comprised of compatible vegetation that extend into the Project footprint, including non-treed bog, non-treed fen and marsh, may not be permanently lost as suggested in Table 6.4-17, and rather, may re-establish through natural regeneration. Additionally, vegetation management practices will be used to maintain vegetation within the transmission line ROW. For example, implementation of a “wire zone – border zone” approach to vegetation management where appropriate in the ROW which allows taller vegetation to grow closer to the edge of the ROW, including tree species. All metrics contained within

the EA do not account for natural regeneration or a wire zone – border zone, and therefore represents the worst-case-scenario.

- One conservation reserve – Campus Lake Conservation Reserve, and one Provincial Park – Turtle River – White Otter Lake Provincial Park extends into the Project. With respect to wetland ecosystem availability within both parks (5,571 ha), a total of 7 ha (0.1%) extends into the Project.
- The Project footprint is located within 120 m buffer from the boundaries of McVicar's Creek Provincially Significant Wetlands (PSW) and Little Falls PSW. Approximately 6 ha occurs within 120 m of access roads and 1.3 ha occurs within 120 m of towers.
- Additionally, the ROW transverses through a portion of McVicar's Creek PSW and Little Falls PSWs:
  - Approximately 2 ha of McVicar's Creek PSW (i.e., 0.78 ha of swamp and 1.28 ha of marsh); and
  - Approximately 4 ha of marsh type of Little Falls PSW.
- With respect to all (non-PSW) wetlands:
  - Approximately 238 ha of non-PSW wetland occurs within the ROW, while approximately 113 ha of access roads will extend through wetlands. Approximately 356 ha of wetland occur within the 30 m of access roads.
  - Approximately 109 preliminary tower locations occur within or partly within wetlands, while 170 occur within 30 m of wetlands.
- Table 6.4-17 considers a 20 m access road ROW. It is noted that approximately 30% of access roads will be maintained as permanent.
- Available wetland ecosystem is dominated by swamp (28 ha; 81%), while fen (4 ha; 11%) and marsh (3 ha; 8%) comprise a small percent.

Table 6.4-17: Predicted Changes to Wetland Ecosystem Availability in the Local and Regional Study Area

Wetland Ecosite: General Habitat Type	LSA Baseline Characterization (ha)	LSA Net Effects (ha)[1]	LSA Change in Area (ha)	LSA Percent Change (%)[2]	RSA Baseline Characterization (ha)	RSA Net Effects (ha)[1]	RSA Change in Area (ha)	RSA Percent Change (%)[2]
Bog	111	-3	108	2.48%	606	-3	603	0.45%
Fen	3777	-40	3737	1.06%	16096	-40	16056	0.25%
Marsh	3188	-28	3160	0.88%	10399	-28	10371	0.27%
Swamp	17829	-331	17498	1.86%	51910	-331	51579	0.64%
Total	24905	-402	24503	1.61%	79010	-402	78609	1.61%

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. The total percent change is calculated relative to the total area and therefore this value will not equal the sum of the individual values.

LSA = Local Study Area, RSA = Regional Study Area; ha = hectare; % = percent.

1) The net effects in the LSA and RSA are a result of the Project footprint (i.e., direct impact to wetland ecosites)

Studies indicate that wetland functions including flood resistance and the ability to improve water quality do not decline until substantial portions (i.e., 40%) of historical wetlands are removed (Environment Canada 2013, Johnston et al. 1990, Zedler 2003). The incremental contribution of the Project footprint to the negative changes in available wetlands (i.e., estimated loss of 294 ha) is predicted to have no to little influence on ecological function on wetland ecosystems. At the scale of the RSA, 99.6% of wetlands at baseline characterization remain intact in terms of Net Effects. At the LSA scale, more than 98% of wetland ecosystems at baseline characterization are predicted to remain in terms of Net Effects for the Project footprint.

Ecosystem Distribution

Environment Canada (2013) states that priorities should be made to maintain wetlands in close proximity to one another. Fragmentation of wetlands can lead to reduced habitat for species that require contiguous patches and may inhibit effective dispersal (Environment Canada 2013). Changes from the Project footprint to wetlands are summarized below. Peat-based wetlands have a large amount of uncertainty with respect to reclamation success. However, some wetland connectivity reduced by the Project may be restored where mineral soil wetlands are located under temporary access roads that will be reclaimed when no longer in use. Below is a summary of Project-related changes to wetland ecosystem distribution (Table 6.4-17; Appendix 6.4-B, Appendix 6.4-A):

- The greatest loss of wetland habitat loss within the LSA consists of swamp (17,498 ha; 1.9% loss to the LSA).
- The smallest loss of wetland habitat loss within the LSA consists of marsh (3160 ha; 0.9% loss to the LSA).
- Despite some increase in fragmentation, overall most wetland ecosystems will remain abundant and well connected across the LSA and RSA to support healthy and functioning ecosystems.

Ecosystem Composition

Species associated with wetlands, including moose (*Alces alces*), swamp sparrow (*Melospiza georgiana*) and northern waterthrush (*Parkesia noveboracensis*) were identified or are expected to occur within the RSA. It is possible that these species may be negatively affected by changes in the condition of wetlands due to the Project footprint. Wetland habitat in close proximity to construction activities and permanent development features are predicted to provide lower quality habitat for wildlife due to changes in the composition of vegetation communities. Wildlife species sensitive to anthropogenic disturbance are predicted to avoid these lower quality wetlands (e.g., sora [*Porzana carolina*]) whereas species adapted to anthropogenic disturbance are more likely to be present (e.g., red winged blackbird [*Agelaius phoeniceus*]).

Native habitat edges are prone to ingress by non-native invasive species near disturbance. No invasive plant species as defined by the *Invasive Species Act* (Ontario 2015) was detected during baseline characterization studies in the LSA. However, baseline characterization botanical field surveys detected one non-native wetland species, the narrow-leaved cattail. It was observed within the RSA in a shallow marsh habitat.

The Project footprint has the potential to degrade some wetlands in the LSA due to changes in water quality and quantity; however, these effects are anticipated to be associated with wetlands that overlap and are immediately adjacent to the Project footprint.

Mitigation Measures

During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails. Mechanical vegetation removal is the preferred method of clearing for initial removal. Clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss will be used to the extent practicable. The construction of temporary (e.g., access road) and permanent (e.g., tower foundations) facilities in wetlands or within a 30 m setback from a wetland will be avoided as practicable. Compatible vegetation, coarse woody debris and plants, and other sensitive plants (e.g., SAR, SOCC, SWH communities) identified during clearing activities will be retained where feasible as practicable and will be considered for further mitigation action as appropriate. Compatible vegetation is described as vegetation that is best suited in terms of available moisture and sunlight and will also avoid interference with the operation of the transmission line. This generally includes species that are unlikely to grow to a height that would interfere with the safe operation of the transmission line.

To minimize encroachment on the edges of the Project footprint, vegetation should be clearly delineated between areas to be retained and cleared. Proposed locations of temporary construction camps and temporary laydown areas will be field verified to avoid wetlands, including bogs and fens, to the extent practicable. Where reasonably possible, work activities in wet areas will be scheduled during frozen conditions.

Similar to the upland ecosystem approach, Hydro One will use vegetation management practices to maintain vegetation within the transmission line ROW. For example, implementation of a “wire zone – border zone” approach to vegetation management (Ballard et al. 2007) where appropriate in the ROW. This approach allows for the safe delivery of electricity while also fostering wildlife habitat and biodiversity, and simultaneously developing overall aesthetics and decreased long-term vegetation management costs.

Areas that have had aggregate placed will be recontoured as necessary to return hydrology and drainage to pre-construction conditions. The stored topsoil and organic material will be spread over the surface. All sites will be left in a stable and self-sustaining condition though areas that may be prone to erosion will be seeded in accordance with MNRF, or other applicable regulatory agency, requirements to ensure prompt revegetation.

Prior to reclamation activities, a reclamation plan will be developed and can be provided to the MNRF. The plan will consist of a map depicting the level of reclamation for each segment of road and a corresponding description of the reclamation activities to be undertaken for each level of reclamation.

Unless directed otherwise by the MNRF new access roads will be recontoured and stored topsoil and organic material will be spread across the disturbed road width. Natural drainage will be restored. Existing access roads may be stabilized and left in place depending on feedback from the MNRF and other road users.

Reclamation and clean up activities will occur progressively throughout the construction of the Project. These activities will include, but not be limited to, removing refuse, grading disturbed areas, contouring disturbed slopes to a stable profile, and re-establishing natural drainage patterns.

A post-construction assessment process will be established, to enable construction ROW and workspace turnover following completion of construction. Final reclamation activities will be completed outside of frozen conditions as soon as weather and soil conditions permit. Reclamation efforts will commence within and near wetlands as soon as reasonably possible to reduce the potential impact and to take advantage of access.

Re-vegetation efforts will be timed to take advantage of favourable moisture and temperature conditions.

Mitigation measures will be outlined in the EPP to address items such as re-grading, subsoil compaction, subsoil and topsoil replacement, seeding and revegetation, and temporary watercourse structure removal as it pertains to Final Reclamation.

Additional mitigation measures are listed in Table 6.4-20.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Site preparation, construction and operation activities can result in the loss or alteration of wetland ecosystems and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.3.2 Dust and Air Emissions, and Subsequent Deposition

Potential Effects

Construction and operation of the Project is predicted to generate air and dust emissions such as carbon monoxide (CO), oxides of sulphur (SO), including sulphur dioxide [SO_2]), oxides of nitrogen (NO_x), particulate matter (e.g., PM2.5) and total suspended particulate matter (SPM). The dust and air emissions effects are discussed in Section 6.4.7.2.2 for upland ecosystems. The outlined effects are also applicable to wetland ecosystems.

Background data obtained from the Thunder Bay and Winnipeg, Manitoba monitoring stations indicate that air quality surrounding the Project is below the relevant provincial and federal ambient air quality guidelines, criteria and standards (Section 6.7).

Potential effects associated with construction are anticipated to be minimal due to their short duration and intermittent frequency. Construction activities are not static and will only occur at one location for a short period before they progress along the ROW.

Mitigation Measures

Mitigation measures planned to further reduce the effects of air emissions associated with the Project include practices to control dust and other air emissions (e.g., maintenance of vehicles and equipment, wetting areas). In areas where there are residences or sensitive receptors located within approximately 200 m of the Project footprint, emphasis will be placed on comprehensive implementation of mitigation measures, in particular dust suppression activities such as watering and dust suppressants (i.e., calcium chloride). Fugitive dust controls on unpaved roads and material handling activities range from a 10% to 90% control (Western Governors' Association 2006).

Construction will implement effective dust suppression techniques, such as on-site watering, as necessary to minimize fugitive dust at worksites and access roads as required.

Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland.

A Dust Control/Air Quality Plan will also be included as part of the EPP that will be provided to affected Indigenous communities for review and input at least 90 days in advance of construction.

A Blasting and Communications Management Plan will be prepared and implemented to limit the amount of chemical residue in the environment. The Blasting and Communication Management Plan will include measures to address the following items:

- Stakeholder notification;
- Storage, Transportation and Use;
- Security;
- Environmentally Sensitive Areas; and
- Waterbodies.

All mitigation measures applicable to dust and air emissions, and subsequent deposition, are further described in the air quality assessment in Section 6.7 (Table 6.7-21) and in Table 6.4-20.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above and in Section 6.7, Table 6.7-21, and summarized in Table 6.4-20. Dust and air emissions, and subsequent deposition associated with the construction and maintenance phases can affect wetland ecosystems through changes in soil quality and direct contact with plants and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.3.3 Introduction and Spread of Noxious and Invasive Plant Species

Potential Effects

Construction and operation and maintenance activities have the potential to introduce non-native invasive plant species into new areas, especially when entering areas with known populations of non-native invasive plant species. Construction and operations equipment and personnel have the potential to introduce non-native invasive plant species into new areas by transporting seed or plant parts on equipment or clothing. Introduction and spread of noxious and invasive plant species are discussed in Section 6.4.7.2.3.

Preventing noxious and invasive species from entering an area is often more efficient and cost effective than dealing with their removal once established (Polster 2003, Carlson and Shepard 2007). One species, which is introduced (NHIC 2022), was observed during the botanical field surveys, the narrow-leaved cattail. Narrow-leaved cattail was observed at one site in marsh habitat (Appendix 6.4-A). This species is not listed under the prohibited invasive species or restricted invasive species of the *Invasive Species Act* (Ontario 2015).

Mitigation Measures

Hydro One will implement suitable vegetation management procedures to avoid and minimize the introduction and spread of noxious and invasive plants during construction and operation and maintenance as a result of the Project. Additional mitigation measures described for upland ecosystems in Section 6.4.7.2.3 are also applicable to wetland ecosystems and further discussed in Table 6.4-20.

Net Effect

It is expected that with implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor, and result in negligible net effects to availability, distribution, and composition of wetland ecosystems.

There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Introduction and spread of noxious and invasive plant species can affect wetland ecosystems during the construction and operation phase and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.4 *Riparian Ecosystems*

6.4.7.4.1 Ecosystem Loss or Alteration

Potential Effects

Ecosystem Availability

Below is a summary of Project footprint-related changes to riparian ecosystem availability in the LSA and RSA (Table 6.4-18; Figures 1 to 19 in Appendix 6.4-B; Appendix 6.4-A):

- The Project footprint would remove 126 ha of riparian habitat in the LSA (1.2% riparian habitat loss within the LSA; 0.4% riparian habitat loss within the RSA).
- The largest predicted loss by percentage change is meadow habitat with 9.2% loss within the LSA and 7.9% loss within the RSA.
- 98.8% in the LSA and 99.6% in the RSA of naturally vegetated areas are predicted to remain intact adjacent to watercourses and waterbodies in terms of net effects.

Table 6.4-18: Predicted Changes to Riparian Ecosystem Availability in the Local and Regional Study Area

Riparian Habitat / Ecosite Grouping	General Habitat Type	LSA Baseline Characterization (ha)	LSA Net Effects[2] (ha)	LSA Change in Area (ha)	LSA Percent Change (%)	RSA Baseline Characterization (ha)	RSA Net Effects[2] (ha)	RSA Change in Area (ha)	RSA Percent Change (%)
Upland Ecosites	Coniferous Forest	4,713	-44	4,668	0.94%	15,072	-44	15,028	0.29%
Upland Ecosites	Deciduous Forest	2,293	-25	2,268	1.08%	7,809	-25	7,784	0.32%
Upland Ecosites	Mixed Forest	87	-2	85	2.01%	549	-2	547	0.32%
Upland Ecosites	Shrub	74	-1	73	0.84%	172	-1	172	0.36%
Upland Ecosites	Field	15	0	15	0.99%	58	-	58	0.26%
Upland Ecosites	Meadow[1]	117	-11	107	9.17%	136	-11	126	7.90%
Upland Ecosites	Barren	36	-1	35	3.15%	77	-1	75	1.48%
Upland Ecosites	**Upland Total**	7,334	-83	7,251	1.1%	23,874	-83	23,790	0.3%
Wetland Ecosites	Bog	-	-	-	-	-	-	-	-
Wetland Ecosites	Fen	7	-9	-2	127.19%	19	-9	10	47.37%
Wetland Ecosites	Marsh	1,027	-14	1,012	1.38%	3,295	-14	3,281	0.43%
Wetland Ecosites	Swamp	1,708	-19	1,688	1.14%	5,339	-19	5,319	0.37%
Wetland Ecosites	**Wetland Total**	**2,741**	**-42**	**2,699**	**1.5%**	8,653	-42	8,610	**0.5%**
Upland and Wetland Ecosites	**Total**	**10,075**	**-126**	**9,950**	**1.2%**	**32,526**	**-126**	**32,400**	**0.4%**

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. The total percent change is calculated relative to the total area and therefore this value will not equal the sum of the individual values.

LSA = Local Study Area, RSA = Regional Study Area; ha = hectare; % = percent.

1) Available meadow habitat includes areas previously disturbed for anthropogenic purposes and may not accurately reflect natural occurring habitat.

2) The net effects in the LSA and RSA are a result of the Project footprint (i.e., direct impact to upland and wetland ecosites within the riparian ecosystem)

Ecosystem Distribution

Below is a summary of the Project footprint-related changes to riparian ecosystem distribution (Table 6.4-18; Figures 1 to 19 in Appendix 6.4-B; Appendix 6.4-A):

- The greatest area of riparian habitat loss within the LSA consists of coniferous forest (4,668 ha; 0.9% loss of the LSA). However, the greatest percent of riparian habitat loss within the LSA consists of meadow (107 ha; 9.2% loss in the LSA).
- The smallest area of riparian habitat loss within the LSA consists of both mixed forest (85 ha; 2.0% loss in the LSA) and barren habitats (35 ha; 3.2% loss in the LSA).
- The Project footprint overlaps with 6 ha (4.7%) of disturbed ecosites within the riparian ecosystem.

Ecosystem Composition

Wildlife species associated with riparian ecosystems, including olive-sided flycatcher (*Contopus cooperi*) and common yellowthroat (*Geothlypis trichas*), were identified during baseline characterization botanical field surveys. It is possible that these species may be negatively affected by changes in the condition of riparian ecosystems due to the Project footprint. Riparian habitat in close proximity to construction activities and permanent development features are predicted to provide lower quality habitat for wildlife due to changes in the composition of vegetation communities. Species sensitive to anthropogenic disturbance are predicted to avoid these lower quality riparian ecosystems, whereas species adapted to anthropogenic disturbance may increase in abundance. However, these potential changes in species abundance and richness from sensory disturbance are predicted to be reversible a few months after construction activities have stopped (Section 6.4.8).

Changes in drainage patterns and increases and decreases in drainage flows and surface water levels beyond the natural range of variation could lead to a loss of soils through increased erosion and affect the quality and quantity (and distribution) of vegetation. As soil moisture levels change because of changes in surface flows and water levels, plant species that thrive in drier soil moisture regimes can out compete riparian species that rely on fluctuations in soil moisture (Shafroth et al. 2002, Leyer 2005). Changes to water quality are expected to be minimal as a result of the Project and would continue during construction when heavy equipment would be used on site. Following construction and during operation, changes to water quality from the Project are predicted to be ecologically non-measurable (Section 6.2).

Mitigation Measures

During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails to riparian ecosystems (upland and wetland).

Similar to the upland and wetland ecosystem approach, Hydro One will use vegetation management practices to maintain vegetation within the transmission line ROW. For example, implementation of a “wire zone – border zone” approach to vegetation management (Ballard et al. 2007) where appropriate in the ROW. This approach allows for the safe delivery of electricity while also fostering wildlife habitat and biodiversity, and simultaneously developing overall aesthetics and decreased long-term vegetation management costs.

Removal of waterbody crossings as part of reclamation activities will ensure that slopes are recontoured and stabilized to maintain similar hydrologic function and drainage as pre-construction condition. Areas that have had aggregate placed will be recontoured as necessary to return hydrology and drainage to pre-construction conditions. The stored topsoil and organic material will be spread over the surface. All sites will be left in a stable and self-sustaining condition though areas that may be prone to erosion will be seeded in accordance with MNRF, or other applicable regulatory agency, requirements to ensure prompt revegetation.

Reclamation and clean up activities will occur progressively throughout the construction of the Project. These activities will include, but not be limited to, removing refuse, grading disturbed areas, contouring disturbed slopes to a stable profile, and re-establishing natural drainage patterns.

A post-construction assessment process will be established, to enable construction ROW and workspace turnover following completion of construction. Final reclamation activities will be completed outside of frozen conditions as soon as weather and soil conditions permit. Reclamation efforts will commence within and near wetlands as soon as reasonably possible to reduce the potential impact and to take advantage of access.

Re-vegetation efforts will be timed to take advantage of favourable moisture and temperature conditions.

Mitigation measures will be outlined in the EPP to address items such as re-grading, subsoil compaction, subsoil and topsoil replacement, seeding and revegetation, and temporary watercourse structure removal as it pertains to Final Reclamation.

Other mitigation measures discussed in upland ecosystems (Section 6.4.7.2.1) and wetland ecosystems (Section 6.4.7.3.1) are also applicable to riparian ecosystems and are further discussed in Table 6.4-20.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Site preparation, construction and operation activities can result in the loss or alteration of riparian ecosystems and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.4.2 Dust and Air Emissions, and Subsequent Deposition

Potential Effects

Construction and operation of the Project is predicted to generate air and dust emissions such as carbon monoxide (CO), oxides of sulphur (SO_x, including sulphur dioxide [SO_2]), oxides of nitrogen (NO_x), particulate matter (e.g., PM2.5) and total suspended particulate matter (SPM). The dust and air emissions effects are discussed in Section 6.4.7.2.2 for upland ecosystems. The outlined effects are also applicable to riparian ecosystems.

Background data obtained from the Thunder Bay and Winnipeg, Manitoba monitoring stations indicate that air quality surrounding the Project is below the relevant provincial and federal ambient air quality guidelines, criteria and standards (Section 6.7).

Potential effects associated with construction are anticipated to be minimal due to their short duration and intermittent frequency. Construction activities are not static and will only occur at one location for a short period before they progress along the ROW.

Mitigation Measures

Mitigation measures planned to further reduce the effects of air emissions associated with the Project include practices to control dust and other air emissions (e.g., maintenance of vehicles and equipment, wetting areas). In areas where there are residences or sensitive receptors located within approximately 200 m of the Project footprint, emphasis will be placed on comprehensive implementation of mitigation measures, in particular dust suppression activities such as watering and dust suppressants (i.e., calcium chloride). Fugitive dust controls on unpaved roads and material handling activities range from a 10% to 90% control (Western Governors' Association 2006).

Construction will implement effective dust suppression techniques, such as on-site watering, as necessary to minimize fugitive dust at worksites and access roads as required.

Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland.

A Dust Control/Air Quality Plan will also be included as part of the EPP that will be provided to affected Indigenous communities for review and input at least 90 days in advance of construction.

A Blasting and Communications Management Plan will be prepared and implemented to limit the amount of chemical residue in the environment. The Blasting and Communication Management Plan will include measures to address the following items:

- Stakeholder notification;
- Storage, Transportation and Use;
- Security;

- Environmentally Sensitive Areas; and
- Waterbodies.

All mitigation measures applicable to dust and air emissions, and subsequent deposition, are further described in the air quality assessment in Section 6.7 (Table 6.7-21) and in Table 6.4-20.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above and in Section 6.7, Table 6.7-21, and summarized in Table 6.4-20. Dust and air emissions, and subsequent deposition associated with the construction and maintenance phases can affect riparian ecosystems through changes in soil quality and direct contact with plants and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.4.3 Introduction and Spread of Noxious and Invasive Plant Species

Potential Effects

Construction and operation and maintenance activities have the potential to introduce non-native invasive plant species into new areas, especially when entering areas with known populations of non-native invasive plant species. Construction and operations equipment and personnel have the potential to introduce non-native invasive plant species into new areas by transporting seed or plant parts on equipment or clothing. Introduction and spread of noxious and invasive plant species are discussed in Section 6.4.7.2.3.

Preventing noxious and invasive species from entering an area is often more efficient and cost effective than dealing with their removal once established (Polster 2003, Carlson and Shepard 2007). As mentioned in upland and wetland ecosystems, two species, which are considered to be introduced (NHIC 2022), were observed during the botanical field surveys and have the potential to occur within riparian ecosystems: Canada thistle and narrow-leaved cattail (Appendix 6.4-A). Canada thistle was observed at three sites in meadow and forest depletion – cuts habitat. Narrow-leaved cattail was observed at one site in marsh habitat. Neither of these species are listed under the prohibited invasive species or restricted invasive species of the *Invasive Species Act* (Ontario 2015). Only Canada thistle is classed as “noxious” under the *Ontario Weeds Act* Schedule of Noxious Weeds (OMAFRA 2017).

Mitigation Measures

Hydro One will implement suitable vegetation management procedures to avoid and minimize the introduction and spread of noxious and invasive plants during construction and operation and maintenance as a result of the Project. Additional mitigation measures described for upland ecosystems in Section 6.4.7.2.3 are also applicable to riparian ecosystems and further discussed in Table 6.4-20.

Net Effect

It is expected that with implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor, and result in negligible net effects to availability, distribution and composition of riparian ecosystems.

There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Introduction and spread of noxious and invasive plant species can affect riparian ecosystems during the construction and operation phase and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.5 Plant Species at Risk

6.4.7.5.1 Plant Loss or Alteration

Potential Effect

Habitat Quantity

Below is a summary of the Project footprint related changes to black ash habitat in the LSA and RSA (Figure 6.4-C-2 in Appendix C; Figure 6.4-C-3 in Appendix C; Figure 6.4-C-9 in Appendix C; Appendix 6.4-A):

- Black ash habitat, both confirmed and candidate types, will be removed as part of the Project.
- A total loss of 6.5 ha representing <1% of the Project footprint, and negligible amount of each of the LSA and RSA.

Habitat Distribution

Below is a summary of the Project footprint-related changes to black ash habitat distribution in the LSA and RSA (Figure 6.4-C-2 in Appendix C; Figure 6.4-C-3 in Appendix C; Figure 6.4-C-9 in Appendix C; Appendix 6.4-A):

- A total loss of 4 ha for confirmed black ash habitat (<1% within the LSA; <1%within the RSA).
- A total loss of 2.5 ha for candidate black ash habitat (<1% within the LSA; <1% within the RSA).

Encroachment into treed habitats suitable to support black ash species may result in direct loss of black ash trees. Additionally, indirect impacts caused from construction activities, such as degradation of soil quality, drainage and introduction of invasive species, can inadvertently degrade habitat, which may cause tree mortality or interfere with regeneration of black ash adjacent to the Project footprint.

Despite some increase in fragmentation, most ecosystems host to black ash are expected to remain available and well connected across the LSA and RSA to support healthy and functioning ecosystems.

Survival and Reproduction

Black ash is a wetland facultative species and has been confirmed in the LSA and RSA in both upland and wetland ecosystems (Section 6.4.5.2.4). Direct competition with non-native species and alteration to regeneration of black ash would bring changes to the survival of established species and their reproduction. It is possible that upland and wetland ecosystems may be negatively affected by changes in the survival and reproduction ability of this species due to the Project footprint and close proximity to construction activities and permanent development features. Specific habitat changes are further discussed in upland ecosystems (Section 6.4.7.2.1) and wetland ecosystems (Section 6.4.7.3.1). The effects to the survival and reproduction of black ash are anticipated for the habitats that overlap and are immediately adjacent to the Project footprint.

Mitigation Measures

As black ash is designated endangered on the SARO list, and protection under the ESA comes into effect in January 2024 (MECP 2022). As such, further consultation with the MECP is required for the removal of black ash trees for the Project and to determine if permits/authorizations are necessary.

Mitigation measures outlined within the upland ecosystem-specific section above (Section 6.4.7.2.1) are also applicable here and will aid in the protection of black ash. Additionally, to protect the surrounding black ash populations to the Project footprint, it is imperative cut black ash wood is properly disposed to prevent the spread of the emerald ash borer. Best practice by the Canadian Food Inspection Agency (2020) is to not transport these trees/logs away from the source. In the event black ash individuals cut are host to the invasive species emerald ash borer it will prevent further spread in the LSA and RSA. Additional mitigation are further discussed in Table 6.4-20.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Site preparation, construction and operation activities can result in the loss or alteration of black ash habitat and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.5.2 Dust and Air Emissions, and Subsequent Deposition

Potential Effects

Construction and operation of the Project is predicted to generate air and dust emissions such as carbon monoxide (CO), oxides of sulphur (SO_x, including sulphur dioxide [SO_2]), oxides of nitrogen (NO_x), particulate matter (e.g., PM2.5) and total suspended particulate matter (SPM). The dust and air emissions effects are discussed in Section 6.4.7.2.2 for upland ecosystems.

The outlined effects are also applicable to wetland ecosystems and subsequent SAR, such as black ash.

Background data obtained from the Thunder Bay and Winnipeg, Manitoba monitoring stations indicate that air quality surrounding the Project is below the relevant provincial and federal ambient air quality guidelines, criteria and standards (Section 6.7).

Potential effects associated with construction are anticipated to be minimal due to their short duration and intermittent frequency. Construction activities are not static and will only occur at one location for a short period before they progress along the ROW.

Mitigation Measures

Mitigation measures planned to further reduce the effects of air emissions associated with the Project include practices to control dust and other air emissions (e.g., maintenance of vehicles and equipment, wetting areas). In areas where there are residences or sensitive receptors located within approximately 200 m of the Project footprint, emphasis will be placed on comprehensive implementation of mitigation measures, in particular dust suppression activities such as watering and dust suppressants (i.e., calcium chloride). Fugitive dust controls on unpaved roads and material handling activities range from a 10% to 90% control (Western Governors' Association 2006).

Construction will implement effective dust suppression techniques, such as on-site watering, as necessary to minimize fugitive dust at worksites and access roads as required.

Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland.

A Dust Control/Air Quality Plan will also be included as part of the EPP that will be provided to affected Indigenous communities for review and input at least 90 days in advance of construction.

A Blasting and Communications Management Plan will be prepared and implemented to limit the amount of chemical residue in the environment. The Blasting and Communication Management Plan will include measures to address the following items:

- Stakeholder notification;
- Storage, Transportation and Use;
- Security;
- Environmentally Sensitive Areas; and
- Waterbodies.

All mitigation measures applicable to dust and air emissions, and subsequent deposition, are further described in the air quality assessment in Section 6.7 (Table 6.7-21) and in Table 6.4-20.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above and in Section 6.7, Table 6.7-21, and summarized in Table 6.4-20. Dust and air emissions, and subsequent deposition associated with the construction and maintenance phases can affect ecosystems and associated SAR, such as black ash, through changes in soil quality and direct contact with plants and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.5.3 Introduction and Spread of Noxious and Invasive Plant Species

Potential Effects

Construction and operation and maintenance activities have the potential to introduce non-native invasive plant species into new areas, especially when entering areas with known populations of non-native invasive plant species. Construction and operations equipment and personnel have the potential to introduce non-native invasive plant species into new areas by transporting seed or plant parts on equipment or clothing. Introduction and spread of noxious and invasive plant species are further discussed in Section 6.4.7.2.3.

Preventing noxious and invasive species from entering an area is often more efficient and cost effective than dealing with their removal once established (Polster 2003, Carlson and Shepard 2007). Two species, which are considered to be introduced (NHIC 2022), were observed during the botanical field surveys and have the potential to occur within upland and wetland ecosystems: Canada thistle (Section 6.4.7.2.3) and narrow-leaved cattail (Section 6.4.7.3.3). These species have a low potential of impacting established black ash populations, however, they could potentially affect black ash regeneration by altering physical characteristic of the habitat, preventing the species to germinate, and/or being in direct competition with black ash seedlings.

Mitigation Measures

Hydro One will implement suitable vegetation management procedures to avoid and minimize the introduction and spread of noxious and invasive plants during construction and operation and maintenance as a result of the Project. Additional mitigation measures described for upland ecosystems in Section 6.4.7.2.3 are also applicable to facultative wetland plant SAR, black ash and further discussed in Table 6.4-20.

Net Effect

It is expected that with implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor, and result in negligible net effects to habitat quantity, habitat distribution, survival and reproduction of black ash and habitat.

There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Introduction and spread of noxious and invasive plant species can affect black ash regeneration and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.6 Plant Species of Conservation Concern

6.4.7.6.1 Plant Loss or Alteration

Potential Effect

Habitat Quantity

Fourteen plant SOCC, one regional rare plant and one type of SOCC-related SWH occur within the LSA and RSA (Table 6.4-11; Appendix 2.4-C; Appendix 6.4-A). Below is a summary of changes in availability of SOCC, regionally rare plant, and candidate SWH due to the Project footprint:

- Two SOCC have records within the footprint, including Scabrous black sedge and Vasey's rush. These records comprise a small area (39 ha; <1%) of the Footprint.
- Total SOCC habitat loss equates to 39 ha (<1% habitat loss in the LSA; <1% habitat loss in the RSA.
- Regional rare ragged fringed orchid occurs within ecosite identified as B139S (Figures 11 and 12 in Appendix 2.4-C; Appendix 6.4-A). A total of 1.8 ha of confirmed habitat occurs within the Project footprint.
- Predicted candidate SOCC-related SWH loss of 371 ha of candidate diverse and sensitive orchid community SWH (0.2% loss in the LSA, <1% loss in the RSA).
- >99% of SOCC habitat in the LSA and >99% in the RSA are predicted to remain intact.

As discussed in the wetland and riparian ecosystem sections, Hydro One will use vegetation management practices to maintain vegetation within the transmission line ROW. For example, implementation of a "wire zone – border zone" approach to vegetation management (Ballard et al. 2007) where appropriate in the ROW. This approach allows for the safe delivery of electricity while also promoting retention of groundcover and shrub species within the respective zones.

Habitat Distribution

Below is a summary of the Project footprint-related changes to SOCC distribution (Appendix 2.4-C; Appendix 6.4-A):

- The greatest area of potential habitat loss for SOCC within the LSA consists of candidate diverse and sensitive orchid community SWH (371 ha; 0.2% loss of the LSA).
- Twelve SOCC will have no habitat loss within the LSA from the Project footprint.

Despite some increase in fragmentation, overall most SOCC habitat and candidate SWH are expected to remain abundant and well connected across the LSA and RSA to support healthy and functioning ecosystems.

Survival and Reproduction

SOCC and SOCC-related SWH are present in both upland and wetland ecosystems. Direct competition with non-native species and alteration to regeneration of SOCC and SWH would bring changes to the survival of established species and their reproduction. It is possible that these ecosystems may be negatively affected by changes in the survival and reproduction ability of these features due to the Project footprint and close proximity to construction activities and permanent development features. Specific habitat changes are further discussed in upland ecosystems (Section 6.4.7.2.1) and wetland ecosystems (Section 6.4.7.3.1).

Project-related changes in survival and reproduction are likely well within the resilience and adaptability limits for this criterion. However, the effects to the survival and reproduction of SOCC and indicator plants in candidate SWH communities are anticipated for the habitats that overlap and are immediately adjacent to the Project footprint.

Mitigation Measures

During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails to riparian ecosystems (upland and wetland). Compatible vegetation, coarse woody debris and plants, and other sensitive plants including SOCC and SWH identified during clearing activities will be retained where feasible and will be considered for further mitigation action as appropriate. To minimize encroachment on the edges of the Project footprint, vegetation should be clearly delineated between areas to be retained and cleared. Other mitigation measures discussed in upland ecosystems (Section 6.4.7.2.1) and wetland ecosystems (Section 6.4.7.3.1) are also applicable to plant SOCC and candidate SWH and are further discussed in Table 6.4-20.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Site preparation, construction and operation activities can result in the loss or alteration of plant SOCC and SWH and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.6.2 Dust and Air Emissions, and Subsequent Deposition

Potential Effects

Construction and operation of the Project is predicted to generate air and dust emissions such as carbon monoxide (CO), oxides of sulphur (SO_x, including sulphur dioxide [SO_2]), oxides of nitrogen (NO_x), particulate matter (e.g., PM2.5) and total suspended particulate matter (SPM). The dust and air emissions effects are discussed in Section 6.4.7.2.2 for upland ecosystems. The outlined effects are also applicable to wetland ecosystems and subsequent SOCC and SWH.

Background data obtained from the Thunder Bay and Winnipeg, Manitoba monitoring stations indicate that air quality surrounding the Project is below the relevant provincial and federal ambient air quality guidelines, criteria and standards (Section 6.7).

Potential effects associated with construction are anticipated to be minimal due to their short duration and intermittent frequency. Construction activities are not static and will only occur at one location for a short period before they progress along the ROW.

Mitigation Measures

Mitigation measures planned to further reduce the effects of air emissions associated with the Project include practices to control dust and other air emissions (e.g., maintenance of vehicles and equipment, wetting areas). In areas where there are residences or sensitive receptors located within approximately 200 m of the Project footprint, emphasis will be placed on comprehensive implementation of mitigation measures, in particular dust suppression activities such as watering and dust suppressants (i.e., calcium chloride). Fugitive dust controls on unpaved roads and material handling activities range from a 10% to 90% control (Western Governors' Association 2006).

Construction will implement effective dust suppression techniques, such as on-site watering, as necessary to minimize fugitive dust at worksites and access roads as required.

Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland.

A Dust Control/Air Quality Plan will also be included as part of the EPP that will be provided to affected Indigenous communities for review and input at least 90 days in advance of construction.

A Blasting and Communications Management Plan will be prepared and implemented to limit the amount of chemical residue in the environment. The Blasting and Communication Management Plan will include measures to address the following items:

- Stakeholder notification;
- Storage, Transportation and Use;
- Security;
- Environmentally Sensitive Areas; and
- Waterbodies.

All mitigation measures applicable to dust and air emissions, and subsequent deposition, are further described in the air quality assessment in Section 6.7 (Table 6.7-21) and in Table 6.4-20.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above (Section 6.4.7.2.2) and in Table 6.4-20. Dust and air emissions, and subsequent deposition associated with the construction and maintenance phases can affect SOCC and SWH through changes in soil quality and direct contact with plants. This is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.6.3 Introduction and Spread of Noxious and Invasive Plant Species

Potential Effects

Construction and operation and maintenance activities have the potential to introduce non-native invasive plant species into new areas, especially when entering areas with known populations of non-native invasive plant species. Construction and operations equipment and personnel have the potential to introduce non-native invasive plant species into new areas by transporting seed or plant parts on equipment or clothing. Introduction and spread of noxious and invasive plant species are discussed in Section 6.4.7.2.3.

Preventing noxious and invasive species from entering an area is often more efficient and cost effective than dealing with their removal once established (Polster 2003, Carlson and Shepard 2007). Two species, which are considered to be introduced (NHIC 2022), were observed during the botanical field surveys and have the potential to occur within upland and wetland ecosystems: Canada thistle (Section 6.4.7.2.3) and narrow-leaved cattail (Section 6.4.7.3.3). These species have a potential to impact established SOCC populations and SWH by potentially altering physical characteristic of the habitat and being in direct competition with SOCC and SWH.

Mitigation Measures

Hydro One will implement suitable vegetation management procedures to avoid and minimize the introduction and spread of noxious and invasive plants during construction and operation and maintenance as a result of the Project. Additional mitigation measures described for upland ecosystems in Section 6.4.7.2.3 are also applicable to wetland ecosystems and associated SOCC as well as SWH, and further discussed in Table 6.4-20.

Net Effect

It is expected that with implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor, and result in negligible net effects to habitat quantity, habitat distribution, and survival and reproduction of SOCC and SWH.

There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Introduction and spread of noxious and invasive plant species can affect population and regeneration of SOCC and SWH. This is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.7 Plants of Traditional Use

6.4.7.7.1 Plant Loss or Alteration

Potential Effect

The loss or alteration of vegetation and topography may affect the abundance and distribution of plants available for traditional use.

Habitat Quantity

- A subset of plant species of traditional use were determined as part of the baseline characterization of the LSA and RSA (Table 6.4-12:; Appendix 6.4-A). Below is a summary of Project footprint-related changes to habitat availability for plant species of traditional use in the LSA and RSA (Table 6.4-19).Total loss of 138,764 ha (2.7% plants of traditional use habitat loss in the LSA, 0.9% plants of traditional use habitat loss in the RSA) of habitat confirmed and suitable to plant species of traditional use within the LSA and RSA.
- Total loss of 28 ha of wild rice SWH is predicted – 1.9% loss with respect to the LSA and 1.9% loss with respect to the RSA. In accordance with baseline methodology, potential loss is associated entirely with candidate (marsh) wild rice habitat areas. Confirmed wild rice habitat mapped provincially (i.e., wild rice stand LIO data) does not occur within the Project or within 120 m of the Project; input from First Nations communities have identified areas supporting wild rice crossed by the ROW southeast of Thunder Lake and near Dinorwic. As highlighted in Section 6.4.6, wild rice stand is more closely associated with open water, not wetland.
- With respect to the Project footprint, 43 ha of open water directly occurs within the footprint, 68 ha occurs within 30 m of the footprint, and 435 ha occurs within 120 m of the footprint.
- The Project footprint does not include any structures within open water.
- A total of 42 ha and 209 ha of candidate (marsh) habitat occurs within 30 m and 120 m of the Project, respectively.
- Approximately 97% in the LSA and 99% in the RSA of habitats to plant species of traditional use are predicted to remain intact in terms of net effects.

As discussed in the upland, wetland and riparian ecosystem sections, Hydro One will use vegetation management practices to maintain vegetation within the transmission line ROW. For example, implementation of a “wire zone – border zone” approach to vegetation management (Ballard et al. 2007) where appropriate in the ROW. This approach allows for the safe delivery of electricity while also promoting retention of groundcover and shrub species within the respective zones.

Table 6.4-19: Predicted Changes to Ecosystem Availability for Plant Species of Traditional Use in the Local and Regional Study Area

Plant Species of Traditional Use Habitat / Ecosite Grouping	General Habitat Type	LSA Baseline Characterization (ha)	LSA Net Effects (ha)[2]	LSA Change in Area (ha)	LSA Percent Change (%)	RSA Baseline Characterization (ha)	RSA Net Effects (ha)[2]	RSA Change in Area (ha)	RSA Percent Change (%)
Upland Ecosites	Coniferous Forest	59,995	-1665	58,330	2.78%	184,137	-1665	182,472	0.90%
Upland Ecosites	Deciduous Forest	51,233	-1321	49,911	2.58%	156,667	-1321	155,345	0.84%
Upland Ecosites	Mixed Forest	1,652	-59	1,593	3.59%	6,460	-59	6,401	0.92%
Upland Ecosites	Shrub	946	-25	920	2.74%	1,968	-25	1,942	1.32%
Upland Ecosite	Field	527	-4	523	0.68%	1,869	-4	1,865	0.19%
Upland Ecosites	Meadow[1]	2,394	-292	2,102	12.21%	2,735	-292	2,443	10.68%
Upland Ecosites	Barren	957	-75	882	7.83%	1,516	-75	1,441	4.94%
Upland Ecosites	**Upland Total**	**117,704**	**-3,443**	**114,261**	2.93%	**355,352**	**-3,443**	**351,909**	0.97%
Wetland Ecosites	Bog	111	-3	108	2.48%	605	-3	602	0.45%
Wetland Ecosites	Fen	3,777	-40	3,737	1.06%	16,096	-40	16,056	0.25%
Wetland Ecosites	Marsh	3,188	-28	3,160	0.88%	10,399	-28	10,371	0.27%
Wetland Ecosites	Swamp	17,829	-331	17,498	1.86%	51,909	-331	51,578	0.64%
Wetland Ecosites	**Wetland Total**	**24,905**	**-402**	**24,503**	1.61%	**79,009**	**-402**	**78,607**	0.51%
Upland and Wetland Ecosites	**Total**	**142,609**	**-3,845**	**138,764**	2.70%	**434,361**	**-3,845**	**430,516**	0.89%

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. The total percent change is calculated relative to the total area and therefore this value will not equal the sum of the individual values.

LSA = Local Study Area, RSA = Regional Study Area; ha = hectare; % = percent.

1) Available meadow habitat includes areas previously disturbed for anthropogenic purposes and may not accurately reflect natural occurring habitat.

2) The net effects in the LSA and RSA are a result of the Project footprint (i.e., direct impact to upland and wetland ecosites)

Habitat Distribution

Below is a summary of the Project footprint-related changes to plant species of traditional use habitat distribution (Table 6.4-19; Appendix 6.4-A):

- The greatest area of habitat loss for plant species of traditional use within the LSA consists of coniferous forest (58,330 ha; 2.8% loss of the LSA), it is host to the majority of plant species of traditional use discussed in this assessment. However, the greatest percent of habitat loss for plant species of traditional use within the LSA consists of meadow (2,102 ha; 12.2% loss in the LSA). It is noted that the Project footprint will be allowed to naturally recover with compatible species.
- Many plant species of traditional use are also found in deciduous forests with a habitat loss of 49,911 ha (2.6% loss of the LSA).
- No bog habitat loss for plant species of traditional use within the LSA.
- Plant species of traditional use, sweetgrass and wild rice, are mostly found in marsh habitat type and will experience a habitat loss of 3160 ha (0.9% loss of the LSA).
- While considering confirmed and candidate wild rice habitats:
  - Confirmed wild rice stands in provincial mapping do not occur within the Project footprint, including 30 m and 120 m adjacent areas; input from First Nations communities have identified areas supporting wild rice crossed by the ROW southeast of Thunder Lake and near Dinorwic. Specific areas of concern and site-specific mitigation measures will be further defined through engagement with communities during review of construction plans.
  - Approximately 21 ha of candidate wild rice occurs within the Project footprint, while 6 ha is attributed to access roads, 0.40 ha - fly yards, and <0.01 ha associated pull sites. Preliminary arrangement of four towers will occur within these candidate areas; however, impacts associated with tower feet placement. It is presumed that wild rice will continue to grow under and around the transmission structures.
  - Approximately 29 ha and 142 ha of candidate wild rice habitat occurs within 30 m and 120 m of the Project footprint.

Despite some increase in fragmentation, most ecosystems host to plant species of traditional use are expected to remain abundant and well connected across the LSA and RSA to support healthy and functioning ecosystems.

Survival and Reproduction

Plant species of traditional use are in some cases prominent species present in all boreal ecosystems, including upland, wetland, and riparian ecosystems. These ecosystems are host to a multitude of wildlife species, such as moose (*Alces alces*), olive-sided flycatcher (*Contopus cooperi*), northern saw-whet owl (*Aegolius acadicus*), red squirrel (*Sciurus vulgaris*), amongst others. It is possible that these species may be negatively affected by changes in the survival and reproduction ability of plant species of traditional use present in boreal ecosystems due to the Project footprint. Plant species of traditional use habitat in close proximity to construction activities and permanent development features are predicted to provide lower quality habitat for wildlife due to changes in their survival and reproduction. Wildlife species sensitive to anthropogenic disturbance are predicted to avoid these lower quality boreal ecosystems and are further discussed in upland ecosystems (Section 6.4.7.2.1) and wetland ecosystems (Section 6.4.7.3.1).

Project-related changes in survival and reproduction are likely well within the resilience and adaptability limits for this criterion. However, plant species of traditional use with limited suitable habitats may be approaching limits of resilience and adaptability. Specifically, wild rice is heavily dependent on water levels and drainage patterns to current habitats, and this species would have a lower capacity to adapt to further changes brought on by the project. As well, sweetgrass, which is located in limited habitats, would have a lower capacity to adapt to changes; loss of its habitat may result in further presence declines. However, these effects are anticipated to be associated with plant species of traditional use habitats that overlap and are immediately adjacent to the Project footprint.

Mitigation Measures

During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails to riparian ecosystems (upland and wetland). Compatible vegetation, coarse woody debris and plants, and other sensitive plants identified during clearing activities will be retained where feasible and will be considered for further mitigation action as appropriate. To minimize encroachment on the edges of the Project footprint, vegetation should be clearly delineated between areas to be retained and cleared. Other mitigation measures discussed in upland ecosystems (Section 6.4.7.2.1) and wetland ecosystems (Section 6.4.7.3.1) are also applicable to plant species of traditional use, and are further discussed in Table 6.4-20.

The location of Project components, specifically access roads, structures, fly yards and pull sites, extend into candidate wild rice habitat and the respective 30 m protective buffer. These areas will undergo further review, including ground-truthing, to avoid habitat encroachment and maintain a protective buffer. Where avoidance of habitat and the protective buffer are not possible, site-specific considerations will be undertaken to develop an enhanced mitigation plan for respective habitat areas, and engage with applicable Indigenous communities.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Site preparation, construction and operation activities can result in the loss or alteration of plant species of traditional use habitat and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.7.2 Dust and Air Emissions and Subsequent Deposition

Potential Effects

Construction and operation of the Project is predicted to generate air and dust emissions such as carbon monoxide (CO), oxides of sulphur (SO_x, including sulphur dioxide [SO_2]), oxides of nitrogen (NO_x), particulate matter (e.g., $PM_{2.5}$) and total suspended particulate matter (SPM). The dust and air emissions effects are discussed in Section 6.4.7.2.2 for upland ecosystems. The outlined effects are also applicable to wetland ecosystems and subsequent plant species of traditional use.

Background data obtained from the Thunder Bay and Winnipeg, Manitoba monitoring stations indicate that air quality surrounding the Project is below the relevant provincial and federal ambient air quality guidelines, criteria and standards (Section 6.7). Potential effects associated with construction are anticipated to be minimal due to their short duration and intermittent frequency. Construction activities are not static and will only occur at one location for a short period before they progress along the ROW.

Mitigation Measures

Mitigation measures planned to further reduce the effects of air emissions associated with the Project include practices to control dust and other air emissions (e.g., maintenance of vehicles and equipment, wetting areas).

Construction will implement effective dust suppression techniques, such as on-site watering, as necessary to minimize fugitive dust at worksites and access roads as required.

Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland.

A Dust Control/Air Quality Plan will also be included as part of the EPP that will be provided to affected Indigenous communities for review and input at least 90 days in advance of construction.

A Blasting and Communications Management Plan will be prepared and implemented to limit the amount of chemical residue in the environment. The Blasting and Communication Management Plan will include measures to address the following items:

- Stakeholder notification;
- Storage, Transportation and Use;
- Security;

- Environmentally Sensitive Areas; and
- Waterbodies.

All mitigation measures applicable to dust and air emissions, and subsequent deposition, are further described in the air quality assessment in Section 6.7 (Table 6.7-21) and in Table 6.4-20.

Net Effect

There is a net effect predicted after implementation of the mitigation measures described above and in Section 6.7, Table 6.7-21, and summarized in Table 6.4-20. Dust and air emissions, and subsequent deposition associated with the construction and maintenance phases can affect ecosystems and associated plant species of traditional use through changes in soil quality and direct contact with plants. This is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.7.3 Introduction and Spread of Noxious and Invasive Plant Species

Potential Effects

Construction and operation and maintenance activities have the potential to introduce non-native invasive plant species into new areas, especially when entering areas with known populations of non-native invasive plant species. Construction and operations equipment and personnel have the potential to introduce non-native invasive plant species into new areas by transporting seed or plant parts on equipment or clothing. Introduction and spread of noxious and invasive plant species are discussed in Section 6.4.7.2.3.

Preventing noxious and invasive species from entering an area is often more efficient and cost effective than dealing with their removal once established (Polster 2003, Carlson and Shepard 2007). As mentioned in upland and wetland ecosystems, two species, which are considered to be introduced (NHIC 2022), were observed during the botanical field surveys and have the potential to occur within upland and wetland ecosystems host to plant species of traditional use such as Canada thistle and narrow-leaved cattail. Canada thistle was observed during field studies at three sites in meadow and forest depletion – cuts habitat. Narrow-leaved cattail was observed at one site in marsh habitat. Neither of these species are listed under the prohibited invasive species or restricted invasive species of the *Invasive Species Act* (Ontario 2015). Only Canada thistle is classed as “noxious” under the *Ontario Weeds Act* Schedule of Noxious Weeds (OMAFRA 2017).

Mitigation Measures

Hydro One will implement suitable vegetation management procedures to avoid and minimize the introduction and spread of noxious and invasive plants during construction and operation and maintenance as a result of the Project. Additional mitigation measures described for upland ecosystems in Section 6.4.7.2.3 are also applicable to wetland ecosystems and associated plant species of traditional use, and further discussed in Table 6.4-20.

Net Effect

It is expected that with implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor, and result in negligible net effects to habitat quantity, habitat distribution, and survival and reproduction of plant species of traditional use. There is a net effect predicted after implementation of the mitigation measures described above and in Table 6.4-20. Introduction and spread of noxious and invasive plant species can affect plant species of traditional use and is carried forward to the net effects characterization (Section 6.4.8).

6.4.7.8 Summary of Potential Effects, Mitigation Measures, and Net Effects

Table 6.4-20 provides a summary of the Project-environment interactions assessment and the mitigation measures. The Project-environment interactions that result in a net effect after mitigation measures are applied will be carried forward to the Section 6.4.8 Net Effects Characterization.

Table 6.4-20: Potential Effects, Mitigation Measures, and Predicted Net Effects for Vegetation and Wetlands

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
• Upland ecosystems • Wetland ecosystems • Riparian ecosystems	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Surface water management and erosion control; • Hazardous materials, solid and liquid waste handling; • Maintenance of site services; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps. **Operation and maintenance stage:** • Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer stations and permanent access roads.	**Ecosystem loss or alteration**	**Construction stage:** • During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails. • Unless directed otherwise by the MNRF, new access roads will be recontoured and stored topsoil and organic material will be spread across the disturbed road width. Natural drainage will be restored. • Use clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss (e.g., equipment with low ground pressure tracks or tires, blade shores and brush), to the extent practicable. • Hydro One or their contractor(s) will prepare and implement a Soil Management Plan. • Herbicides will not be used during construction of the Project. • Mechanical removal methods will be used for initial vegetation removal. • Use of vegetation management practices to maintain vegetation within the transmission line ROW. For example, implementation of a “wire zone – border zone” approach to vegetation management (Ballard et al. 2007) where appropriate in the ROW. This method manages vegetation in the two zones, where herb/grass/forb species are promoted in the wire zone, and shrub/short tree species are promoted in the border zone. This approach allows for the safe delivery of electricity while also fostering wildlife habitat and biodiversity, and simultaneously developing overall aesthetics and decreased long-term vegetation management costs. Limit to the extent practicable the construction of temporary (e.g., access road, travel lane) and permanent (e.g., tower foundations) structures in wetlands or within 30 m setback from a wetland. • Where construction is required within wetlands without approval under MNRF permits, MNRF will be notified as soon as possible. Work may not be conducted unless clearance is obtained from the appropriate regulatory agencies. • The construction of temporary (e.g., access road) and permanent (e.g., tower foundations) facilities in wetlands or within a 30 m setback from a wetland will be avoided as practicable. • Restrict grubbing within areas with steep slopes or soils with risk of erosion. • Retain compatible vegetation, coarse woody debris and plants, and other sensitive plants (e.g., black ash, SOCC, SWH) where feasible as practicable and will be considered for further mitigation action as appropriate. • Under nonfrozen conditions and where regulatory approvals allow, install mats (e.g., rig mats, swamp mats or access mats) to limit effects to wetlands, if warranted and surface conditions require. Alternative crossing measures will be used in areas which occur below a high-water mark (see Section 6.6). • Proposed locations of temporary construction camps and temporary laydown areas will be field verified to avoid wetlands, including bogs and fens, to the extent practicable. Where possible, schedule work activities in wet areas during frozen conditions. • Slash and debris will be chipped and spread over the ROW as appropriate in accordance with maximum mulch depth or will be burned in accordance with provincial *Forest Fires Prevention Act* and the Regulation 207/96 Outdoor Fires under this Act. • Mulch will be generated in areas that have minimal salvageable timber. In these locations, generated mulch will be spread across the ROW to avoid accumulation of flammable material.	**Net effect** - The loss or alteration of vegetation and topography changes ecosystem availability, composition and connectivity.

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				Mulch chips are not to exceed a spread depth of 18 cm. Generally, mulch depths in wetland areas are minimal since there is insufficient fibre to generate large mulch depths. • In-situ mulch may also be used to help stabilize soils prone to erosion in combination with other erosion control measures. • Areas disturbed by aggregate placement will be recontoured to return hydrology and drainage to similar pre-construction conditions. • Residual logging debris and timber not reserved for landowner use may be mulched in place and spread on the ROW or piled and burned contingent on the approval of a burn plan. Designated tree species (if applicable) will be disposed of in accordance with local or provincial regulations. • Avoid burning slash piles in peat-rich areas where residual fires could smoulder after April 1. • Minimize burning of slash piles within 100 m of a waterbody to the extent practicable. • Strip the topsoil at burn locations to prevent sterilization of the soil. • Hydro One will work with sustainable forestry license holders to manage merchantable timber cleared by the Project. • If timber and brush are disposed of by mechanical means (i.e., mulching or chipping), the material must be dispersed in a way to avoid accumulation of flammable material and comply with the *Forest Fires Prevention Act.* • Management plans will be developed before construction activities for vegetation and wetlands including a Vegetation Management Plan which will include rare plant management techniques and Invasive Species and Biosecurity Management Plan. • In the event a rare plant species or a rare vegetation community are suspected or encountered unexpectedly, appropriate avoidance or mitigation measures will be applied. • Known sensitive ecological features will be clearly marked (e.g., wetlands and significant wildlife habitat) with associated setbacks. • Stabilize erodible soils as soon as practicable by seeding, spreading mulch or installing erosion control blankets. • Enhanced vegetation recovery methods (e.g., seeding, planting seedlings) will be implemented where these enhanced methods are appropriate. For example, Hydro One will plant seedlings along new off-ROW access roads in conservation reserves and provincial parks. Further, waterbody crossing locations that have been removed after construction will be seeded in accordance with MNRF, or other applicable regulatory agency, requirements. • Proper delineation of Project footprint will be executed to avoid encroachment into natural vegetation to be retained on edge of development and ensure areas beyond the Project footprint are not disturbed (e.g., tree protection fences, silt fences around wetlands and waterbodies). • Temporary access roads and trails, temporary construction camps, turn-around areas, wetland crossings and temporary laydown areas will be decommissioned and reclaimed at the end of construction. • Recontour disturbed areas to restore drainage patterns. • Decompact subsoils, temporary access trails and soils damaged during wet weather. **Operation and maintenance stage:** • Allow compatible vegetation within the ROW, including riparian vegetation buffer.	

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• Herbicides will not be used during operation and maintenance of the Project. • Follow established vegetation management procedures to ensure protection of wildlife and adjacent vegetation. Where vegetation management is considered necessary, mechanical methods will be used. Control of non-native species will be a priority. • Compacted areas will be ripped or otherwise treated to loosen soil and facilitate natural revegetation. Reclamation activities are anticipated to occur immediately after construction, which would decrease the negative effects to physical, chemical and biological properties of soil from stockpiling (i.e., stockpiling would happen only over the short-term). Prior to reclamation activities, a reclamation plan will be developed and can be provided to MNRF. The plan will consist of a map depicting the level of reclamation for each segment of road and a corresponding description of the reclamation activities to be undertaken for each level of reclamation. • Re-vegetation efforts will be timed to take advantage of favourable moisture and temperature conditions. • Mitigation measures will be outlined in the EPP to address items such as re-grading, subsoil compaction, subsoil and topsoil replacement, seeding and revegetation, and temporary watercourse structure removal as it pertains to Final Reclamation.	
• Upland ecosystems • Wetland ecosystems • Riparian ecosystems	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Surface water management and erosion control; • Hazardous materials, solid and liquid waste handling; • Maintenance of site services; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps. **Operation and maintenance stage:** • Operation and maintenance of new ROW, fencing, transmission line, conductors,	**Reduced soil quantity and quality**	**Construction stage:** • The Project will provide direction on topsoil stripping, stockpiling, salvage and prioritized placement on the landscape and is further discussed in the physiography and geology assessment in Section 6.1. • During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails. • Use clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss (e.g., equipment with low ground pressure tracks or tires, blade shores and brush), to the extent practicable. • Reclamation and clean up activities will occur progressively throughout the construction of the Project. These activities will include, but not be limited to, removing refuse, grading disturbed areas, contouring disturbed slopes to a stable profile, and re-establishing natural drainage patterns. • A post-construction assessment process will be established, to assess and respond to reclamation needs within he ROW following completion of construction. Seeding will be completed during the spring and/or summer months, when conditions are most favorable. • Mitigation measures will be outlined in the EPP to address items such as re-grading, subsoil compaction, subsoil and topsoil replacement, seeding and revegetation, and temporary watercourse structure removal as it pertains to Final Reclamation. • All ROW traffic will be restricted to a single, established travel lane and only use approved access routes. • Follow the appropriate mitigation measures listed in a Soil Management Plan prepared by the contractor. • Herbicides will not be used during construction of the Project. Mechanical removal methods will be used for initial vegetation removal. • Limit to the extent practicable the construction of temporary (e.g., access road, travel lane) and permanent (tower foundations) structures in wetlands or within a 30 m setback from a wetland.	No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		tower foundations, transformer stations and permanent access roads.		• Where construction is required within wetlands and is not already approved under MNRF permits, MNRF will be notified as soon as possible. Work may not be conducted unless clearance is obtained from the appropriate regulatory agencies. • Restrict grubbing within areas with steep slopes or soils with risk of erosion. • Retain compatible vegetation, coarse woody plants, and other sensitive plants (e.g., black ash, SOCC, SWH) where feasible as practicable and will be considered for further mitigation action as appropriate. • Under nonfrozen conditions and where regulatory approvals allow, install mats (e.g., rig mats, swamp mats or access mats) to limit effects to wetlands, if warranted and surface conditions require. Alternative crossing measures will be used in areas which occur below a high-water mark (see Section 6.6). • Proposed locations of temporary construction camps and temporary laydown areas will be field verified to avoid wetlands including bogs and fens, to the extent practicable. Where possible, schedule work activities in wet areas during frozen conditions. • Where construction is required within wetlands and is not already approved under MNRF permits, MNRF will be notified as soon as possible. Work may not be conducted unless clearance is obtained from the appropriate regulatory agencies. • Areas disturbed by aggregate placement will be recontoured to return hydrology and drainage to pre-construction conditions. • Residual logging debris and timber not reserved for landowner use may be mulched in place and spread on the ROW or piled and burned contingent on the approval of a burn plan. Designated tree species (if applicable) will be disposed of in accordance with local or provincial regulations. • Mulch will be generated in areas that have minimal salvageable timber. In these locations, generated mulch will be spread across the ROW to avoid accumulation of flammable material. Mulch chips are not to exceed a spread depth of 18 cm. Generally, mulch depths in wetland areas are minimal since there is insufficient fibre to generate large mulch depths. • Other slash and debris resulting from mechanical clearing operations will be spread to ensure depths do not exceed 0.3 m or will be piled and burned. In areas that are hand felled only, trees will be bucked and delimbed to lie close to the ground. • In-situ mulch may also be used to help stabilize soils prone to erosion in combination with other erosion control measures. • Slash and debris will be chipped and spread over the ROW a appropriate in accordance with maximum mulch depth or will be burned in accordance with provincial *Forest Fires Prevention Act* and the Regulation 207/96 Outdoor Fires under this Act. • Avoid burning slash piles when a fire hazard is present. • Minimize burning of slash piles within 100 m of a waterbody to the extent practicable. • Avoid locating slash burn piles in peat-rich areas where residual fires could persist after construction. • Strip the topsoil at burn locations to prevent sterilization of the soil. • Hydro One will work with sustainable forestry license holders to manage merchantable timber cleared by the Project.	

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• If timber and brush are disposed of by mechanical means (i.e., mulching or chipping), the material must be dispersed in a way to avoid accumulation of flammable material and comply with the *Forest Fires Prevention Act.* • In the event a rare plant species or a rare vegetation community are suspected or encountered unexpectedly, or cannot be avoided, appropriate avoidance or mitigation measures will be applied; Known sensitive ecological features will be clearly marked (e.g., wetlands and significant wildlife habitat) with associated setbacks. • Stabilize erodible soils as soon as practicable by seeding, spreading mulch or installing erosion control blankets. • Proper delineation of Project footprint will be executed to avoid encroachment into natural vegetation to be retained on edge of development and ensure areas beyond the Project footprint are not disturbed (e.g., tree protection fences, silt fences around wetlands and waterbodies). • Temporary access roads and trails, temporary construction camps, turn-around areas, wetland crossings and temporary laydown areas will be decommissioned and reclaimed at the end of construction. • Recontour disturbed areas to restore drainage patterns. • Decompact subsoils, temporary access trails and soils damaged during wet weather. **Operation and maintenance stage:** • Allow compatible vegetation within the ROW, including riparian vegetation buffer. • Follow established vegetation management procedures to ensure protection of wildlife and adjacent vegetation. Where vegetation management is considered necessary, mechanical methods will be used. Control of non-native species will be a priority. • Herbicides will not be used during the operation and maintenance of the Project.	
• Upland ecosystems • Wetland ecosystems • Riparian ecosystems	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Water taking from surface water sources for the purposes of construction and water supply; • Surface water management and erosion control; • Discharges of wastewater from construction, vehicle and	**Changes in hydrology**	Refer to mitigation measures presented for the surface water assessment in **Section 6.2**. In summary, during the **Construction stage:** • For vehicles and equipment owned/rented by Hydro One or their contractor, only properly functioning vehicles and equipment will be operated. • Vehicles and equipment will be regularly serviced, maintained, and inspected for leaks. • Where reasonable and practicable, vehicles and equipment will be turned off when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition. • Multi passenger vehicles will be used to transport personnel, where practicable. • Soil and aggregate materials will be transported wetted or under cover, as appropriate. • Dust control practices (e.g., wetting with water) will be employed at concrete batch plants, work sites and on access roads as appropriate. • Progressive reclamation of disturbed areas will be practiced. • Natural recovery is the preferred method over seeding of reclamation on level terrain where erosion is not expected. Enhanced vegetation recovery methods (e.g., seeding, planting seedlings) will be implemented where these enhanced methods are appropriate. If seeding is required, seed erosion prone areas in accordance with MNRF, or other applicable regulatory agency, requirements to promote plant species establishment during reclamation. Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal	No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		equipment wash, and domestic activities; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps.		or weather conditions. Areas that have had aggregate placed will be recontoured as necessary to return hydrology and drainage to pre-construction conditions. The stored topsoil and organic material will be spread over the surface. All sites will be left in a stable and self-sustaining condition though areas that may be prone to erosion will be seeded in accordance with MNRF, or other applicable regulatory agency, requirements to ensure prompt revegetation. • Soil stockpiles will be vegetated, where appropriate (e.g., if soils are prone to wind erosion). • Topsoil handling will be suspended during high wind conditions, where practicable and as required. • Stripped soil will be stored outside waterbody buffers. Stripped soils will not be placed in surface drainage channel or wetland. • Install culverts or temporary bridges using best management practices and following environmental approval conditions	

• Upland ecosystems
• Wetland ecosystems
• Riparian ecosystems
	• Ecosystem availability
	• Ecosystem distribution
	• Ecosystem composition
		Construction stage:
		• Re-fuelling, service and maintenance of vehicles and construction equipment;
		• Operation of vehicles, construction equipment and diesel generators; and
		• Hazardous materials, solid and liquid waste handling.
		
		Operation and maintenance stage:
		• Transportation of personnel, materials and equipment.
			Chemical or Hazardous Material Spills	Refer to mitigation measures presented for the surface water assessment in **Section 6.2**. In summary, during the **Construction Stage:**
				• The transportation, storage, and handling of chemicals and fuels will be in compliance with the *Technical Standards and Safety Act, 2000* (Government of Ontario 2020) and Canada's *Transportation of Dangerous Goods Act, 1992* (Government of Canada 2019).
				• Hydro One or their contractor(s) will prepare and implement a Spill Prevention and Emergency Response Plan that describes specific measures that would be implemented if a spill occurred.
				• Hydro One or their contractor(s) will prepare and implement a Waste Management and Disposal Plan that describe the appropriate management of solid, liquid and hazardous waste, including:
				  ◦ Construction-related garbage, debris, and surplus materials;
				  ◦ Hazardous materials, such as used oil, filter and grease cartridges, lubrication containers; and
				  ◦ Domestic garbage and camp waste (i.e., food and grey water). Portable, secure, solid waste receptacles will be provided on work sites, temporary laydown areas and temporary construction camps and periodically emptied.
				• Fuel and hazardous materials will be transported in approved containers in licensed vehicles. Transportation of fuel on winter roads will only take place in safe ice conditions.
				• Fuel and hazardous materials will be stored and handled in designated areas with appropriate secondary containment.
				• Refueling, service, and maintenance of vehicles and equipment will generally be carried out in designated areas at temporary construction camps and temporary laydown areas located a minimum of 120 from waterbodies to the extent possible. These areas will be designed and constructed to collect and contain minor leaks and spills. For example, containment measures may consist of low permeability liners, sloped appropriately, and buried in the ground, portable berms (e.g., insta-berms) or concrete pads with perimeter drainage control. Drainage will be passed through an oil water separator to remove hydrocarbons prior to its release to a vegetated area. If refueling within 120 m of a waterbody cannot be avoided, enhanced spill containment measures will be used.
				• In the event that refuelling, servicing and maintenance is required in the field, 120 m buffer will be respected to the extent possible. There may be locations where this is not possible due to the prevalence of wetlands; however, in these locations enhanced spill containment measures will be used. For vehicles and equipment owned/rented by Hydro One or their contractor, only properly functioning vehicles and equipment will be operated.
					No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• Vehicles and equipment are to arrive on-site in a clean condition and will be regularly serviced, maintained and inspected for leaks. • Spill response kits will be provided in fuel and hazardous materials storage and handling facilities at temporary construction camps and temporary laydown areas, in on-site work areas and/or in vehicles and equipment, and personnel will be trained in spill response practices and procedures. Spills and leaks will be contained and cleaned up as soon as possible following incidents. • Personnel will be trained in spill avoidance, cleanup and reporting procedures. **Operation and maintenance stage:** • Hazardous materials will be transported in approved containers in licensed vehicles. • Vehicles and equipment will be regularly serviced, maintained and inspected for leaks. • For vehicles and equipment owned/rented by Hydro One, only properly functioning vehicles and equipment will be operated. • Spill response kits will be provided in vehicles and equipment.	

• Upland ecosystems
• Wetland ecosystems
• Riparian ecosystems
	• Ecosystem availability
	• Ecosystem distribution
	• Ecosystem composition
		Construction stage:
		• Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps);
		• Use of explosives and blasting to create level areas for transmission structures, roads and foundation excavations; and
		• Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps.
		
		Operation and maintenance stage:
		• Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer stations and permanent access roads.
			Dust and air emissions, and subsequent deposition	Mitigation measures presented in the air quality assessment in **Section 6.7** during the **construction stage:**
				• Where reasonable, vehicles and equipment will be turned off when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition.
				• Vehicles and equipment will be regularly serviced, maintained and inspected for leaks.
				• Obey all speed limits to limit fugitive dust.
				• Slash pile burning will be subject to permits and approvals by appropriate regulatory agencies.
				• Slash piles will be burned in compliance with O. Reg. 207/96.
				• Dust control practices (e.g., wetting with water) will be implemented at work sites and on access roads near residential areas or other areas as appropriate.
				• Construction will implement effective dust suppression techniques, such as on-site watering, as necessary to minimize fugitive dust at worksites and access roads as required.
				• Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland.
				• A Dust Control/Air Quality Plan will also be included as part of the EPP that will be provided to affected Indigenous communities for review and input at least 90 days in advance of construction.
				• A Blasting and Communications Management Plan will be prepared and implemented to limit the amount of chemical residue in the environment. The Blasting and Communication Management Plan will include measures to address the following items:
				  ◦ Stakeholder notification;
				  ◦ Storage, Transportation and Use;
				  ◦ Security;
				  ◦ Environmentally Sensitive Areas; and
				  ◦ Waterbodies.
					Net effect - Dust and air emissions, and subsequent deposition can directly affect vegetation growth and thus affect ecosystem availability, distribution and ecosystem composition.

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		• Transportation of personnel, materials and equipment.		• Minimize dust-generating activities, as practicable and where required, during periods of high wind to limit dust emissions and spread. • Stabilize exposed soils in high traffic areas as appropriate. • Restore disturbed areas as soon as reasonably possible to minimize duration of soil exposure. • Multi-passenger vehicles will be used to transport personnel, where practicable. • Hydro One or its contractor(s) will prepare and implement a Dust Control/Air Quality Plan prior to construction.	

• Upland ecosystems
• Wetland ecosystems
• Riparian ecosystems
	• Ecosystem availability
	• Ecosystem distribution
	• Ecosystem composition
		Construction stage:
		• Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas, and temporary construction camps; and
		• Reclamation of decommissioned access roads, temporary laydown areas, staging areas and temporary construction camps.
		
		Operation and maintenance stage:
		• Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer stations and permanent access roads.
			Introduction and spread of noxious and invasive plant species	**Construction stage:**
				• Prepare and implement appropriate vegetation management procedures that describe the appropriate management of construction materials and equipment to prevent the infiltration and spread of weeds, including:
				  ◦ Cleaning and inspection of vehicles and equipment for soil and/or plant material, as per the Clean Equipment Protocol for Industry (Halloran, et al., 2013), prior to Project site entry;
				  ◦ Re-cleaning vehicles and equipment if an area of weed infestation is encountered, prior to advancing to a weed free area;
				  ◦ Locating and managing cleaning locations on the Project footprint; and
				  ◦ For areas requiring re-vegetation following the completion of the Project, use approved seed mixes in accordance with MNRF, or other applicable regulatory agency, requirements and/or tree saplings of native species.
				• Progressive reclamation of disturbed areas will be practiced. Natural recovery is the preferred method over seeding of reclamation on level terrain where erosion is not expected. Enhanced vegetation recovery methods (e.g., seeding, planting seedlings) will be implemented where these enhanced methods are appropriate. If seeding is required, seed erosion prone areas in accordance with MNRF, or other applicable regulatory agency, requirements to promote plant species establishment during reclamation. Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal or weather conditions.
				• Herbicides will not be used during construction of the Project.
				• Residual logging debris and timber not reserved for landowner use may be mulched in place and spread on the ROW or piled and burned contingent on the approval of a burn plan. Designated tree species (if applicable) will be disposed of in accordance with local or provincial regulations.
				
				Operation and maintenance stage:
				• Herbicides will not be used during the operation and maintenance of the Project.
				• Minimize disturbance to and access to trapping and hunting areas where possible during the construction stage and during the infrequent periods for operation and maintenance activities for safety reasons.
					Net effect – Introduction and spread of noxious and invasive plant species can affect upland, wetland and riparian ecosystems.

• Plant species at risk • Plant species of conservation concern	• Habitat quantity • Habitat distribution • Survival and reproduction	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access	**Plant loss or alteration**	**Construction stage:** • During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails. • Use clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss (e.g., equipment with low ground pressure tracks or tires, blade shores and brush), to the extent practicable. • Hydro One or their contractor(s) will prepare and implement a Soil Management Plan.	**Net effect** – The loss or alteration of vegetation and topography changes the quantity and connectivity of habitat that supports the growth of criteria

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
• Plant species of traditional use		roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Surface water management and erosion control; • Hazardous materials, solid and liquid waste handling; • Maintenance of site services; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps. **Operation and maintenance stage:** • Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer stations and permanent access roads.		• Herbicides will not be used during construction of the Project. Mechanical removal methods will be used for initial vegetation removal. • Limit to the extent practicable the construction of temporary (e.g., access road, travel lane) and permanent (e.g., tower foundations) structures in wetlands or within 30 m setback from a wetland. • Where construction is required within wetlands without approval under MNRF permits, MNRF will be notified as soon as possible. Work may not be conducted unless clearance is obtained from the appropriate regulatory agencies. • Restrict grubbing within areas with steep slopes or soils with risk of erosion. • Retain compatible vegetation, coarse woody plants, and other sensitive plants (e.g., black ash, SOCC, SWH) where feasible as practicable and will be considered for further mitigation action as appropriate. • Avoid disturbance within wild rice habitat and maintain a 30 m protective buffer. Where this is not reasonably possible, further assessment will be undertaken to support development of an enhanced mitigation plan for respective areas, and engagement with applicable Indigenous communities. • Under nonfrozen conditions and where regulatory approvals allow, install mats (e.g., rig mats, swamp mats or access mats) to limit effects to wetlands, if warranted and surface conditions require. Alternative crossing measures will be used in areas which occur below a high-water mark (see Section 6.6). • Proposed locations of temporary construction camps and temporary laydown areas will be field verified to avoid wetlands including bogs and fens, to the extent practicable. Where possible, schedule work activities in wet areas during frozen conditions. • Slash and debris will be chipped and spread over the ROW as appropriate in accordance with maximum mulch depth or will be burned in accordance with provincial *Forest Fires Prevention Act* and the Regulation 207/96 Outdoor Fires under this Act. • Avoid burning slash piles when a fire hazard is present. • Minimize burning of slash piles within 100 m of a waterbody to the extent practicable. • Avoid locating slash burn piles in peat-rich areas where residual fires could persist after construction. • Strip the topsoil at burn locations to prevent sterilization of the soil. • Hydro One will work with sustainable forestry license holders to manage merchantable timber cleared by the Project. • If timber and brush are disposed of by mechanical means (i.e., mulching or chipping), the material must be dispersed in a way to avoid accumulation of flammable material and comply with the *Forest Fires Prevention Act.* • Continue to engage with MECP SARB regarding ESA permitting requirements for black ash including site specific mitigation measures for the protection and conservation of the species. • Practices to ensure black ash wood is properly disposed to prevent the spread of the invasive species, emerald ash borer, will be implemented to the extent practicable, such as those outlined by the Canadian Food Inspection Agency (2020) (e.g., not transporting these trees/logs away from the source).	plants and influence plant abundance and distribution.

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• Management plans will be developed before construction activities for vegetation and wetlands including a Vegetation Management Plan which will include rare plant management techniques and Invasive Species and Biosecurity Management Plan. • In the event a rare plant species or a rare vegetation community are suspected or encountered unexpectedly, appropriate avoidance or mitigation measures will be implemented. • Known sensitive ecological features will be clearly marked (e.g., wetlands and significant wildlife habitat) with associated setbacks. • Stabilize erodible soils as soon as practicable by seeding, spreading mulch or installing erosion control blankets. • Proper delineation of Project footprint will be executed to avoid encroachment into natural vegetation to be retained on edge of development and ensure areas beyond the Project footprint are not disturbed (e.g., avoidance flagging, tree protection fences, silt fences around wetlands and waterbodies). • Temporary access roads and trails, temporary construction camps, turn-around areas, waterbody crossings and temporary laydown areas will be reclaimed at the end of construction. • Recontour disturbed areas to restore drainage patterns and the approximate pre-construction profile. • Decompact subsoils, temporary access trails and soils damaged during wet weather. **Operation and maintenance stage:** • Allow compatible vegetation within the ROW, including riparian vegetation buffer. • Follow established vegetation management procedures to ensure protection of wildlife and adjacent vegetation. Where vegetation management is considered necessary, mechanical methods will be used. Control of non-native species will be a priority. • Herbicides will not be used during operation and maintenance of the Project.	
• Plant species at risk • Plant species of conservation concern • Plant species of traditional use	• Habitat quantity • Habitat distribution • Survival and reproduction	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Surface water management and erosion control; • Hazardous materials, solid and liquid waste handling; • Maintenance of site services; and	**Reduced soil quantity and quality**	**Construction stage:** • The Project will provide direction on topsoil stripping, stockpiling, salvage and prioritized placement on the landscape and is further discussed in the physiography and geology assessment in Section 6.1. • During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails. • Use clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss (e.g., equipment with low ground pressure tracks or tires, blade shores and brush), to the extent practicable. • Follow the appropriate mitigation measures listed in a Soil Management Plan prepared by the contractor. • Herbicides will not be used during construction of the Project. Mechanical removal methods will be used for initial vegetation removal. • Limit to the extent practicable the construction of temporary (e.g., access road, travel lane) and permanent (tower foundations) structures in wetlands or within 30 m setback from a wetland.	No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		• Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps. **Operation and maintenance stage:** • Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer stations and permanent access roads.		• Where construction is required within wetlands and is not already approved under MNRF permits, MNRF will be notified as soon as possible. Work may not be conducted unless clearance is obtained from the appropriate regulatory agencies. • Restrict grubbing within areas with steep slopes or soils with risk of erosion. • Retain compatible vegetation, coarse woody plants, and sensitive plants (e.g., black ash, SOCC, SWH) where feasible as practicable and will be considered for further mitigation action as appropriate. • Avoid disturbance within wild rice habitat and maintain a 30 m protective buffer. Where this is not reasonably possible, further assessment will be undertaken to support development of an enhanced mitigation plan for respective areas, and engagement with applicable Indigenous communities. • Under nonfrozen conditions and where regulatory approvals allow, install mats (e.g., rig mats, swamp mats or access mats) to limit effects to wetlands, if warranted and surface conditions require. Alternative crossing measures will be used in areas which occur below a high-water mark (see Section 6.6). • Proposed locations of temporary construction camps and temporary laydown areas will be field verified to avoid wetlands including bogs and fens, to the extent practicable. Where possible, schedule work activities in wet areas during frozen conditions. • Slash and debris will be chipped and spread over the ROW as appropriate in accordance with maximum mulch depth or will be burned in accordance with provincial *Forest Fires Prevention Act* and the Regulation 207/96 Outdoor Fires under this Act. • Avoid burning slash piles when a fire hazard is present. • Minimize burning of slash piles within 100 m of a waterbody to the extent practicable. • Avoid locating slash burn piles in peat-rich areas where residual fires could persist after construction. • Strip the topsoil at burn locations to prevent sterilization of the soil. • Hydro One will work with sustainable forestry license holders to manage merchantable timber cleared by the Project. • If timber and brush are disposed of by mechanical means (i.e., mulching or chipping), the material must be dispersed in a way to avoid accumulation of flammable material and comply with the *Forest Fires Prevention Act.* • In the event a rare plant species or a rare vegetation community are suspected or encountered unexpectedly, appropriate avoidance or mitigation measures will be implemented. • Known sensitive ecological features will be clearly marked (e.g., wetlands and significant wildlife habitat) with associated setbacks. • Stabilize erodible soils as soon as practicable by seeding, spreading mulch or installing erosion control blankets. • Proper delineation of Project footprint will be executed to avoid encroachment into natural vegetation to be retained on edge of development and ensure areas beyond the Project footprint are not disturbed (e.g., tree protection fences, silt fences around wetlands and waterbodies). • Temporary access roads and trails, temporary construction camps, turn-around areas, waterbody crossings and temporary laydown areas will be reclaimed at the end of construction.	

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• Recontour disturbed areas to restore drainage patterns and the approximate pre-construction profile. • Decompact subsoils, temporary access trails and soils damaged during wet weather. **Operation and maintenance stage:** • Allow compatible vegetation within the ROW, including riparian vegetation buffer. • Follow established vegetation management procedures to ensure protection of wildlife and adjacent vegetation. Where vegetation management is considered necessary, mechanical methods will be used. Control of non-native species will be a priority. • Herbicides will not be used during the operation and maintenance of the Project.	
• Plant species at risk • Plant species of conservation concern • Plant species of traditional use	• Habitat quantity • Habitat distribution • Survival and reproduction	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Water taking from surface water sources for the purposes of construction and water supply; • Surface water management and erosion control; • Discharges of wastewater from construction, vehicle and equipment wash, and domestic activities; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps.	**Changes in Hydrology**	Refer to mitigation measures presented for the surface water assessment in **Section 6.2**. In summary, during the **Construction stage:** • For vehicles and equipment owned/rented by Hydro One or their contractor, only properly functioning vehicles and equipment will be operated. • Vehicles and equipment will be regularly serviced, maintained, and inspected for leaks. • Where reasonable and practicable, vehicles and equipment will be turned off when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition. • Multi passenger vehicles will be used to transport personnel, where practicable. • Soil and aggregate materials will be transported wetted or under cover, as appropriate. • Dust control practices (e.g., wetting with water) will be employed at concrete batch plants, work sites and on access roads as appropriate. • Progressive reclamation of disturbed areas will be practiced. • Natural recovery is the preferred method over seeding of reclamation on level terrain where erosion is not expected. Enhanced vegetation recovery methods (e.g., seeding, planting seedlings) will be implemented where these enhanced methods are appropriate. If seeding is required, seed erosion prone areas in accordance with MNRF, or other applicable regulatory agency, requirements to promote plant species establishment during reclamation. Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal or weather conditions. Areas that have had aggregate placed will be recontoured as necessary to return hydrology and drainage to pre-construction conditions. The stored topsoil and organic material will be spread over the surface. All sites will be left in a stable and self-sustaining condition though areas that may be prone to erosion will be seeded in accordance with MNRF, or other applicable regulatory agency, requirements to ensure prompt revegetation. • Soil stockpiles will be vegetated, where appropriate (e.g., if soils are prone to wind erosion). • Topsoil handling will be suspended during high wind conditions, where practicable and as required. • Stripped soil will be stored outside waterbody and wild rice buffers. Stripped soils will not be placed in surface drainage channel or wetland.	No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect

• Plant species at risk
• Plant species of conservation concern
• Plant species of traditional use
	• Habitat quantity
	• Habitat distribution
	• Survival and reproduction
		Construction stage:
		• Re-fuelling, service and maintenance of vehicles and construction equipment;
		• Operation of vehicles, construction equipment and diesel generators; and
		• Hazardous materials, solid and liquid waste handling.
		
		Operation and maintenance stage:
		• Transportation of personnel, materials and equipment.
			Chemical or Hazardous Material Spills	Refer to mitigation measures presented for the surface water assessment in **Section 6.2**. In summary, during the **Construction Stage:**
				• The transportation, storage, and handling of chemicals and fuels will be in compliance with the *Technical Standards and Safety Act, 2000* (Government of Ontario 2020) and Canada's *Transportation of Dangerous Goods Act, 1992* (Government of Canada 2019).
				• Hydro One or their contractor(s) will prepare and implement a Spill Prevention and Emergency Response Plan that describes specific measures that would be implemented if a spill occurred.
				• Hydro One or their contractor(s) will prepare and implement a Waste Management and Disposal Plan that describe the appropriate management of solid, liquid and hazardous waste, including:
				  ◦ Construction related garbage, debris, and surplus materials;
				  ◦ Hazardous materials such as used oil, filter and grease cartridges, lubrication containers; and
				  ◦ Domestic garbage and camp waste (i.e., food and grey water). Portable, secure, solid waste receptacles will be provided on work sites, temporary laydown areas and temporary construction camps and periodically emptied.
				• Fuel and hazardous materials will be transported in approved containers in licensed vehicles. Transportation of fuel on winter roads will only take place in safe ice conditions.
				• Fuel and hazardous materials will be stored and handled in designated areas with appropriate secondary containment.
				• Refueling, service, and maintenance of vehicles and equipment will generally be carried out in designated areas at temporary construction camps and temporary laydown areas located a minimum of 120 from waterbodies to the extent possible. These areas will be designed and constructed to collect and contain minor leaks and spills. For example, containment measures may consist of low permeability liners, sloped appropriately, and buried in the ground, portable berms (e.g., insta-berms) or concrete pads with perimeter drainage control. Drainage will be passed through an oil water separator to remove hydrocarbons prior to its release to a vegetated area. If refueling within 120 m of a waterbody cannot be avoided, enhanced spill containment measures will be used.
				• In the event that refuelling, servicing and maintenance is required in the field, 120 m buffer will be respected to the extent possible. There may be locations where this is not possible due to the prevalence of wetlands; however, in these locations enhanced spill containment measures will be used. For vehicles and equipment owned/rented by Hydro One or their contractor, only properly functioning vehicles and equipment will be operated.
				• Vehicles and equipment are to arrive on-site in a clean condition and will be regularly serviced, maintained and inspected for leaks.
				• Spill response kits will be provided in fuel and hazardous materials storage and handling facilities at temporary construction camps and temporary laydown areas, in on-site work areas and/or in vehicles and equipment, and personnel will be trained in spill response practices and procedures. Spills and leaks will be contained and cleaned up as soon as possible following incidents.
				• Personnel will be trained in spill avoidance, cleanup and reporting procedures.
				
				Operation and maintenance stage:
				• Hazardous materials will be transported in approved containers in licensed vehicles.
					No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• Vehicles and equipment will be regularly serviced, maintained and inspected for leaks. • For vehicles and equipment owned/rented by Hydro One, only properly functioning vehicles and equipment will be operated. • Spill response kits will be provided in vehicles and equipment.	
• Plant species at risk • Plant species of conservation concern • Plant species of traditional use	• Habitat quantity • Habitat distribution • Survival and reproduction	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Use of explosives and blasting to create level areas for transmission structures, roads and foundation excavations; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps.	**Dust and air emissions, and subsequent deposition**	Mitigation measures presented in the air quality assessment in **Section 6.7** during the **construction stage:** • Where reasonable, vehicles and equipment will be turned off when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition. • Vehicles and equipment will be regularly serviced, maintained and inspected for leaks. • Obey all speed limits to limit fugitive dust. • Slash pile burning will be subject to permits and approvals by appropriate regulatory agencies. • Slash piles will be burned in compliance with O. Reg. 207/96. • Dust control practices (e.g., wetting with water) will be implemented at work sites and on access roads near residential areas or other areas as appropriate. Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland. • Minimize dust-generating activities, as practicable and where required, during periods of high wind to limit dust emissions and spread. • exposed soils and stabilize high traffic areas with suitable cover material. • Restore disturbed areas as soon as reasonably possible to minimize duration of soil exposure. • Multi-passenger vehicles will be used to transport personnel, where practicable • Hydro One or its contractor(s) will prepare and implement a Dust Control/Air Quality Plan prior to construction.	**Net effect** - Dust and air emissions, and subsequent deposition can directly affect plant growth and thus affect habitat availability, distribution for plant SAR, plant SOCC and traditional use plants as well as plant growth and health.

• Plant species at risk
• Plant species of conservation concern
• Plant species of traditional use
	• Habitat quantity
	• Habitat distribution
	• Survival and reproduction
		Construction stage:
		• clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas, and temporary construction camps; and
		• reclamation of decommissioned access roads, temporary laydown areas, staging areas and temporary construction camps.
			Introduction and spread of noxious and invasive plant species	**Construction stage:**
				• Prepare and implement appropriate vegetation management procedures that describe the appropriate management of construction materials and equipment to prevent the infiltration and spread of weeds, including:
				  ◦ Cleaning and inspection of vehicles and equipment prior to Project site entry;
				  ◦ Re-cleaning vehicles and equipment if an area of weed infestation is encountered, prior to advancing to a weed free area;
				  ◦ Locating and managing cleaning locations on the Project footprint; and
				  ◦ or areas requiring re-vegetation following the completion of the Project, use approved seed mixes in accordance with MNRF, or other applicable regulatory agency, requirements and/or tree saplings of native species.
				• Progressive reclamation of disturbed areas will be practised.
				• Avoid disturbance within wild rice habitat and maintain a 30 m protective buffer. Where this is not reasonably possible, further assessment will be undertaken to support development of an enhanced mitigation plan for respective areas, and engagement with applicable Indigenous communities.
					Net effect - Introduction of noxious weeds to natural habitats can result in mortality or impact to SAR, SOCC and traditional use plants.

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		Operation and maintenance stage: • Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, and permanent access roads.		• Natural recovery is the preferred method over seeding of reclamation on level terrain where erosion is not expected. Enhanced vegetation recovery methods (e.g., seeding, planting seedlings) will be implemented where these enhanced methods are appropriate. If seeding is required, seed erosion prone areas in accordance with MNRF, or other applicable regulatory agency, requirements to promote plant species establishment during reclamation. Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal or weather conditions. Allow for natural regeneration or use certified native seed in engagement with the MNRF and local foresters; • Natural recovery is the preferred method of reclamation on Crown land, preferably seeding with conifer dominated vegetation to be consistent with adjacent vegetation communities that support wildlife, where required; • Use natural recovery in wetlands; • Herbicides will not be used during construction of the Project. • Follow established vegetation management procedures to ensure protection of wildlife and adjacent vegetation. Where vegetation management is considered necessary, mechanical methods will be used. Control of non-native species will be a priority. **Operation and maintenance stage:** • Minimize disturbance to and access to trapping and hunting areas where possible during the construction stage and during the infrequent periods for operation and maintenance activities for safety reasons.	

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
• Upland ecosystems • Wetland ecosystems • Riparian ecosystems	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Surface water management and erosion control; • Hazardous materials, solid and liquid waste handling; • Maintenance of site services; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps. **Operation and maintenance stage:** • Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer stations and permanent access roads.	**Ecosystem loss or alteration**	**Construction stage:** • During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails. • Unless directed otherwise by the MNRF, new access roads will be recontoured and stored topsoil and organic material will be spread across the disturbed road width. Natural drainage will be restored. • Use clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss (e.g., equipment with low ground pressure tracks or tires, blade shores and brush), to the extent practicable. • Hydro One or their contractor(s) will prepare and implement a Soil Management Plan. • Herbicides will not be used during construction of the Project. • Mechanical removal methods will be used for initial vegetation removal. • Use of vegetation management practices to maintain vegetation within the transmission line ROW. For example, implementation of a “wire zone – border zone” approach to vegetation management (Ballard et al. 2007) where appropriate in the ROW. This method manages vegetation in the two zones, where herb/grass/forb species are promoted in the wire zone, and shrub/short tree species are promoted in the border zone. This approach allows for the safe delivery of electricity while also fostering wildlife habitat and biodiversity, and simultaneously developing overall aesthetics and decreased long-term vegetation management costs. Limit to the extent practicable the construction of temporary (e.g., access road, travel lane) and permanent (e.g., tower foundations) structures in wetlands or within 30 m setback from a wetland. • Where construction is required within wetlands without approval under MNRF permits, MNRF will be notified as soon as possible. Work may not be conducted unless clearance is obtained from the appropriate regulatory agencies. • The construction of temporary (e.g., access road) and permanent (e.g., tower foundations) facilities in wetlands or within a 30 m setback from a wetland will be avoided as practicable. • Restrict grubbing within areas with steep slopes or soils with risk of erosion. • Retain compatible vegetation, coarse woody debris and plants, and other sensitive plants (e.g., black ash, SOCC, SWH) where feasible as practicable and will be considered for further mitigation action as appropriate. • Under nonfrozen conditions and where regulatory approvals allow, install mats (e.g., rig mats, swamp mats or access mats) to limit effects to wetlands, if warranted and surface conditions require. Alternative crossing measures will be used in areas which occur below a high-water mark (see Section 6.6). • Proposed locations of temporary construction camps and temporary laydown areas will be field verified to avoid wetlands, including bogs and fens, to the extent practicable. Where possible, schedule work activities in wet areas during frozen conditions. • Slash and debris will be chipped and spread over the ROW as appropriate in accordance with maximum mulch depth or will be burned in accordance with provincial *Forest Fires Prevention Act* and the Regulation 207/96 Outdoor Fires under this Act. • Mulch will be generated in areas that have minimal salvageable timber. In these locations, generated mulch will be spread across the ROW to avoid accumulation of flammable material. Mulch chips are not to exceed a spread depth of 18 cm. Generally, mulch depths in wetland areas are minimal since there is insufficient fibre to generate large mulch depths.	**Net effect** - The loss or alteration of vegetation and topography changes ecosystem availability, composition and connectivity.

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• In-situ mulch may also be used to help stabilize soils prone to erosion in combination with other erosion control measures. • Areas disturbed by aggregate placement will be recontoured to return hydrology and drainage to similar pre-construction conditions. • Residual logging debris and timber not reserved for landowner use may be mulched in place and spread on the ROW or piled and burned contingent on the approval of a burn plan. Designated tree species (if applicable) will be disposed of in accordance with local or provincial regulations. • Avoid burning slash piles in peat-rich areas where residual fires could smoulder after April 1. • Minimize burning of slash piles within 100 m of a waterbody to the extent practicable. • Strip the topsoil at burn locations to prevent sterilization of the soil. • Hydro One will work with sustainable forestry license holders to manage merchantable timber cleared by the Project. • If timber and brush are disposed of by mechanical means (i.e., mulching or chipping), the material must be dispersed in a way to avoid accumulation of flammable material and comply with the *Forest Fires Prevention Act.* • Management plans will be developed before construction activities for vegetation and wetlands including a Vegetation Management Plan which will include rare plant management techniques and Invasive Species and Biosecurity Management Plan. • In the event a rare plant species or a rare vegetation community are suspected or encountered unexpectedly, appropriate avoidance or mitigation measures will be applied. • Known sensitive ecological features will be clearly marked (e.g., wetlands and significant wildlife habitat) with associated setbacks. • Stabilize erodible soils as soon as practicable by seeding, spreading mulch or installing erosion control blankets. • Enhanced vegetation recovery methods (e.g., seeding, planting seedlings) will be implemented where these enhanced methods are appropriate. For example, Hydro One will plant seedlings along new off-ROW access roads in conservation reserves and provincial parks. Further, waterbody crossing locations that have been removed after construction will be seeded in accordance with MNRF, or other applicable regulatory agency, requirements. • Proper delineation of Project footprint will be executed to avoid encroachment into natural vegetation to be retained on edge of development and ensure areas beyond the Project footprint are not disturbed (e.g., tree protection fences, silt fences around wetlands and waterbodies). • Temporary access roads and trails, temporary construction camps, turn-around areas, wetland crossings and temporary laydown areas will be decommissioned and reclaimed at the end of construction. • Recontour disturbed areas to restore drainage patterns. • Decompact subsoils, temporary access trails and soils damaged during wet weather. **Operation and maintenance stage:** • Allow compatible vegetation within the ROW, including riparian vegetation buffer. • Herbicides will not be used during operation and maintenance of the Project.	

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• Follow established vegetation management procedures to ensure protection of wildlife and adjacent vegetation. Where vegetation management is considered necessary, mechanical methods will be used. Control of non-native species will be a priority. • Compacted areas will be ripped or otherwise treated to loosen soil and facilitate natural revegetation. Reclamation activities are anticipated to occur immediately after construction, which would decrease the negative effects to physical, chemical and biological properties of soil from stockpiling (i.e., stockpiling would happen only over the short-term). Prior to reclamation activities, a reclamation plan will be developed and can be provided to MNRF. The plan will consist of a map depicting the level of reclamation for each segment of road and a corresponding description of the reclamation activities to be undertaken for each level of reclamation. • Re-vegetation efforts will be timed to take advantage of favourable moisture and temperature conditions. • Mitigation measures will be outlined in the EPP to address items such as re-grading, subsoil compaction, subsoil and topsoil replacement, seeding and revegetation, and temporary watercourse structure removal as it pertains to Final Reclamation.	
• Upland ecosystems • Wetland ecosystems • Riparian ecosystems	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Surface water management and erosion control; • Hazardous materials, solid and liquid waste handling; • Maintenance of site services; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps. **Operation and maintenance stage:** • Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer	**Reduced soil quantity and quality**	**Construction stage:** • The Project will provide direction on topsoil stripping, stockpiling, salvage and prioritized placement on the landscape and is further discussed in the physiography and geology assessment in Section 6.1. • During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails. • Use clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss (e.g., equipment with low ground pressure tracks or tires, blade shores and brush), to the extent practicable. • Reclamation and clean up activities will occur progressively throughout the construction of the Project. These activities will include, but not be limited to, removing refuse, grading disturbed areas, contouring disturbed slopes to a stable profile, and re-establishing natural drainage patterns. • A post-construction assessment process will be established, to assess and respond to reclamation needs within he ROW following completion of construction. Seeding will be completed during the spring and/or summer months, when conditions are most favorable. • Mitigation measures will be outlined in the EPP to address items such as re-grading, subsoil compaction, subsoil and topsoil replacement, seeding and revegetation, and temporary watercourse structure removal as it pertains to Final Reclamation. • All ROW traffic will be restricted to a single, established travel lane and only use approved access routes. • Follow the appropriate mitigation measures listed in a Soil Management Plan prepared by the contractor. • Herbicides will not be used during construction of the Project. Mechanical removal methods will be used for initial vegetation removal. • Limit to the extent practicable the construction of temporary (e.g., access road, travel lane) and permanent (tower foundations) structures in wetlands or within a 30 m setback from a wetland.	No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		stations and permanent access roads.		• Where construction is required within wetlands and is not already approved under MNRF permits, MNRF will be notified as soon as possible. Work may not be conducted unless clearance is obtained from the appropriate regulatory agencies. • Restrict grubbing within areas with steep slopes or soils with risk of erosion. • Retain compatible vegetation, coarse woody plants, and other sensitive plants (e.g., black ash, SOCC, SWH) where feasible as practicable and will be considered for further mitigation action as appropriate. • Under nonfrozen conditions and where regulatory approvals allow, install mats (e.g., rig mats, swamp mats or access mats) to limit effects to wetlands, if warranted and surface conditions require. Alternative crossing measures will be used in areas which occur below a high-water mark (see Section 6.6). • Proposed locations of temporary construction camps and temporary laydown areas will be field verified to avoid wetlands including bogs and fens, to the extent practicable. Where possible, schedule work activities in wet areas during frozen conditions. • Where construction is required within wetlands and is not already approved under MNRF permits, MNRF will be notified as soon as possible. Work may not be conducted unless clearance is obtained from the appropriate regulatory agencies. • Areas disturbed by aggregate placement will be recontoured to return hydrology and drainage to pre-construction conditions. • Residual logging debris and timber not reserved for landowner use may be mulched in place and spread on the ROW or piled and burned contingent on the approval of a burn plan. Designated tree species (if applicable) will be disposed of in accordance with local or provincial regulations. • Mulch will be generated in areas that have minimal salvageable timber. In these locations, generated mulch will be spread across the ROW to avoid accumulation of flammable material. Mulch chips are not to exceed a spread depth of 18 cm. Generally, mulch depths in wetland areas are minimal since there is insufficient fibre to generate large mulch depths. • Other slash and debris resulting from mechanical clearing operations will be spread to ensure depths do not exceed 0.3 m or will be piled and burned. In areas that are hand felled only, trees will be bucked and delimbed to lie close to the ground. • In-situ mulch may also be used to help stabilize soils prone to erosion in combination with other erosion control measures. • Slash and debris will be chipped and spread over the ROW a appropriate in accordance with maximum mulch depth or will be burned in accordance with provincial *Forest Fires Prevention Act* and the Regulation 207/96 Outdoor Fires under this Act. • Avoid burning slash piles when a fire hazard is present. • Minimize burning of slash piles within 100 m of a waterbody to the extent practicable. • Avoid locating slash burn piles in peat-rich areas where residual fires could persist after construction. • Strip the topsoil at burn locations to prevent sterilization of the soil. • Hydro One will work with sustainable forestry license holders to manage merchantable timber cleared by the Project.	

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• If timber and brush are disposed of by mechanical means (i.e., mulching or chipping), the material must be dispersed in a way to avoid accumulation of flammable material and comply with the *Forest Fires Prevention Act.* • In the event a rare plant species or a rare vegetation community are suspected or encountered unexpectedly, or cannot be avoided, appropriate avoidance or mitigation measures will be applied; Known sensitive ecological features will be clearly marked (e.g., wetlands and significant wildlife habitat) with associated setbacks. • Stabilize erodible soils as soon as practicable by seeding, spreading mulch or installing erosion control blankets. • Proper delineation of Project footprint will be executed to avoid encroachment into natural vegetation to be retained on edge of development and ensure areas beyond the Project footprint are not disturbed (e.g., tree protection fences, silt fences around wetlands and waterbodies). • Temporary access roads and trails, temporary construction camps, turn-around areas, wetland crossings and temporary laydown areas will be decommissioned and reclaimed at the end of construction. • Recontour disturbed areas to restore drainage patterns. • Decompact subsoils, temporary access trails and soils damaged during wet weather. **Operation and maintenance stage:** • Allow compatible vegetation within the ROW, including riparian vegetation buffer. • Follow established vegetation management procedures to ensure protection of wildlife and adjacent vegetation. Where vegetation management is considered necessary, mechanical methods will be used. Control of non-native species will be a priority. • Herbicides will not be used during the operation and maintenance of the Project.	
• Upland ecosystems • Wetland ecosystems • Riparian ecosystems	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Water taking from surface water sources for the purposes of construction and water supply; • Surface water management and erosion control; • Discharges of wastewater from construction, vehicle and	**Changes in hydrology**	Refer to mitigation measures presented for the surface water assessment in **Section 6.2**. In summary, during the **Construction stage:** • For vehicles and equipment owned/rented by Hydro One or their contractor, only properly functioning vehicles and equipment will be operated. • Vehicles and equipment will be regularly serviced, maintained, and inspected for leaks. • Where reasonable and practicable, vehicles and equipment will be turned off when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition. • Multi passenger vehicles will be used to transport personnel, where practicable. • Soil and aggregate materials will be transported wetted or under cover, as appropriate. • Dust control practices (e.g., wetting with water) will be employed at concrete batch plants, work sites and on access roads as appropriate. • Progressive reclamation of disturbed areas will be practiced. • Natural recovery is the preferred method over seeding of reclamation on level terrain where erosion is not expected. Enhanced vegetation recovery methods (e.g., seeding, planting seedlings) will be implemented where these enhanced methods are appropriate. If seeding is required, seed erosion prone areas in accordance with MNRF, or other applicable regulatory agency, requirements to promote plant species establishment during reclamation. Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal	No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		equipment wash, and domestic activities; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps.		or weather conditions. Areas that have had aggregate placed will be recontoured as necessary to return hydrology and drainage to pre-construction conditions. The stored topsoil and organic material will be spread over the surface. All sites will be left in a stable and self-sustaining condition though areas that may be prone to erosion will be seeded in accordance with MNRF, or other applicable regulatory agency, requirements to ensure prompt revegetation. • Soil stockpiles will be vegetated, where appropriate (e.g., if soils are prone to wind erosion). • Topsoil handling will be suspended during high wind conditions, where practicable and as required. • Stripped soil will be stored outside waterbody buffers. Stripped soils will not be placed in surface drainage channel or wetland. • Install culverts or temporary bridges using best management practices and following environmental approval conditions	

• Upland ecosystems
• Wetland ecosystems
• Riparian ecosystems
	• Ecosystem availability
	• Ecosystem distribution
	• Ecosystem composition
		Construction stage:
		• Re-fuelling, service and maintenance of vehicles and construction equipment;
		• Operation of vehicles, construction equipment and diesel generators; and
		• Hazardous materials, solid and liquid waste handling.
		
		Operation and maintenance stage:
		• Transportation of personnel, materials and equipment.
			Chemical or Hazardous Material Spills	Refer to mitigation measures presented for the surface water assessment in **Section 6.2**. In summary, during the **Construction Stage:**
				• The transportation, storage, and handling of chemicals and fuels will be in compliance with the *Technical Standards and Safety Act, 2000* (Government of Ontario 2020) and Canada's *Transportation of Dangerous Goods Act, 1992* (Government of Canada 2019).
				• Hydro One or their contractor(s) will prepare and implement a Spill Prevention and Emergency Response Plan that describes specific measures that would be implemented if a spill occurred.
				• Hydro One or their contractor(s) will prepare and implement a Waste Management and Disposal Plan that describe the appropriate management of solid, liquid and hazardous waste, including:
				  ◦ Construction-related garbage, debris, and surplus materials;
				  ◦ Hazardous materials, such as used oil, filter and grease cartridges, lubrication containers; and
				  ◦ Domestic garbage and camp waste (i.e., food and grey water). Portable, secure, solid waste receptacles will be provided on work sites, temporary laydown areas and temporary construction camps and periodically emptied.
				• Fuel and hazardous materials will be transported in approved containers in licensed vehicles. Transportation of fuel on winter roads will only take place in safe ice conditions.
				• Fuel and hazardous materials will be stored and handled in designated areas with appropriate secondary containment.
				• Refueling, service, and maintenance of vehicles and equipment will generally be carried out in designated areas at temporary construction camps and temporary laydown areas located a minimum of 120 from waterbodies to the extent possible. These areas will be designed and constructed to collect and contain minor leaks and spills. For example, containment measures may consist of low permeability liners, sloped appropriately, and buried in the ground, portable berms (e.g., insta-berms) or concrete pads with perimeter drainage control. Drainage will be passed through an oil water separator to remove hydrocarbons prior to its release to a vegetated area. If refueling within 120 m of a waterbody cannot be avoided, enhanced spill containment measures will be used.
				• In the event that refuelling, servicing and maintenance is required in the field, 120 m buffer will be respected to the extent possible. There may be locations where this is not possible due to the prevalence of wetlands; however, in these locations enhanced spill containment measures will be used. For vehicles and equipment owned/rented by Hydro One or their contractor, only properly functioning vehicles and equipment will be operated.
					No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• Vehicles and equipment are to arrive on-site in a clean condition and will be regularly serviced, maintained and inspected for leaks. • Spill response kits will be provided in fuel and hazardous materials storage and handling facilities at temporary construction camps and temporary laydown areas, in on-site work areas and/or in vehicles and equipment, and personnel will be trained in spill response practices and procedures. Spills and leaks will be contained and cleaned up as soon as possible following incidents. • Personnel will be trained in spill avoidance, cleanup and reporting procedures. **Operation and maintenance stage:** • Hazardous materials will be transported in approved containers in licensed vehicles. • Vehicles and equipment will be regularly serviced, maintained and inspected for leaks. • For vehicles and equipment owned/rented by Hydro One, only properly functioning vehicles and equipment will be operated. • Spill response kits will be provided in vehicles and equipment.	

• Upland ecosystems
• Wetland ecosystems
• Riparian ecosystems
	• Ecosystem availability
	• Ecosystem distribution
	• Ecosystem composition
		Construction stage:
		• Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps);
		• Use of explosives and blasting to create level areas for transmission structures, roads and foundation excavations; and
		• Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps.
		
		Operation and maintenance stage:
		• Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer stations and permanent access roads.
			Dust and air emissions, and subsequent deposition	Mitigation measures presented in the air quality assessment in **Section 6.7** during the **construction stage:**
				• Where reasonable, vehicles and equipment will be turned off when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition.
				• Vehicles and equipment will be regularly serviced, maintained and inspected for leaks.
				• Obey all speed limits to limit fugitive dust.
				• Slash pile burning will be subject to permits and approvals by appropriate regulatory agencies.
				• Slash piles will be burned in compliance with O. Reg. 207/96.
				• Dust control practices (e.g., wetting with water) will be implemented at work sites and on access roads near residential areas or other areas as appropriate.
				• Construction will implement effective dust suppression techniques, such as on-site watering, as necessary to minimize fugitive dust at worksites and access roads as required.
				• Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland.
				• A Dust Control/Air Quality Plan will also be included as part of the EPP that will be provided to affected Indigenous communities for review and input at least 90 days in advance of construction.
				• A Blasting and Communications Management Plan will be prepared and implemented to limit the amount of chemical residue in the environment. The Blasting and Communication Management Plan will include measures to address the following items:
				  • Stakeholder notification;
				  • Storage, Transportation and Use;
				  • Security;
				  • Environmentally Sensitive Areas; and
				  • Waterbodies.
					Net effect - Dust and air emissions, and subsequent deposition can directly affect vegetation growth and thus affect ecosystem availability, distribution and ecosystem composition.

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		• Transportation of personnel, materials and equipment.		• Minimize dust-generating activities, as practicable and where required, during periods of high wind to limit dust emissions and spread. • Stabilize exposed soils in high traffic areas as appropriate. • Restore disturbed areas as soon as reasonably possible to minimize duration of soil exposure. • Multi-passenger vehicles will be used to transport personnel, where practicable. • Hydro One or its contractor(s) will prepare and implement a Dust Control/Air Quality Plan prior to construction.	

• Upland ecosystems
• Wetland ecosystems
• Riparian ecosystems
	• Ecosystem availability
	• Ecosystem distribution
	• Ecosystem composition
		Construction stage:
		• Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas, and temporary construction camps; and
		• Reclamation of decommissioned access roads, temporary laydown areas, staging areas and temporary construction camps.
		
		Operation and maintenance stage:
		• Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer stations and permanent access roads.
			Introduction and spread of noxious and invasive plant species	**Construction stage:**
				• Prepare and implement appropriate vegetation management procedures that describe the appropriate management of construction materials and equipment to prevent the infiltration and spread of weeds, including:
				  ▪ Cleaning and inspection of vehicles and equipment for soil and/or plant material, as per the Clean Equipment Protocol for Industry (Halloran, et al., 2013), prior to Project site entry;
				  ▪ Re-cleaning vehicles and equipment if an area of weed infestation is encountered, prior to advancing to a weed free area;
				  ▪ Locating and managing cleaning locations on the Project footprint; and
				  ▪ For areas requiring re-vegetation following the completion of the Project, use approved seed mixes in accordance with MNRF, or other applicable regulatory agency, requirements and/or tree saplings of native species.
				• Progressive reclamation of disturbed areas will be practiced. Natural recovery is the preferred method over seeding of reclamation on level terrain where erosion is not expected. Enhanced vegetation recovery methods (e.g., seeding, planting seedlings) will be implemented where these enhanced methods are appropriate. If seeding is required, seed erosion prone areas in accordance with MNRF, or other applicable regulatory agency, requirements to promote plant species establishment during reclamation. Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal or weather conditions.
				• Herbicides will not be used during construction of the Project.
				• Residual logging debris and timber not reserved for landowner use may be mulched in place and spread on the ROW or piled and burned contingent on the approval of a burn plan. Designated tree species (if applicable) will be disposed of in accordance with local or provincial regulations.
				
				Operation and maintenance stage:
				• Herbicides will not be used during the operation and maintenance of the Project.
				• Minimize disturbance to and access to trapping and hunting areas where possible during the construction stage and during the infrequent periods for operation and maintenance activities for safety reasons.
					Net effect – Introduction and spread of noxious and invasive plant species can affect upland, wetland and riparian ecosystems.

• Plant species at risk • Plant species of conservation concern	• Habitat quantity • Habitat distribution • Survival and reproduction	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access	**Plant loss or alteration**	**Construction stage:** • During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails. • Use clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss (e.g., equipment with low ground pressure tracks or tires, blade shores and brush), to the extent practicable. • Hydro One or their contractor(s) will prepare and implement a Soil Management Plan.	**Net effect** – The loss or alteration of vegetation and topography changes the quantity and connectivity of habitat that supports the growth of criteria

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
• Plant species of traditional use		roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Surface water management and erosion control; • Hazardous materials, solid and liquid waste handling; • Maintenance of site services; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps. **Operation and maintenance stage:** • Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer stations and permanent access roads.		• Herbicides will not be used during construction of the Project. Mechanical removal methods will be used for initial vegetation removal. • Limit to the extent practicable the construction of temporary (e.g., access road, travel lane) and permanent (e.g., tower foundations) structures in wetlands or within 30 m setback from a wetland. • Where construction is required within wetlands without approval under MNRF permits, MNRF will be notified as soon as possible. Work may not be conducted unless clearance is obtained from the appropriate regulatory agencies. • Restrict grubbing within areas with steep slopes or soils with risk of erosion. • Retain compatible vegetation, coarse woody plants, and other sensitive plants (e.g., black ash, SOCC, SWH) where feasible as practicable and will be considered for further mitigation action as appropriate. • Avoid disturbance within wild rice habitat and maintain a 30 m protective buffer. Where this is not reasonably possible, further assessment will be undertaken to support development of an enhanced mitigation plan for respective areas, and engagement with applicable Indigenous communities. • Under nonfrozen conditions and where regulatory approvals allow, install mats (e.g., rig mats, swamp mats or access mats) to limit effects to wetlands, if warranted and surface conditions require. Alternative crossing measures will be used in areas which occur below a high-water mark (see Section 6.6). • Proposed locations of temporary construction camps and temporary laydown areas will be field verified to avoid wetlands including bogs and fens, to the extent practicable. Where possible, schedule work activities in wet areas during frozen conditions. • Slash and debris will be chipped and spread over the ROW as appropriate in accordance with maximum mulch depth or will be burned in accordance with provincial *Forest Fires Prevention Act* and the Regulation 207/96 Outdoor Fires under this Act. • Avoid burning slash piles when a fire hazard is present. • Minimize burning of slash piles within 100 m of a waterbody to the extent practicable. • Avoid locating slash burn piles in peat-rich areas where residual fires could persist after construction. • Strip the topsoil at burn locations to prevent sterilization of the soil. • Hydro One will work with sustainable forestry license holders to manage merchantable timber cleared by the Project. • If timber and brush are disposed of by mechanical means (i.e., mulching or chipping), the material must be dispersed in a way to avoid accumulation of flammable material and comply with the *Forest Fires Prevention Act.* • Continue to engage with MECP SARB regarding ESA permitting requirements for black ash including site specific mitigation measures for the protection and conservation of the species. • Practices to ensure black ash wood is properly disposed to prevent the spread of the invasive species, emerald ash borer, will be implemented to the extent practicable, such as those outlined by the Canadian Food Inspection Agency (2020) (e.g., not transporting these trees/logs away from the source).	plants and influence plant abundance and distribution.

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• Management plans will be developed before construction activities for vegetation and wetlands including a Vegetation Management Plan which will include rare plant management techniques and Invasive Species and Biosecurity Management Plan. • In the event a rare plant species or a rare vegetation community are suspected or encountered unexpectedly, appropriate avoidance or mitigation measures will be implemented. • Known sensitive ecological features will be clearly marked (e.g., wetlands and significant wildlife habitat) with associated setbacks. • Stabilize erodible soils as soon as practicable by seeding, spreading mulch or installing erosion control blankets. • Proper delineation of Project footprint will be executed to avoid encroachment into natural vegetation to be retained on edge of development and ensure areas beyond the Project footprint are not disturbed (e.g., avoidance flagging, tree protection fences, silt fences around wetlands and waterbodies). • Temporary access roads and trails, temporary construction camps, turn-around areas, waterbody crossings and temporary laydown areas will be reclaimed at the end of construction. • Recontour disturbed areas to restore drainage patterns and the approximate pre-construction profile. • Decompact subsoils, temporary access trails and soils damaged during wet weather. **Operation and maintenance stage:** • Allow compatible vegetation within the ROW, including riparian vegetation buffer. • Follow established vegetation management procedures to ensure protection of wildlife and adjacent vegetation. Where vegetation management is considered necessary, mechanical methods will be used. Control of non-native species will be a priority. • Herbicides will not be used during operation and maintenance of the Project.	
• Plant species at risk • Plant species of conservation concern • Plant species of traditional use	• Habitat quantity • Habitat distribution • Survival and reproduction	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Surface water management and erosion control; • Hazardous materials, solid and liquid waste handling; • Maintenance of site services; and	**Reduced soil quantity and quality**	**Construction stage:** • The Project will provide direction on topsoil stripping, stockpiling, salvage and prioritized placement on the landscape and is further discussed in the physiography and geology assessment in Section 6.1. • During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails. • Use clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss (e.g., equipment with low ground pressure tracks or tires, blade shores and brush), to the extent practicable. • Follow the appropriate mitigation measures listed in a Soil Management Plan prepared by the contractor. • Herbicides will not be used during construction of the Project. Mechanical removal methods will be used for initial vegetation removal. • Limit to the extent practicable the construction of temporary (e.g., access road, travel lane) and permanent (tower foundations) structures in wetlands or within 30 m setback from a wetland.	No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		• Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps. **Operation and maintenance stage:** • Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer stations and permanent access roads.		• Where construction is required within wetlands and is not already approved under MNRF permits, MNRF will be notified as soon as possible. Work may not be conducted unless clearance is obtained from the appropriate regulatory agencies. • Restrict grubbing within areas with steep slopes or soils with risk of erosion. • Retain compatible vegetation, coarse woody plants, and sensitive plants (e.g., black ash, SOCC, SWH) where feasible as practicable and will be considered for further mitigation action as appropriate. • Avoid disturbance within wild rice habitat and maintain a 30 m protective buffer. Where this is not reasonably possible, further assessment will be undertaken to support development of an enhanced mitigation plan for respective areas, and engagement with applicable Indigenous communities. • Under nonfrozen conditions and where regulatory approvals allow, install mats (e.g., rig mats, swamp mats or access mats) to limit effects to wetlands, if warranted and surface conditions require. Alternative crossing measures will be used in areas which occur below a high-water mark (see Section 6.6). • Proposed locations of temporary construction camps and temporary laydown areas will be field verified to avoid wetlands including bogs and fens, to the extent practicable. Where possible, schedule work activities in wet areas during frozen conditions. • Slash and debris will be chipped and spread over the ROW as appropriate in accordance with maximum mulch depth or will be burned in accordance with provincial *Forest Fires Prevention Act* and the Regulation 207/96 Outdoor Fires under this Act. • Avoid burning slash piles when a fire hazard is present. • Minimize burning of slash piles within 100 m of a waterbody to the extent practicable. • Avoid locating slash burn piles in peat-rich areas where residual fires could persist after construction. • Strip the topsoil at burn locations to prevent sterilization of the soil. • Hydro One will work with sustainable forestry license holders to manage merchantable timber cleared by the Project. • If timber and brush are disposed of by mechanical means (i.e., mulching or chipping), the material must be dispersed in a way to avoid accumulation of flammable material and comply with the *Forest Fires Prevention Act.* • In the event a rare plant species or a rare vegetation community are suspected or encountered unexpectedly, appropriate avoidance or mitigation measures will be implemented. • Known sensitive ecological features will be clearly marked (e.g., wetlands and significant wildlife habitat) with associated setbacks. • Stabilize erodible soils as soon as practicable by seeding, spreading mulch or installing erosion control blankets. • Proper delineation of Project footprint will be executed to avoid encroachment into natural vegetation to be retained on edge of development and ensure areas beyond the Project footprint are not disturbed (e.g., tree protection fences, silt fences around wetlands and waterbodies). • Temporary access roads and trails, temporary construction camps, turn-around areas, waterbody crossings and temporary laydown areas will be reclaimed at the end of construction.	

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• Recontour disturbed areas to restore drainage patterns and the approximate pre-construction profile. • Decompact subsoils, temporary access trails and soils damaged during wet weather. **Operation and maintenance stage:** • Allow compatible vegetation within the ROW, including riparian vegetation buffer. • Follow established vegetation management procedures to ensure protection of wildlife and adjacent vegetation. Where vegetation management is considered necessary, mechanical methods will be used. Control of non-native species will be a priority. • Herbicides will not be used during the operation and maintenance of the Project.	
• Plant species at risk • Plant species of conservation concern • Plant species of traditional use	• Habitat quantity • Habitat distribution • Survival and reproduction	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Water taking from surface water sources for the purposes of construction and water supply; • Surface water management and erosion control; • Discharges of wastewater from construction, vehicle and equipment wash, and domestic activities; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps.	**Changes in Hydrology**	Refer to mitigation measures presented for the surface water assessment in **Section 6.2**. In summary, during the **Construction stage:** • For vehicles and equipment owned/rented by Hydro One or their contractor, only properly functioning vehicles and equipment will be operated. • Vehicles and equipment will be regularly serviced, maintained, and inspected for leaks. • Where reasonable and practicable, vehicles and equipment will be turned off when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition. • Multi passenger vehicles will be used to transport personnel, where practicable. • Soil and aggregate materials will be transported wetted or under cover, as appropriate. • Dust control practices (e.g., wetting with water) will be employed at concrete batch plants, work sites and on access roads as appropriate. • Progressive reclamation of disturbed areas will be practiced. • Natural recovery is the preferred method over seeding of reclamation on level terrain where erosion is not expected. Enhanced vegetation recovery methods (e.g., seeding, planting seedlings) will be implemented where these enhanced methods are appropriate. If seeding is required, seed erosion prone areas in accordance with MNRF, or other applicable regulatory agency, requirements to promote plant species establishment during reclamation. Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal or weather conditions. Areas that have had aggregate placed will be recontoured as necessary to return hydrology and drainage to pre-construction conditions. The stored topsoil and organic material will be spread over the surface. All sites will be left in a stable and self-sustaining condition though areas that may be prone to erosion will be seeded in accordance with MNRF, or other applicable regulatory agency, requirements to ensure prompt revegetation. • Soil stockpiles will be vegetated, where appropriate (e.g., if soils are prone to wind erosion). • Topsoil handling will be suspended during high wind conditions, where practicable and as required. • Stripped soil will be stored outside waterbody and wild rice buffers. Stripped soils will not be placed in surface drainage channel or wetland.	No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect

• Plant species at risk
• Plant species of conservation concern
• Plant species of traditional use
	• Habitat quantity
	• Habitat distribution
	• Survival and reproduction
		Construction stage:
		• Re-fuelling, service and maintenance of vehicles and construction equipment;
		• Operation of vehicles, construction equipment and diesel generators; and
		• Hazardous materials, solid and liquid waste handling.
		
		Operation and maintenance stage:
		• Transportation of personnel, materials and equipment.
			Chemical or Hazardous Material Spills	Refer to mitigation measures presented for the surface water assessment in **Section 6.2**. In summary, during the **Construction Stage:**
				• The transportation, storage, and handling of chemicals and fuels will be in compliance with the *Technical Standards and Safety Act, 2000* (Government of Ontario 2020) and Canada's *Transportation of Dangerous Goods Act, 1992* (Government of Canada 2019).
				• Hydro One or their contractor(s) will prepare and implement a Spill Prevention and Emergency Response Plan that describes specific measures that would be implemented if a spill occurred.
				• Hydro One or their contractor(s) will prepare and implement a Waste Management and Disposal Plan that describe the appropriate management of solid, liquid and hazardous waste, including:
				  ◦ Construction related garbage, debris, and surplus materials;
				  ◦ Hazardous materials such as used oil, filter and grease cartridges, lubrication containers; and
				  ◦ Domestic garbage and camp waste (i.e., food and grey water). Portable, secure, solid waste receptacles will be provided on work sites, temporary laydown areas and temporary construction camps and periodically emptied.
				• Fuel and hazardous materials will be transported in approved containers in licensed vehicles. Transportation of fuel on winter roads will only take place in safe ice conditions.
				• Fuel and hazardous materials will be stored and handled in designated areas with appropriate secondary containment.
				• Refueling, service, and maintenance of vehicles and equipment will generally be carried out in designated areas at temporary construction camps and temporary laydown areas located a minimum of 120 from waterbodies to the extent possible. These areas will be designed and constructed to collect and contain minor leaks and spills. For example, containment measures may consist of low permeability liners, sloped appropriately, and buried in the ground, portable berms (e.g., insta-berms) or concrete pads with perimeter drainage control. Drainage will be passed through an oil water separator to remove hydrocarbons prior to its release to a vegetated area. If refueling within 120 m of a waterbody cannot be avoided, enhanced spill containment measures will be used.
				• In the event that refuelling, servicing and maintenance is required in the field, 120 m buffer will be respected to the extent possible. There may be locations where this is not possible due to the prevalence of wetlands; however, in these locations enhanced spill containment measures will be used. For vehicles and equipment owned/rented by Hydro One or their contractor, only properly functioning vehicles and equipment will be operated.
				• Vehicles and equipment are to arrive on-site in a clean condition and will be regularly serviced, maintained and inspected for leaks.
				• Spill response kits will be provided in fuel and hazardous materials storage and handling facilities at temporary construction camps and temporary laydown areas, in on-site work areas and/or in vehicles and equipment, and personnel will be trained in spill response practices and procedures. Spills and leaks will be contained and cleaned up as soon as possible following incidents.
				• Personnel will be trained in spill avoidance, cleanup and reporting procedures.
				
				Operation and maintenance stage:
				• Hazardous materials will be transported in approved containers in licensed vehicles.
					No net effect

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
				• Vehicles and equipment will be regularly serviced, maintained and inspected for leaks. • For vehicles and equipment owned/rented by Hydro One, only properly functioning vehicles and equipment will be operated. • Spill response kits will be provided in vehicles and equipment.	
• Plant species at risk • Plant species of conservation concern • Plant species of traditional use	• Habitat quantity • Habitat distribution • Survival and reproduction	**Construction stage:** • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas and temporary construction camps); • Use of explosives and blasting to create level areas for transmission structures, roads and foundation excavations; and • Reclamation of decommissioned access roads, temporary laydown areas, staging areas, and temporary construction camps.	**Dust and air emissions, and subsequent deposition**	Mitigation measures presented in the air quality assessment in **Section 6.7** during the **construction stage:** • Where reasonable, vehicles and equipment will be turned off when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition. • Vehicles and equipment will be regularly serviced, maintained and inspected for leaks. • Obey all speed limits to limit fugitive dust. • Slash pile burning will be subject to permits and approvals by appropriate regulatory agencies. • Slash piles will be burned in compliance with O. Reg. 207/96. • Dust control practices (e.g., wetting with water) will be implemented at work sites and on access roads near residential areas or other areas as appropriate. Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland. • Minimize dust-generating activities, as practicable and where required, during periods of high wind to limit dust emissions and spread. • exposed soils and stabilize high traffic areas with suitable cover material. • Restore disturbed areas as soon as reasonably possible to minimize duration of soil exposure. • Multi-passenger vehicles will be used to transport personnel, where practicable • Hydro One or its contractor(s) will prepare and implement a Dust Control/Air Quality Plan prior to construction.	**Net effect** - Dust and air emissions, and subsequent deposition can directly affect plant growth and thus affect habitat availability, distribution for plant SAR, plant SOCC and traditional use plants as well as plant growth and health.

• Plant species at risk
• Plant species of conservation concern
• Plant species of traditional use
	• Habitat quantity
	• Habitat distribution
	• Survival and reproduction
		Construction stage:
		• clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas, and temporary construction camps; and
		• reclamation of decommissioned access roads, temporary laydown areas, staging areas and temporary construction camps.
			Introduction and spread of noxious and invasive plant species	**Construction stage:**
				• Prepare and implement appropriate vegetation management procedures that describe the appropriate management of construction materials and equipment to prevent the infiltration and spread of weeds, including:
				  ◦ Cleaning and inspection of vehicles and equipment prior to Project site entry;
				  ◦ Re-cleaning vehicles and equipment if an area of weed infestation is encountered, prior to advancing to a weed free area;
				  ◦ Locating and managing cleaning locations on the Project footprint; and
				  ◦ or areas requiring re-vegetation following the completion of the Project, use approved seed mixes in accordance with MNRF, or other applicable regulatory agency, requirements and/or tree saplings of native species.
				• Progressive reclamation of disturbed areas will be practised.
				• Avoid disturbance within wild rice habitat and maintain a 30 m protective buffer. Where this is not reasonably possible, further assessment will be undertaken to support development of an enhanced mitigation plan for respective areas, and engagement with applicable Indigenous communities.
					Net effect - Introduction of noxious weeds to natural habitats can result in mortality or impact to SAR, SOCC and traditional use plants.

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		Operation and maintenance stage: • Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, and permanent access roads.		• Natural recovery is the preferred method over seeding of reclamation on level terrain where erosion is not expected. Enhanced vegetation recovery methods (e.g., seeding, planting seedlings) will be implemented where these enhanced methods are appropriate. If seeding is required, seed erosion prone areas in accordance with MNRF, or other applicable regulatory agency, requirements to promote plant species establishment during reclamation. Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal or weather conditions. Allow for natural regeneration or use certified native seed in engagement with the MNRF and local foresters; • Natural recovery is the preferred method of reclamation on Crown land, preferably seeding with conifer dominated vegetation to be consistent with adjacent vegetation communities that support wildlife, where required; • Use natural recovery in wetlands; • Herbicides will not be used during construction of the Project. • Follow established vegetation management procedures to ensure protection of wildlife and adjacent vegetation. Where vegetation management is considered necessary, mechanical methods will be used. Control of non-native species will be a priority. **Operation and maintenance stage:** • Minimize disturbance to and access to trapping and hunting areas where possible during the construction stage and during the infrequent periods for operation and maintenance activities for safety reasons.	

MECP = Ministry of the Environment, Conservation and Parks; MNRF = Ontario Ministry of Natural Resources and Forestry; ROW = right-of-way; SAR = species at risk; SOCC = species of conservation concern; m = metre.

6.4.8 Net Effects Characterization

A summary of the characterization of net effects of the Project on upland, wetland, and riparian ecosystem are provided in Table 6.4-28, Table 6.4-23, and Table 6.4-24, as well net effects of the Project on plant SAR, plant SOCC, and plant species of traditional use are provided in Table 6.4-25, Table 6.4-26, and Table 6.4-27. Net effects are described after the implementation of effective mitigation measures, and summarized according to significance factors direction, magnitude, geographic extent, duration/reversibility, frequency, and likelihood of the effect occurring following the methods described in Section 5.0. The definition for magnitude is provided in Table 6.4-21, along with general definitions for other significance factors in Table 5.6-1. Effective implementation of mitigation measures summarized in Table 6.4-20 are expected to reduce the magnitude and duration of net effects on vegetation and wetlands.

Changes in indicators for each vegetation and wetland criterion were estimated relative to the baseline characterization to describe and classify net effects, as follows:

- Changes in ecosystem availability were estimated quantitatively (i.e., hectares) for each ecosystem type.
- Changes in ecosystem distribution were qualitatively examined through the use of ecosystem mapping; and
- Changes in ecosystem composition were qualitatively predicted for species richness (or diversity) and abundance. Ecosystem composition is primarily affected by changes in the amount of moisture and sunlight, competition with invasive species and dust deposition.

Changes in indicators for each vegetation and wetland plant species criterion were estimated relative to the baseline characterization to describe and classify net effects, as follows:

- Changes in plant habitat quantity were estimated quantitatively (i.e., hectares) for each ecosystem type;
- Changes in habitat distribution were qualitatively examined through the use of habitat mapping; and
- Changes to plant survival and reproduction were qualitatively predicted. Ecosystem composition is primarily affected by changes in the amount of moisture and sunlight, competition with invasive species and dust deposition.

Table 6.4-21: Magnitude Effect Levels for Vegetation and Wetlands

Effects Characteristic	Definition	Description
Magnitude	Magnitude is the intensity of the effect or a measure of the degree of change from existing (baseline characterization) conditions expected to occur in the criterion. Loss of ecological effectiveness (i.e., function) occurs when a population can no longer perform its ecological role, such that it might trigger ecological changes that result in degraded or simplified ecosystems.	Magnitude was defined for each effect using a narrative or numeric quantification (e.g., number of hectares, number of individuals) except where the intensity or degree of change was negligible. Negligible effects are detectable changes to indicators that are predicted to result in no measurable effects to a criterion or where changes are within the adaptive capacity of the criterion (e.g., dust deposition reduces the health of some plants inhabiting ecosites immediately adjacent to the Project footprint during construction but has no measurable effect on upland ecosystems in the LSA and RSA).

LSA = Local Study Area; RSA = Regional Study Area.

Project interactions assessed as negligible net effects for upland ecosystems, are also predicted to be negligible (and not significant) for wetland and riparian ecosystems. After implementation of mitigation measures, these Project interactions (e.g., changes from soil stockpiling, hydrology, air quality and potential invasive species) result in similar changes to indicators (ecosystem availability, distribution, and composition) of vegetation and wetlands criteria and vegetation and wetland plant species criteria (habitat quantity, habitat distribution and plant survival and reproduction. Therefore, the net effects (and cumulative effects) assessment focuses on site preparation, construction and operation activities, as the changes in indicators from the Project interaction are predicted to be different between vegetation and wetlands criteria, and the Project footprint.

6.4.8.1 Upland Ecosystems

Characterization of predicted net effects to upland ecosystems is summarized in Table 6.4-22 and discussed below.

6.4.8.1.1 Ecosystem Loss or Alteration

Effects to the availability, distribution and composition of upland ecosystems from direct loss or alteration are predicted to be certain, continuous, and local in scale. Construction of the Project is predicted to remove upland habitats and the direct and indirect effects of loss and alteration purposes of this assessment, changes to all three indicators will extend for the life of the Project and are assumed to be long-term/reversible for uplands ecosystems disturbed by permanent access roads and towers. Existing access roads will be enhanced, where required, and may include widening to a 6 m width, while a 20 m ROW will be cleared of vegetation. A 20 m wide corridor has been considered in the quantitative analysis included herein. The transmission towers within the ROW will create a long-term footprint related to the four *feet* of the base (effect reversible at decommissioning). In comparison to the re-growth of vegetation throughout the ROW, including under the tower. Although some long-term impacts (i.e., for the life of the Project) will remain given the presence of the feet, they represent a small portion of the tower footprint.

Effects to the availability, distribution, and composition of treed upland ecosystems in the corridor ROW are certain and long-term. This is a result of maintaining compatible, low lying vegetation within the ROW to meet safety requirements during operations. In contrast, effects to upland ecosystems from temporary access roads, laydown areas and temporary construction camps are predicted to be reversible in the medium-term as these areas are reclaimed after construction. Reclamation of non-treed upland ecosystems along the ROW is also expected to result in medium-term reversible effects, given these species will be allowed to regrow to the extent they are compatible with the safe operation of the transmission line.

The net effect is predicted to be low in magnitude, and infrequent to continuous in frequency (depending on if the upland ecosystem is treed or non-treed; footprint is permanent or temporary).The implementation of appropriate invasive species control during progressive reclamation would minimize the potential for invasive species to occupy upland ecosystems adjacent to the Project, and consequently result in possible effects to ecosystem composition.

6.4.8.1.2 Dust and Air Emissions, and Subsequent Deposition

Air and dust emissions and subsequent deposition are expected to result in minor and local changes to soil quality and vegetation with effective implementation of mitigation measures. The World Health Organization (WHO 2000) has established annual critical levels at which vegetation growth and community composition characteristics may be altered due to SO_2 and NO_x emissions. The maximum predicted annual SO_2 and NO_x concentrations from the Project at all distances are below the World Health Organization (WHO) critical levels of 20 µg/m^3 and 30 µg/m^3, respectively (WHO 2000). Overall, changes from air and dust emissions are predicted to result in negligible net effects to the upland ecosystem

6.4.8.1.3 Introduction and Spread of Noxious and Invasive Plant Species

The implementation of mitigation measures, as included within vegetation management procedures, is expected to minimize the introduction and spread of noxious and invasive species so that any changes to native vegetation would be localized and minor, and result in negligible net effects to availability, composition and distribution of upland ecosystems.

Table 6.4-22: Characterization of Predicted Net Effects to the Upland Ecosystem

Criteria	Indicators	Net Effect	Direct/ Indirect	Direction	Magnitude[1]	Geographic Extent	Duration/ Reversibility	Frequency	Likelihood of Occurrence	Significance
Upland ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	Ecosystem Loss or Alteration	Direct	Negative	Low Predicted loss of 2,439 ha (2.3%) of the LSA's baseline characterization.	Project footprint	Medium-term to Long-term/ Reversible	Infrequent (for temporary footprint disturbances and in non-treed upland ecosystems)/Continuous (for permanent footprint disturbances and in treed upland ecosystems)	Certain	Not significant
Upland ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	Dust and Air Emissions, and Subsequent Deposition	Indirect	Negative	Negligible	Local	Medium-term/ Reversible	Frequent	Possible	Not significant
Upland ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	Introduction and Spread of Noxious and Invasive Plant Species	Direct	Negative	Negligible	Local	Medium-term/ Reversible	Infrequent	Possible (Construction) / Unlikely (Operations and Maintenance)	Not significant

LSA = Local Study Area; ha = hectare; % = percent.

1) The loss is due to the disturbance within the Project footprint as compared to available ecosystem in the LSA.

6.4.8.2 Wetland Ecosystems

Characterization of predicted net effects to wetland ecosystems is summarized in Table 6.4-23 and discussed below.

6.4.8.2.1 Ecosystem Loss or Alteration

Effects to the availability and distribution of wetland ecosystems are predicted to be of low magnitude, certain, continuous, and local in scale. Construction of the Project is predicted to remove 1.8% of wetland ecosystem within the LSA, as a result ofProject footprint disturbance. For the purposes of this assessment, changes to all three indicators that extend for the life of the Project are assumed to be long-term/reversible for wetlands disturbed by permanent access roads. In contrast, effects to wetland ecosystems from temporary access roads, laydown areas and temporary construction camps are predicted to be reversible in the medium-term as these areas are reclaimed after construction.

A small percentage of wetland occurring within the Project ROW will be removed to allow for construction of the transmission line infrastructure and associated components (see Section 3.0). However, during operation and maintenance, compatible vegetation (e.g., groundcover and shrubs) that meets safety requirements, will re-grow within the ROW. The Project ROW will continue to support native vegetation communities and offer wildlife habitat (see Section 6.5). While considering the wetland ecosystem throughout the landscape, specifically within the LSA, a small percent of treed wetland habitat will be altered and the re-growth of compatible vegetation will not resemble original wetland habitat types (i.e., swamps). There may be opportunity to maintain or re-establish wetland that supports seasonally wet conditions, such as meadow marsh or shrub thicket types.

The net effect is predicted to be low in magnitude, and infrequent to continuous in frequency (depending on if the wetland ecosystem is treed or non-treed; footprint is permanent or temporary).

6.4.8.2.2 Dust and Air Emissions, and Subsequent Deposition

Air and dust emissions and subsequent deposition are expected to result in minor and local changes to soil quality and vegetation with effective implementation of mitigation measures. Changes from air and dust emissions are predicted to result in negligible net effects to wetland ecosystems.

6.4.8.2.3 Introduction and Spread of Noxious and Invasive Plant Species

The implementation of mitigation measures, as included within vegetation management procedures, is expected to minimize the introduction and spread of noxious and invasive species so that any changes to native vegetation would be localized and minor, and result in negligible net effects to availability, composition and distribution of wetland ecosystems.

Table 6.4-23: Characterization of Predicted Net Effects to the Wetland Ecosystem

Criteria	Indicators	Net Effect	Direct/ Indirect	Direction	Magnitude[1]	Geographic Extent	Duration/ Reversibility	Frequency	Likelihood of Occurrence	Significance
Wetland ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	Ecosystem Loss or Alteration	Direct	Negative	Low Predicted loss of 294 ha (1.8% of the LSA's baseline characterization.	Project footprint	Medium-term – Long-term/ Reversible	Infrequent (for temporary footprint disturbances and in non-treed wetland ecosystems)/Continuous (for permanent footprint disturbances and in treed wetland ecosystems)	Certain	Not significant
Wetland ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	Dust and Air Emissions, and Subsequent Deposition	Indirect	Negative	Negligible	Local	Medium-term/ Reversible	Frequent	Possible	Not significant
Wetland ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	Introduction and Spread of Noxious and Invasive Plant Species	Direct	Negative	Negligible	Local	Medium-term/ Reversible	Infrequent	Possible (Construction) / Unlikely (Operations and Maintenance)	Not significant

LSA = Local Study Area; ha = hectare; % = percent.

1) The loss is due to the disturbance within the Project footprint as compared to available ecosystem in the LSA.

6.4.8.3 Riparian Ecosystems

Characterization of predicted net effects to riparian ecosystems is summarized in Table 6.4-24 and discussed below.

6.4.8.3.1 Ecosystem Loss or Alteration

The effects to the availability and distribution of riparian ecosystems are predicted to be of low magnitude, with only a 0.4% loss with respect to the LSA, certain, continuous, and local in scale. Construction of the Project is predicted to remove 0.4% of riparian ecosystem within the LSA, attributed to permanent and temporary Project footprint disturbances. For the purposes of this assessment, changes to all three indicators that extend for the life of the Project are assumed to be long-term / reversible. In contrast, effects to riparian ecosystems from temporary access roads, laydown areas and temporary construction camps are predicted to be reversible in the medium-term as these areas are reclaimed after construction. The net effect is predicted to be low in magnitude, and infrequent to continuous in frequency (depending on if the riparian ecosystem is treed or non-treed; footprint is permanent or temporary).

6.4.8.3.2 Dust and Air Emissions, and Subsequent Deposition

Air and dust emissions and subsequent deposition are expected to result in minor and local changes to soil quality and vegetation with effective implementation of mitigation measures. Changes from air and dust emissions are predicted to result in negligible net effects to riparian ecosystems.

6.4.8.3.3 Introduction and Spread of Noxious and Invasive Plant Species

The implementation of mitigation measures, as included within vegetation management procedures, is expected to minimize the introduction and spread of noxious and invasive species so that any changes to native vegetation would be localized and minor, and result in negligible net effects to availability, composition and distribution of riparian ecosystems.

Table 6.4-24: Characterization of Predicted Net Effects to the Riparian Ecosystem

Criteria	Indicators	Net Effect	Direct/ Indirect	Direction	Magnitude[1]	Geographic Extent	Duration/ Reversibility	Frequency	Likelihood of Occurrence	Significance
Riparian ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	Ecosystem Loss or Alteration	Direct	Negative	Low Predicted loss of 129 ha (0.4% of the LSA's baseline characterization).	Project footprint	Medium-term – Long-term/ Reversible	Infrequent (for temporary footprint disturbances and in non-treed riparian ecosystems)/Continuous (for permanent footprint disturbances and in treed riparian ecosystems)	Certain	Not significant
Riparian ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	Dust and Air Emissions, and Subsequent Deposition	Indirect	Negative	Negligible	Local	Medium-term/ Reversible	Frequent	Possible	Not significant
Riparian ecosystem	• Ecosystem availability • Ecosystem distribution • Ecosystem composition	Introduction and Spread of Noxious and Invasive Plant Species	Direct	Negative	Negligible	Local	Medium-term/ Reversible	Infrequent	Possible (Construction) / Unlikely (Operations and Maintenance)	Not significant

LSA = Local Study Area; ha = hectare; % = percent.

1) The loss is due to the disturbance within the Project footprint as compared to available ecosystem in the LSA.

6.4.8.4 Plant Species at Risk

Characterization of predicted net effects to plant species at risk is summarized in Table 6.4-25 and discussed below.

6.4.8.4.1 Plant Loss or Alteration

For the Project footprint, negative effects to the availability and distribution of black ash habitat are predicted to be small, probable, continuous, and local in scale. Construction is expected to remove a small amount of both confirmed and candidate black ash habitat within the Project footprint. For the purposes of this assessment, changes to all three indicators that extend for the life of the Project are assumed to be long-term/reversible. In contrast, effects to plant species at risk from temporary access roads, laydown areas and temporary construction camps are predicted to be reversible in the medium-term as these areas are reclaimed after construction.

Regeneration of only low-lying species (i.e., compatible vegetation) within the ROW will be permitted in order to meet safety requirements during operations. Areas outside of the ROW, including laydown areas and construction camps, that will be temporarily disturbed during construction activities and will be permitted to naturalize following construction will have an opportunity to allow recovery where they occur within a black ash regeneration zone (e.g., close proximity to nearby black ash, suitable soil conditions).

6.4.8.4.2 Dust and Air Emissions, and Subsequent Deposition

Air and dust emissions and subsequent deposition are expected to result in minor and local changes to soil quality and black ash habitat with effective implementation of mitigation measures.

6.4.8.4.3 Introduction and Spread of Noxious and Invasive Plant Species

The implementation of mitigation measures as included within vegetation management procedures, particularly to limit the spread of emerald ash borer, will minimize the introduction, and spread of noxious and invasive species so that any changes to native vegetation would be localized and minor, and result in negligible net effects to quantity, distribution and survival and reproduction of the species.

Table 6.4-25: Characterization of Predicted Net Effects to Species at Risk

Criteria	Indicators	Net Effect	Direct/ Indirect	Direction	Magnitude[1]	Geographic Extent	Duration/ Reversibility	Frequency	Likelihood of Occurrence	Significance
Species at Risk	• Habitat Quantity • Ecosystem Habitat Distribution • Survival and Reproduction	Ecosystem Loss or Alteration	Direct	Negative	Low Predicted loss of 10.8% of the LSA's baseline characterization.	Project footprint	Medium-term – Long-term/ Reversible	Infrequent	Certain	Not significant
Species at Risk	• Habitat Quantity • Ecosystem Habitat Distribution • Survival and Reproduction	Dust and Air Emissions, and Subsequent Deposition	Indirect	Negative	Negligible	Local	Medium-term/ Reversible	Frequent	Possible	Not significant
Species at Risk	• Habitat Quantity • Ecosystem Habitat Distribution • Survival and Reproduction	Introduction and Spread of Noxious and Invasive Plant Species	Direct	Negative	Negligible	Local	Medium-term/ Reversible	Infrequent	Possible (Construction) / Unlikely (Operations and Maintenance)	Not significant

LSA = Local Study Area; % = percent.

1) The loss is due to the disturbance within the Project footprint as compared to available ecosystem in the LSA.

6.4.8.5 *Plant Species of Conservation Concern*

Characterization of predicted net effects to plant SOCC is summarized in Table 6.4-26 and discussed below.

6.4.8.5.1 Plant Loss or Alteration

For the Project footprint, negative effects to the availability and distribution of SOCC and SWH are predicted to be small, certain, continuous, and local in scale.

Construction is expected to remove a small amount of SOCC habitat and SWH from the Project footprint. For the purposes of this assessment, changes to all three indicators that extend for the life of the Project are assumed to be long-term/reversible. In contrast, effects to plant species of conservation concern from temporary access roads, laydown areas and temporary construction camps are predicted to be reversible in the medium-term as these areas are reclaimed after construction.

Regeneration of the respective species within the ROW may be possible where sunlight and moisture conditions remain unchanged, such as within existing meadow habitat. Additionally, as vegetation management procedures include retention of compatible vegetation, it can create new meadow habitat that will positively impact some species.

Areas outside of the ROW, including laydown areas and construction camps, that will be temporarily disturbed during construction activities will be permitted to naturalize following construction. Therefore, habitat can be reversed to pre-disturbance or similar condition following construction.

6.4.8.5.2 Dust and Air Emissions, and Subsequent Deposition

Air and dust emissions and subsequent deposition are expected to result in minor and local changes to soil quality with effective implementation of mitigation measures.

6.4.8.5.3 Introduction and Spread of Noxious and Invasive Plant Species

The implementation of mitigation measures, as included within vegetation management procedures, is expected to minimize the introduction and spread of noxious and invasive species so that any changes to native vegetation would be localized and minor, and result in negligible net effects to quantity, distribution, and survival and reproduction.

Table 6.4-26: Characterization of Predicted Net Effects to Plant Species of Conservation Concern.

Criteria	Indicators	Net Effect	Direct/ Indirect	Direction	Magnitude[1]	Geographic Extent	Duration/ Reversibility	Frequency	Likelihood of Occurrence	Significance
Plant Species of Conservation Concern	• Habitat Quantity • Ecosystem Habitat Distribution • Survival and Reproduction	Ecosystem Loss or Alteration	Direct	Negative	Low Predicted loss of 2%-3.6% of the LSA's baseline characterization of each SOCC and SWH type.	Project footprint	Medium-term – Long-term/ Reversible	Infrequent	Certain	Not significant
Plant Species of Conservation Concern	• Habitat Quantity • Ecosystem Habitat Distribution • Survival and Reproduction	Dust and Air Emissions, and Subsequent Deposition	Indirect	Negative	Negligible	Local	Medium-term/ Reversible	Frequent	Possible	Not significant
Plant Species of Conservation Concern	• Habitat Quantity • Ecosystem Habitat Distribution • Survival and Reproduction	Introduction and Spread of Noxious and Invasive Plant Species	Direct	Negative	Negligible	Local	Medium-term/ Reversible	Infrequent	Possible (Construction) / Unlikely (Operations and Maintenance)	Not significant

SOCC = Species of Conservation Concern; SWH = Significant Wildlife Habitat; % = percent.

1) The loss is due to the disturbance within the Project footprint as compared to available ecosystem in the LSA.

6.4.8.6 *Plants of Traditional Use*

Characterization of predicted net effects to plant of traditional use is summarized in Table 6.4-27 and discussed below.

Potential Project effects on vegetation and wetland communities or species that may affect use by Indigenous communities are discussed in further detail in Section 7.7 (First Nations Rights, Interests and Use of Land and Resources) and Section 7.8 (Métis Rights, Interests and Use of Land and Resources).

6.4.8.6.1 Plant Loss or Alteration

For the Project footprint, negative effects to the availability and distribution of plants of traditional use are predicted to be small, certain, continuous, and local in scale.

Construction is expected to remove a small amount of traditional plant habitat from the Project footprint. For the purposes of this assessment, changes to all three indicators that extend for the life of the Project are assumed to be long-term / reversible. In contrast, effects to plants of traditional use from temporary access roads, laydown areas and temporary construction camps are predicted to be reversible in the medium-term as these areas are reclaimed after construction.

Regeneration of the respective species within the ROW may be possible where sunlight and moisture conditions remain unchanged, such as within existing meadow habitat. Additionally, as vegetation management procedures include retention of compatible vegetation, it can create new meadow habitat that will positively impact some species.

Areas outside of the ROW, including laydown areas and construction camps, that will be temporarily disturbed during construction activities will be permitted to naturalize following construction. Therefore, habitat can be reversed to pre-disturbance or similar condition following construction.

6.4.8.6.2 Dust and Air Emissions, and Subsequent Deposition

Air and dust emissions and subsequent deposition are expected to result in minor and local changes to soil quality with effective implementation of mitigation measures.

6.4.8.6.3 Introduction and Spread of Noxious and Invasive Plant Species

The implementation of mitigation measures, as included within vegetation management procedures, is expected to minimize the introduction and spread of noxious and invasive species so that any changes to native vegetation would be localized and minor, and result in negligible net effects to quantity, distribution, and survival and reproduction.

Table 6.4-27: Characterization of Predicted Net Effects to Plants of Traditional Use

Criteria	Indicators	Net Effect	Direct/ Indirect	Direction	Magnitude[1]	Geographic Extent	Duration/ Reversibility	Frequency	Likelihood of Occurrence	Significance
Plants of Traditional Use	• Habitat Quantity • Ecosystem Habitat Distribution • Survival and Reproduction	Ecosystem Loss or Alteration	Direct	Negative	Low Predicted loss of 2,729 ha (3.0% of the LSA's baseline characterization.	Project footprint	Medium-term – Long-term/ Reversible	Infrequent	Certain	Not significant
Plants of Traditional Use	• Habitat Quantity • Ecosystem Habitat Distribution • Survival and Reproduction	Dust and Air Emissions, and Subsequent Deposition	Indirect	Negative	Negligible	Local	Medium-term/ Reversible	Frequent	Possible	Not significant
Plants of Traditional Use	• Habitat Quantity • Ecosystem Habitat Distribution • Survival and Reproduction	Introduction and Spread of Noxious and Invasive Plant Species	Direct	Negative	Negligible	Local	Medium-term/ Reversible	Infrequent	Possible (Construction) / Unlikely (Operations and Maintenance)	Not significant

LSA = Local Study Area; ha = hectare; % = percent.

1) The loss is due to the disturbance within the Project footprint as compared to available ecosystem in the LSA.

6.4.9 Assessment of Significance

For each vegetation and wetland, and Species at Risk criteria, an assessment of significance was made for the Project footprint for the Net Effects Assessment (combined effects of baseline characterization and Project) and for Cumulative Effects Assessment (baseline characterization, Project and reasonably foreseeable developments [RFDs]).

Significance was determined based on combined effects because the effects of a single project infrequently cause an ecologically significant effect on their own (McCold and Saulsbury 1996), and many environmental effects of primary concern are cumulative (Canter and Ross 2010). Therefore, whether upland, riparian or wetland ecosystems would remain self-sustaining and ecologically effective was assessed by combining the effects identified in the baseline characterization with the net effects identified for the Net Effects Assessment and the Cumulative Effects Assessment to assess the total predicted combined effect. If a significant effect was identified, the contribution of the Project footprint to the cumulative effects was described.

Significance was predicted as a binary response, with effects classified as significant or not significant (Section 5.6.5). Predicted net effects were determined to be significant if a criterion is expected to no longer be: (1) self-sustaining, or (2) ecologically effective. Self-sustaining ecosystems are healthy, functioning and robust entities that are capable of withstanding environmental change and accommodating stochastic processes. Ecologically effective ecosystems are those that can support the range of native species and ecological and evolutionary processes normally provided by the ecosystem (Noss 1990). These processes vary by ecosystem type and are not easily quantified. Specifically:

- An ecosystem was considered to be no longer self-sustaining where cumulative effects were expected to place the abundance of an ecosystem RSA on a declining trajectory that is not predicted to recover or stabilize. Part of being self-sustaining, in this context, was that an ecosystem that stabilizes at a lower abundance is not expected to be lost in the future. Another part of being self-sustaining was the assumption that no additional mitigation measures or management actions beyond the Project footprint mitigation measures and existing management strategies in the RSA would be required. Effects that are considered not significant could result in no change, stabilization at lower abundance, stabilization at higher abundance, or a temporary decline followed by recovery.
- Even where the ecosystem remains abundant and present on the landscape, a loss of important ecological function also resulted in a significant negative effect. Ecological function can be lost, even when an ecosystem remains abundant, if ecosystem composition is altered. Even where ecosystems remain stable, fragmentation effects that cause ecological isolation (i.e., severely reducing or eliminating overall viability of the ecosystem) may also be considered significant.

The approach to determining the significance of combined effects for each criterion incorporated the concepts of resilience and adaptability using the reasoned narrative provided in the effects assessment and cumulative effects assessment for the Project footprint. Although the assessment of significance was informed by the characterization of net effects, the interaction between ecological context from the baseline characterization and the magnitude, duration and geographic extent of the interacting net effects were the most important factors. Provincial and federal standards, guidelines and objectives were considered, where available, and integrated into the reasoned narrative.

Resource management criteria are targets identified by governments and resource management organizations to maintain and improve biodiversity. Available provincial and federal standards, guidelines, and objectives were considered, where available, and integrated into the reasoned narrative. Such resource management criteria have been developed by Environment Canada (2013) and other sources to help define functional ecosystems. Exceeding a resource management criterion may or may not indicate that an ecosystem is no longer self-sustaining or ecologically effective, but resource management criteria can provide useful context, especially where uncertainty is high.

6.4.9.1 Upland Ecosystems

The Project will contribute to negative changes in upland ecosystem availability, distribution, and condition; however, these changes are predicted to be within the resilience limits and adaptive capacity of existing upland ecosystems. Common upland ecosites are expected to have the capacity to adapt and be resilient to existing natural and human related disturbances and associated variations in availability. Less commonly found upland ecosystems, such as rare vegetation communities, are likely less resilient and more susceptible to change. The small size, relative infrequency, and slow growth of some of these upland ecosystems account for the community's depressed adaptive capacity.

Relative to the baseline characterization, most uplands remain abundant, intact and well distributed across the RSA. The contribution of the Project footprint on upland ecosystems in the RSA is not expected to change the self-sustaining and ecologically effective status of this criterion. Consequently, net effects on upland ecosystems are predicted to be not significant.

6.4.9.2 Wetland Ecosystems

Changes to ecosystem availability, distribution and composition from the Project are predicted to be within the resilience limits and adaptive capacity of wetland ecosystems. Despite changes in wetland condition during the baseline characterization, existing wetlands remain well connected to support a diversity of plant and wildlife species in the region. The reduction in wetland ecosystem condition in the Net Effects relative to the baseline characterization is not predicted to greatly alter the ecological function of wetlands on the landscape because most (99.6%) wetlands would remain intact and well distributed across the RSA of the Project footprint. The combined evidence regarding wetland ecosystem availability, distribution and condition in the RSA indicates that this ecosystem would continue to be self-sustaining and ecologically effective. Consequently, net effects on wetland ecosystems are predicted to be not significant.

6.4.9.3 *Riparian Ecosystems*

Changes in riparian habitat indicators from the Project footprint are not predicted to exceed the limits of resilience and adaptability of riparian habitat in the RSA. Relative to the baseline characterization, riparian habitat remains abundant, intact and well distributed across the RSA. The net effects to the baseline characterization indicates approximately 98.8% of habitat adjacent to watercourses and waterbodies in the RSA will remain in their naturally vegetated state. The LSA is 99.6% naturally vegetated in the baseline characterization, which is within the resource management criterion of 75% naturally vegetated stream length recommended by Environment Canada (2013) to prevent degradation of these ecosystems. The weight of evidence indicates that net effects from the Project on riparian ecosystems in the RSA are predicted to be not significant.

6.4.9.4 *Plant Species at Risk*

Quantifiable impacts from the Project footprint will result in predicted loss of black ash habitat; mitigation measures to avoid and minimize effects from the Project footprint are outlined in the Net Effects Assessment.

The Project will contribute to negative changes in upland/wetland ecosystem availability, distribution, and condition; however, these changes are predicted to be within the resilience limits and adaptive capacity of existing upland/wetland ecosystems. Relative to the baseline characterization, most black ash habitat remains present, intact and well distributed across the RSA. The contribution of the Project footprint to net effects on black ash habitat in the RSA is not expected to change the self-sustaining and ecologically effective status of this criterion. Consequently, net effects on black ash habitat are predicted to be not significant.

6.4.9.5 *Plant Species of Conservation Concern*

Quantifiable impacts from the Project footprint will result in predicted loss of plant SOCC habitat; mitigation measures to avoid and minimize effects from the Project footprint are outlined in the Net Effects Assessment.

The Project will contribute to negative changes in upland/wetland ecosystem availability, distribution and condition; however, these changes are predicted to be within the resilience limits and adaptive capacity of existing upland/wetland ecosystems. Relative to the baseline characterization, most SOCC habitat remains present, intact and well distributed across the RSA. The contribution of the Project footprint to net effects on SOCC habitat in the RSA is not expected to change the self-sustaining and ecologically effective status of this criterion. Consequently, net effects on SOCC habitat are predicted to be not significant.

6.4.9.6 Plant Species of Traditional Use

Changes in habitat for plant species of traditional use from the Project footprint are not predicted to exceed the limits of resilience and adaptability of their habitat in the RSA. Relative to the baseline characterization, plant species of traditional use habitat remains abundant, intact and well distributed across the RSA. The net effects to the baseline characterization indicates approximately 99.2% of upland and wetland habitat (host to traditional use plant species) in the RSA will remain in their naturally vegetated state. The weight of evidence indicates that net effects from the Project on ecosystems host to plant species of traditional use in the RSA are predicted to be not significant.

6.4.10 Cumulative Effects Assessment

The Cumulative Effects Assessment measures and describes cumulative effects of adding the incremental changes from the Net Effects Assessment (i.e., baseline characterization plus Project) and certain/planned and planned developments (RFDs) (Section 9). Subsequently, the cumulative effects assessment is completed at the regional scale (i.e., criterion-specific RSA or beyond RSA). The effects assessment is primarily qualitative and describes how the interacting effects of developments and natural factors are predicted to affect indicators for each criterion (Section 6.4.7). The assessment is presented as a reasoned narrative describing the outcomes of cumulative effects for each vegetation and wetlands criterion, in addition to plant SAR, species of conservation concern, and traditional use plants and related habitat criterion. Importantly, Project interactions determined to have no net effects on upland (Table 6.4-22), wetland (Table 6.4-23) and riparian (Table 6.4-24) ecosystems in addition to plant SAR (Table 6.4-25), species of conservation concern (Table 6.4-26), and traditional use plants and related habitat (Table 6.4-27) are not carried forward to the Cumulative Effects Assessment.

6.4.10.1 Overview of Potential Cumulative Effects

As described above, the Cumulative Effects Assessment is primarily qualitative, completed at the regional scale and presented as a reasoned narrative describing the outcomes of cumulative effects for each vegetation criterion. For RFDs identified to have net effects that would overlap spatially and temporally with the Project, estimates of habitat loss were developed where available and are considered conservative.

A list of the RFDs that were considered for this EA are presented in Section 9.0, Table 9.1-1. Out of these projects, the RFDs listed in Table 6.4-28 were identified as being probable to occur within the LSA, and therefore have potential to have cumulative effects within the RSA on the vegetation and wetlands, and SAR, SOCC and plants of traditional use. The cumulative effects are described in further detail for upland ecosystems in Section 6.4.10.3, wetland ecosystems in Section 6.4.10.4, riparian ecosystems in Section 6.4.10.5, SAR in Section 6.4.10.6, SOCC in Section 6.4.10.7 and plants of traditional use in Section 6.4.10.8. Table 6.4-28 also identifies if the net effects for the Project are expected to overlap spatially and temporally with the net effects of the RFDs.

Table 6.4-28: Summary of Cumulative Effects Assessment Interactions for Vegetation and Wetlands, and SAR, SOCC and Plants of Traditional Use

ID	Project/Activity	Description	Spatial Overlap of Net Effects	Temporal Overlap of Net Effects	Included in Cumulative Effects Analysis
6	McIntyre Creek Culvert rehabilitation	• The project includes the culvert rehabilitation at McIntyre Creek Culvert, 1 km west of Hwy 102, Thunder Bay, and Wild Goose Creek Culvert, 6 km east of Hwy 527, Shuniah.	Yes	Yes	Yes
8	Blind Creek Culvert rehabilitation	• The project includes the Blind Creek Culvert rehabilitation located 7 km east of Hwy 527, Shuniah.	Yes	Yes	Yes
12	Hwy 17 resurfacing	• The project includes resurfacing of Highway 17 West of Hwy 72 at Dinorwic westerly, Dryden.	Yes	Yes	Yes
13	Osaquan and Melgund Creek Culverts, rehabilitation	• The project includes the rehabilitation of Osaquan and Melgund Creek Culverts, 8 and 56 km, respectively, west of Ignace and Shoshowae Creek Culvert, 10 km west of Dryden.	Yes	Yes	Yes
17	Highway 11, 11B resurfacing, paved shoulders	• The project includes resurfacing and adding paved shoulders to the west of Hwy 11B easterly and Hwy 11B, Atikokan.	Yes	Yes	Yes

ID	Project/Activity	Description	Spatial Overlap of Net Effects	Temporal Overlap of Net Effects	Included in Cumulative Effects Analysis
18	Highway 11 resurfacing, paved shoulders	• The project includes resurfacing and adding paved shoulders on Highway 11 from Oliver Rd., Kakabeka to Hwy 11, Shabaqua, Oliver Paipoonge, Conmee, west of Conmee.	Yes	Yes	Yes
19	Highway 102, resurfacing	• The project includes resurfacing Hwy 102 west of Hwy 589 westerly to Hwy 11/17, Thunder Bay, Oliver Paipoonge, north of Conmee.	Yes	Yes	Yes
20	CPR Kaministiquia and CNR overheads, bridge rehabilitation and bridge removal	• The project includes the rehabilitation and removal of CPR overhead bridge Kaministiquia and CNR overhead bridge, 4 km east of Hwy 17 at Sistonen's Corners, west of Oliver-Paipoonge.	Yes	Yes	Yes
21	Seine River Bridge, rehabilitation	• The project includes the rehabilitation of the Seine River Bridge, 21 km north of Hwy 11B, north of Atikokan.	Yes	Yes	Yes
22	Turtle and Little Turtle River Bridges, rehabilitation	• The project includes the rehabilitation of Turtle and Little Turtle River Bridges, 44 and 79 km, respectively, south of Hwy 17, north of Atikokan.	Yes	Yes	Yes
23	Revell River No. 3 Bridge, rehabilitation	• The project includes the rehabilitation of the Revell River No. 3 Bridge, 1 km east of Hwy 622, west of Ignace.	Yes	Yes	Yes

ID	Project/Activity	Description	Spatial Overlap of Net Effects	Temporal Overlap of Net Effects	Included in Cumulative Effects Analysis
24	Treasury Metals Inc. Goliath Gold Project	• The project includes one open pit with underground development, a tailings storage facility, waste rock storage, overburden storage, low-grade stockpile and a 115kV transmission line with on-site electrical substation. Once in operation, the rate of production will be approximately 2,700 tonnes per day (t/d). Site Preparation and Construction will take approximately two years. The site is 20 km east of Dryden. Operation is anticipated to be 12 years.	Yes	Yes	Yes
25	Rehabilitation of Steep Rock Mine	• Ministry of Natural Resources and Forestry (MNRF) plans to stabilize and remediate the former Steep Rock Mine, including a plan for enhanced natural recovery that will increase the size of Steep Rock Lake in the coming decades.	Yes	Yes	Yes

ID	Project/Activity	Description	Spatial Overlap of Net Effects	Temporal Overlap of Net Effects	Included in Cumulative Effects Analysis
30	Agnico Eagle Hammond Reef Gold Mine	• Agnico Eagle Mines Limited has proposed the construction, operation, decommissioning and abandonment of a new open-pit gold mine. Mining would occur for 11 years, with an ore production capacity of 60,000 tonnes per day. The on-site metal mill would have an ore input capacity of 60,000 tonnes per day. The mine will occur outside of the RSA; however, the access road and transmission line extend through the footprint, LSA and RSA.	Yes	Yes	Yes

The RFD IDs 6, 8, 12, 13, 17, 18, 19, 20, 21, 22 and 23 involve the rehabilitation and resurfacing of existing highway and bridge infrastructure. There are no overlapping net effects between these RFD and the Project that could result in cumulative effects and these RFD are not further assessed. The rehabilitation of Steep Rock Mine (No. 25) will result in a net benefit or enhancement to the project area. The extent of rehabilitation is unknown at this time.

The remaining two RDFs, namely, Treasury Metals Inc. Goliath Gold Project (No. 24) and Agnico Eagle Hammond Reef Gold Mine (No. 30), are anticipated to overlap spatially and temporally with the Project. The Treasury Metals Inc. Goliath Gold Project occurs within the LSA and RSA. The Agnico Eagle Hammond Reef Gold Mine will occur outside of the RSA; however, both a new road access and transmission line to the mine extend through the LSA and RSA. The approximate footprint and anticipated area of impact for these two areas are considered further below in Sections 6.4.10.3 through 6.4.10.8.

6.4.10.2 Summary of Climate Change Effects on Boreal Ecosystems

The present-day climate in the LSA and RSA is predominantly high-latitude continental best described with long cold winters, short cool summers and relatively low precipitation (regional variations include lake effects, storm tracks from eastern USA) (Price et al. 2013). Today the boreal vegetation of the LSA and RSA is dominated by a small number of widespread conifer species (*Picea* sp., *Pinus* sp., *Abies* sp.; Appendix 6.4-A) accompanied by a few deciduous species (*Betula* sp., *Populus* sp., *Salix* sp., *Larix* sp.; Appendix 6.4-A) spread along an extensively flat boreal landscape that are subject to large-scale climate-related impacts (Price et al. 2013). Environmental stress and disturbances from climate change are likely to cause major pressures on forest availability, distribution, and composition across most of Canada's boreal ecozones within the next few decades. The assessment of climate-related effects is complex because of the continuous interaction of parameters but can be best divided between direct effects such as environmental stress and indirect effects such as environmental disturbances.

Climate change will have many environmental stress-related effects (direct effects) on boreal ecosystem functions due to increased temperature, changes in water availability and increases in atmospheric carbon dioxide (CO_2) concentration (Price et al. 2013). Changing temperature driving regional evapotranspiration coupled with changing the distribution and timing of annual precipitation will alter the seasonality and amount of water available to vegetation (Price et al. 2013). Although, climate change is projected to increase annual precipitation in the area, this does not necessarily lead to an increase in soil moisture as warmer environmental conditions will lead to an increase of evapotranspiration (Price et al. 2013). In boreal ecosystems, when evapotranspiration is increased and exceeds the average precipitation, low-land ecosystems, specifically wetlands, will generally transition to dryer conditions (Price et al. 2013). This threatens all wetlands of the boreal ecosystems including bogs, fens, marshes and swamps. The boreal shield receives approximately 600 mm of precipitation per year, projected to increase by 11% by 2100, distributed more in winter and spring, and less in summer and fall, suggesting an extended and drier growing season in the LSA and RSA (Price et al. 2011). A drier environmental condition increases tree mortality and reduces the viability of boreal conifer seeds for natural regeneration (Hogg and Schwarz 1997, Johnstone et al. 2011, Michaelian et al. 2011, Peng et al. 2011). Growth of trees in the boreal forest such as white spruce and black spruce is impaired when stressed by dry conditions (Barber et al. 2000, Caccianiga and Payette 2006, Dang and Lieffers 1989, Girardin et al. 2008, Girardin et al. 2012). Increase in temperature and changes in water availability are an imminent threat to the functions of boreal ecosystems, as they are particularly sensitive to climate-related changes and threatened by warming and drying.

A major component driving climate change are anthropogenic-led increases of greenhouse gases, such as CO_2. Elevated CO_2 concentration affects plants in a multitude of ways and varies greatly among species (Price et al. 2013). Short term exposure of vegetation to increased CO_2 concentration results in increased net photosynthesis (consequently increased net primary production) and decreased evapotranspiration (Curtis and Wang 1998, Saxe et al. 1998, Huang et al. 2007). Continued exposure to elevated CO_2 concentration can generate increases in net primary production for several years (Medlyn et al. 1999, Norby et al. 1999, Ainsworth et al. 2004). With higher net primary production, more energy is available and used towards growth of wood biomass (Curtis and Wang 1998). In mature trees, instead of promoting aboveground growth, increases in net primary production increases fine-root production (Asshoff et al. 2006, Körner et al. 2005). However, in the longer term, this increase is often offset by the reduction of photosynthetic capacity from acclimating to elevated conditions of CO_2 concentration (Tjoelker et al. 1998). In natural forests, it is difficult to assess tree growth due to elevated CO_2 concentration as other confounding/limiting factors such as temperature, moisture regime and nitrogen availability also impact growth (Huang et al. 2007, Brienen et al. 2012). Under the right circumstances, it is hypothesized that warm, moderately drought-stressed ecosystems with an excess nitrogen availability are ideal conditions for increased tree growth in response to elevated CO_2 concentration (Huang et al. 2007).

Assessing the impacts of climate change on the boreal forest ecosystem involves multiple dynamic parameters and interactions, simultaneously. In Québec, mature black spruce forests (aged 70 to 140 years) have shown a positive response to climate warming since the 1950s, suggesting improved growing conditions (Girardin et al. 2012, Price et al. 2013). However, for forest stands of greater than 140 years, the benefits are offset by soil moisture availability and higher respiration rates showing a negative response to the warming climate (Girardin et al. 2012). Overall, no significant increases in wood biomass were recorded in response to historic increases in CO_2 concentration (Price et al. 2013). Therefore, it is unlikely that increased CO_2 concentration combined with warmer temperature will stimulate major increases in growth by the tree species found in the present-day boreal forest (Price et al. 2013).

In addition to climate related environmental stress, the boreal forest will also be impacted by environmental disturbances (indirect effects) from changes in climatic extremes and seasonality, e.g., extended, but drier, growing seasons; occurrence of more intense convective storms (from latent heat) leading to more lightning-caused fires; wind damage and/or flooding; as well as less frequent weather events such as ice storms in early spring and late spring frosts, which are all damaging to the present-day boreal vegetation (Price et al. 2013). The boreal forest requires large-scale disturbances to clear extensive areas to drive natural forest succession (Price et al. 2013, Price and Apps 1995, Oliver and Larson 1996). Fire-adapted conifers (jack pine and black spruce) produce serotinous cones (release seeds following environmental trigger) that allow a simultaneous regeneration by rapid and dense colonization over vast areas following large fires (Thompson et al. 1998, Brown and Johnstone 2012). Given the expected increases in occurrence of large fires because of climate change as well as the possibly of large-scale insect pest outbreaks in a warmer, drier, and/or more storm-laden climate, it is likely these environmental disturbances will bring changes in boreal forest species composition (Loehle 2003). When hot, dry conditions prevent successful establishment of conifer seedlings, pioneer deciduous species, such as aspen and birch, may outcompete conifers by their ability to regrow following drought and fire (Goldblum and Rigg 2005, Price et al. 2001, Price et al. 2013). This is exacerbated when the interval between fires becomes too short to allow sexual maturation of conifer trees (Price et al. 2013). This is a possible explanation (along with water availability) for the lack of naturally occurring conifer species in the present-day aspen parkland south of the Canadian boreal zone extending across Alberta, Saskatchewan and Manitoba (Hogg 1994, Hogg and Schwarz 1997). Comparatively, where disturbances remain less frequent, temperate hardwood species such as sugar maple may gradually expand into areas that are presently conifer dominated boreal forest (Goldblum and Rigg 2005, Price et al. 2013). Although, some aspect of a warmer climate seems likely to increase forest productivity in the long term, climate zones suitable for boreal conifer forests may start to disappear from the southern boundaries of their present-day distributions across much of Canada by 2100 (McKenney et al. 2007, McKenney et al. 2011, Price et al. 1999, Price et al. 2013, Malcolm et al. 2005).

6.4.10.3 Upland Ecosystems

Ecosystem Availability

Cumulative effects include the effects from the Project in addition to the effects by past, present, and RFDs. Future developments that did not have footprints available at the time of analysis and reporting (Section 9; Table 9.9-1; Table 6.4-28) are expected to contribute to decreases in the availability of upland habitats. The RFDs that were quantified (Section 6.4.10.1) are summarized for the Project footprint below. Below is a summary of potential cumulative effects to upland ecosystem availability in the RSA (Table 6.4-29):

- Upland ecosystem loss of an additional 279 ha related to RFDs, or 3,722 ha (1.0% change of baseline characterization) to the Project footprint and RFDs in the RSA.
- Loss of an additional 242 ha related to RFDs, or 3,319ha (0.3% change of baseline characterization) to forested areas in the RSA.
- Field and barren types represent the smallest percentage of landcover within the RSA. There is expected to be a 4 ha loss (<0.0% of field loss in the baseline characterization) of field habitat type and a 25 ha loss (<0.0% of barren loss in the RSA) to the barren habitat type.
- Largest predicted loss by percent change in the RSA – Meadow – depletion with a 10.9% change from baseline characterization and an absolute predicted loss of 295 ha.

Table 6.4-29: Upland Ecosites in the Cumulative Effects Assessment of the Regional Study Area

Upland Ecosites: General Habitat Type	RSA Baseline Characterization (ha)	RSA Cumulative Effects (ha)	RSA Change in Area (ha)	RSA Percent Change (%)
Coniferous Forest	184,137	182,275	1,862	1.0%
Deciduous Forest	156,668	155,271	1,397	0.9%
Mixed Forest	6,460	6,401	59	0.9%
Shrub	1,968	1,943	26	1.3%
Field	1,869	1,865	4	0.2%
Meadow	2,736	2,438	298	10.9%
Barren	1,516	1,439	77	5.1%
Upland Total	**355,355**	**351,631**	**3,723**	1.0%

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

RSA = Regional Study Area; ha = hectare; % = percent.

Forest Management Plans and Other Factors of Change to Upland Ecosystems

It is the responsibility of the MNRF to manage forests in a sustainable manner and provide healthy forests for future generations (MNR 2012). Forest health and values are managed through the use of forest guides. Pest control and forest fire management are other tools used to maintain healthy forests (MNR 2012). The annual average harvest from 2004 to 2008 in Ontario boreal forests was 180,447 ha (MNR 2012). It is noted that these years provide an example of a reduced harvest relative to previous years (MNR 2012). Reductions in forest harvesting and the suppression of fire and insects could lead to a shift to older forests over time in the RSAs. While this shift provides habitat for species that rely on older forests, it may reduce the amount of available habitat for species that rely on younger forests. The average annual area regenerated across Ontario forests from 2004 to 2008 was 202,947 ha (approximately 13% higher than the average annual harvest) showing that renewal efforts were greater than harvesting.

Each of the FMUs across the RSA has an FMP that describes future plans and expected forest structure and age. These FMPs are summarized as follows:

- Boundary Waters FMP – The 2020-2030 management plan projects levels of conifer forests of all ages to increase over time. Old growth upland spruce forest area is projected to increase likely due to the increase in purer spruce forest units over time from natural succession (MNRF 2022). Total harvest volume is expected to remain stable over the planning term, with spruce-pine-fir (SPF) harvest gradually increasing over time, popular (PO) harvest volumes are projected to decrease from year one to two then gradually increase and paper birch (white birch) (BW) harvest volumes are projected to gradually decrease from year one levels then remain stable (MNRF 2022). An additional 197.3 km of new or reconstructed primary roads and 590.2 km of branch roads are planned to be constructed during the period of the FMP (2020-2030) (MNRF 2023).
- Dog River-Matawin FMP – The 2021-2031 management plan indicates that the largest amount of forest to be harvested, and the largest projected change in crown productive forest area, is the forest unit hardwood dominant (HRDOM), at 23,550 ha, or 100% of the available harvest area, which has the average composition of 45% popular, 23% paper birch, and 23% conifer species, which is dominantly black spruce (MNRF 2023). The target for the forest classes mature and late balsam fir mixed (MLB) and mature and late lowland spruce and low other conifer (MLI) is to decrease the current area and maintain over the long term (MNRF 2023). All old growth forest units are targeted to increase and maintain within the IQR (interquartile range) over the long term (MNRF 2023). All ages of upland conifer forest have the target of increasing, with all ages of red and white pine forest units targeted to increase the Crown productive forest to the desirable pre-industrial condition estimate (MNRF 2023). An additional 8.6 km of new or reconstructed primary roads and 112.7 km of branch roads are planned to be constructed during the period of the FMP (MNRF 2023).

- Dryden FMP – The 2021-2031 management plan outlines a planned harvest area of 14,566 ha to be clearcut. By area, the largest forestry classes to be harvested are Jack pine and Jack pine dominant conifer Mix (MNRF 2022a). Long-term management plans are focused on increasing the amount of red pine and white pine forest and upland pine and spruce forest. An objective of the FMP is to de-fragment the forest over time by generating large patches of even-aged young forest, to later age into mature and old large landscape patches. Abundant reserves of gold, silver and zinc remain available in the forest unit, in addition to reserves of peat and granite. Over 2,000 active mining claims are recorded for the Dryden Forest unit. An additional 92 km of primary and branch roads are planned to be constructed from 2021-2041 (MNRF 2022a).

- English River FMP – The 2019-2029 management plan indicates that the largest amount of forest to be harvested, and the largest projected change in crown productive forest area, is the HRDOM forest unit at 18,283 ha, or 99.9% of the available harvest area, of which the species that are planned to be harvested are 34% popular, 28% paper birch and 37% conifer species that are dominantly black spruce, at 17% of the planned harvest for the HRDOM forestry unit (MNRF 2022b). Long term management objectives aim to increase the red pine and white pine forests from 3,691 ha at the start of the plan to 7,945 ha at the end of the planning horizon (term 15) by preventing succession to other forest units, as it was discovered that some sites succeed out to other forest units without regular harvest. Upland conifer spruce and pine dominated forest, mature and late balsam fir, and mature and late conifer forest units also have the target of increasing. An additional 192.6 km of new or reconstructed primary roads and 258.2 km of branch roads are planned to be constructed during the period of this FMP (2019-2029) (MNRF 2022b).

- Lakehead FMP – The 2020-2030 management plan projects the balsam fir mixed (BfMix) forest unit to increase over the long term 100-year planning cycle due to natural succession causing the BfMix amount to increase in unmanaged Crown forest area (i.e., parks and conservation areas) (MNRF 2022c). The paper birch (white birch) dominant (BwDom) forest unit decreases in area over time, which is consistent with the objective to move towards the historical forest composition. Conifer mixed (ConMx) forest unit area decreases by approximately 20,500 hectares, while the hardwood mixedwood (HrdMx) forest unit area decreases by 26,000 hectares over the 100-year planning cycle. Hardwood dominant (HrDom) forest unit area decreases significantly over the 100-year planning cycle, which is consistent with the FMP objective to reduce the amount of mature and late hardwood and hardwood mix landscape class (MNRF 2022c). Jack pine dominant (PjDom) forest unit area is projected to increase by approximately 26,000 hectares by 2100, which is consistent with the objective to increase mature and late upland conifer and conifer mixed. Popular dominant (PoDom) is projected to increase in unit area over the 100-year planning cycle, as well as Red and White Pine Mixed (PrwMx) that is projected to increase by approximately 13,500 ha. Consistent with the objective of increasing the amount of pure conifer forest type and moving towards the historical forest condition, over the 100-year planning cycle black spruce dominant (SbDom) forest unit area increases by approximately 12,000 hectares (MNRF 2022c). An additional 66 km of primary roads and 43 km of branch roads are planned to be constructed during the period of this FMP (MNRF 2022c).

- Wabigoon FMP – Over the 10-year planning period (2019-2029), most of the planned harvest is in the CONMX forest unit (18,637 ha) followed by hardwood mixedwood (HRDMW) (9,067 ha), Jack pine deep (PJDEE) (7,249 ha), and Jack pine mixedwood (PJMX1) (6,976 ha) (MNRF 2022). Red pine and white pine forest unit areas have the objective of increasing to the pre-industrial condition estimate. Upland Pine and Spruce Forest unit areas are also desired to increase (MNRF 2022). Many additional primary and branch roads are planned to be constructed during the period of this FMP to access current available harvests, and for future potential access (MNRF 2022c).

Significant Wildlife Habitat

Table 6.4-8 identifies eight SWH comprised of rare vegetation communities and specialized habitat for wildlife within the RSA, seven of which occur within the upland ecosystem (i.e., Diverse and Sensitive Orchid Communities, Cliff and Rim, Rare Tree: Elm, Rare Tree: Red and Sugar Maple, Rare Tree: Red and White Pine, Rock Barren and Milkweed Patch). Potential cumulative effects include the effects by the Project in addition to the effects by past, present and RFDs. Future developments that did not have footprints available at the time of analysis and reporting (Section 9; Table 9.9-1; Table 6.4-30) are expected to contribute to decreases in the quantity of SWH habitat. RFDs that were quantified are summarized in Section 6.4.10.1 and the potential cumulative effects to SWH in the RSA are presented in Table 6.4-30:

- Loss of 1,137 ha (0.7% change of baseline characterization) to SWH habitat in the RSA.
- Largest predicted loss by percent change is Rare Tree: Red and White Pine with a 1.1% change from baseline characterization and an absolute loss of 201 ha in the RSA.
- The RFDs are not expected to disturb the two least common rare vegetation communities, which are cliff and rim and rock barren in the RSA.
- RFD-related changes to SWH quantity attributed to the digitized RFDs (i.e., the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine) occurred at four of the eight SWH communities (two rare vegetation communities and two specialized habitats for wildlife) found in the RSA. No RFD-related changes were predicted to four of the six rare vegetation communities found in the RSA.

Table 6.4-30: Significant Wildlife Habitat in the Cumulative Effects Assessment of the Regional Study Area

SWH Community	SWH Type	RSA Baseline Characterization (ha)	RSA Cumulative Effects (ha)	RSA Change in Area (ha)	RSA Percent Change (%)
Rare Vegetation Community	Cliff and Rim	49	48	-	1.03%
Rare Vegetation Community	Diverse and Sensitive Orchid Communities	65,756	65,336	-420	0.64%
Rare Vegetation Community	Rare Tree: Elm	253	249	-4	1.49%
Rare Vegetation Community	Rare Tree: Red and Sugar Maple	1,072	1,064	-8	0.75%
Rare Vegetation Community	Rare Tree: Red and White Pine	18,538	18,337	-201	1.08%
Rare Vegetation Community	Rock Barren	32	32	-	0.00%
Specialized Habitat for Wildlife	Wild Rice	8,433	8,412	-21	0.25%
Specialized Habitat for Wildlife	Milkweed Patch	79,218	78,753	-465	0.59%
Total	**Total**	**175,322**	**174,184**	**1,137**	0.65%

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

RSA = Regional Study Area; SWH = Significant Wildlife Habitat, ha = hectare; % = percent.

Climate change

Changes in upland ecosystems due to climate change are qualitatively discussed in this assessment and summarized for all boreal ecosystems in Section 6.4.10.2. Based on warming trends, the annual mean temperature in Ontario is predicted to increase by 5 to 6 C by the end of the 21st century (McKenney et al. 2010). More conservative estimates predict that the temperature will rise 3.6 °C, which take into account actions to reduce greenhouse gas emissions. The combination of environmental stress (e.g., higher temperatures, changes in water availability, increases in atmospheric CO_2 concentration) and environmental disturbances (e.g., extended drier growing season, more intense convective storms, increase in the occurrence of fire, wind damage and/or flooding, ice storms, spring frosts) are expected to reduce the amount of area covered by boreal forests (Price et al. 2013, Thompson et al. 1998, Varrin et al. 2007). Depending on the rate of climate change, there may be increased forest mortality for species that are unable to adapt to changes fast enough (Thompson et al. 1998). Species that are adapted to regenerate following fire such as pine and aspen are predicted to increase in the landscape leading to a homogenization of species on the landscape (Thompson et al. 1998, Iverson and Prasad 2001, Varrin et al. 2007). Warming is expected to be greater in the winter versus the summer with more increases in the north versus the south of the province (Colombo et al. 2007).

Ecosystem Distribution

The distribution of upland ecosystems in the RSA is best described by the distribution in the baseline characterization considering ongoing anthropogenic and natural changes. Changes in the distribution of upland ecosystems due to climate change were not quantified here; however, climate change effects on boreal ecosystems are discussed in Section 6.4.10.2. Connectivity among upland ecosystems is expected to be maintained despite increased fragmentation.

Most notable changes to upland habitat distribution are predicted to occur within the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine where the cumulative effects of mining would increase fragmentation of existing upland habitat in the RSA.

Ecosystem Composition

Upland ecosystems in close proximity to new developments may be affected by removal of wildlife trees (i.e., a standing dead or dying tree or a live veteran tree that is important for wildlife because it provides areas for nests, nurseries, storage, foraging, roosting and perching) and other edge effects (e.g., sensory disturbance, ingress of generalist or invasive species, alteration in moisture and sunlight regimes) that change conditions. Natural upland ecosystem edges are prone to ingress by generalist wildlife species (i.e., species that will use a variety of habitats) that may displace specialists. Natural areas with undisturbed soils that occur away from disturbances are resistant to invasion by non native plant species. Mitigation measures under Section 6.4.7 provide strategies related to vegetation removal and restoration during construction, vegetation maintenance during operation and consideration for invasive species management. However, it is noted that the potential absence of existing vegetation management practices for current operations within the RSA maintains risk of spreading existing invasive species. For example, forestry roads and logging equipment could facilitate the spread of invasive species, particularly on private timberlands where new access roads would be required.

Warmer temperatures could create conditions that may be inhospitable to some species while favoring others, thereby affecting community composition (Huff and Thomas 2014, Varrin et al. 2007). Boreal tree species (e.g., black spruce, Jack pine, white spruce, balsam fir and trembling aspen) are predicted to migrate northwards; however, because trees are long-lived species with slow migration rates, some trees are likely to become less adapted to climate conditions making them susceptible to mortality (Canadian Council of Forest Ministers 2010).

6.4.10.3.1 Characterization of Cumulative Effects Assessment

A summary of the characterization of cumulative effects from the Project footprint, in addition to past, present and RFDs on upland ecosystems in the Cumulative Effects Assessment are provided for each indicator in Table 6.4-31.

All mitigation measures to avoid and minimize effects from the Project footprint in the Net Effects Assessment apply to the Cumulative Effects Assessment. It is expected that RFDs will be required to implement similar mitigation measures that will limit cumulative effects on upland ecosystems.

Effects from RFDs to ecosystem availability and distribution are likely less than certain (i.e., probable or possible) due to the uncertainty in the construction and operation of these projects. However, to avoid underestimating the potential significance of effects, changes in ecosystem availability and distribution from RFDs were classified as certain (i.e., precautionary approach). Similarly, for the purpose of this assessment, the predicted loss of upland habitat due to the RFDs is permanent as reclamation plans are not available for these projects, and medium term for temporary Project components that are expected to be reclaimed. The effects from climate change are uncertain but would influence the magnitude of development-related changes in upland ecosystems and the geographic extent of effects would occur beyond the RSA.

Table 6.4-31: Description of Net Effects in the Cumulative Effects Assessment for Upland Ecosystems Indicators

Indicators	Cumulative Effect	Direction	Magnitude	Geographic Extent	Duration / Reversibility	Frequency	Likelihood of Occurrence	Significance
Upland Ecosystems	• Ecosystem Availability	Negative	• Upland ecosystem availability would be reduced by 3,723 ha (1.0% change) in the RSA relative to the baseline characterization. Loss of 77 ha (5.1% change of upland baseline characterization) to the general habitat type Barren and loss of 4 ha (0.2% change of baseline characterization) to the uncommon general habitat type Field in the RSA. Magnitude will depend on influences from climate change.	Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Upland Ecosystems	• Ecosystem Distribution	Negative	• The distribution of upland ecosystems in the RSA in terms of cumulative effects would be similar to the distribution in the baseline characterization. There would be some loss and fragmentation of upland ecosystems throughout the RSA. Magnitude will depend on influences from climate change.	Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Upland Ecosystems	• Ecosystem Composition	Negative	• Edge effects and potential introduction of invasive species may alter upland species abundance and richness. Magnitude will depend on influences from climate change.	Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Possible	Not significant

ha = hectare; RSA = Regional Study Area; % = percent.

6.4.10.3.2 Assessment of Significance

The goal of many FMPs is to achieve a forest age and composition structure similar to historical conditions prior to human development and fire suppression. The manual suppression of fire and presence of insects could lead to a shift in older forests over time. While this shift provides habitat for species that rely on older forests, it may reduce the amount of available habitat for species that rely on younger forests. Future forest harvesting would also change the availability, distribution and composition of upland ecosystems in the RSA. Historically, the forest composition had purer conifer stands and was younger in age. Targets for selectively leaving some wildlife trees in harvested areas and slating areas for old growth deferrals are part of some FMP goals. Meeting these targets is expected to support the maintenance of self sustaining and ecologically effective upland ecosystems within and beyond the RSA.

Climate change may alter the processes that influence the abundance and distribution of upland ecosystems, and effects would likely occur beyond the RSA. Based on warming trends, the annual mean temperature in Ontario is predicted to increase by 5 to 6 C by the end of the 21st century (McKenney et al. 2010). Boreal tree species (e.g., black spruce, Jack pine, white spruce, balsam fir and trembling aspen) are predicted to migrate northwards; however, because trees are long-lived species with slow migration rates, some trees are likely to become less adapted to climate conditions making them susceptible to mortality (Canadian Council of Forest Ministers 2010). It is anticipated that climate change will ultimately have a negative effect on the available ecosystem with respect to how it exists today.

The Project and other RFDs would contribute to negative changes in upland ecosystem availability, distribution and condition; however, these changes are predicted to be within the resilience limits and adaptive capacity of existing upland ecosystems. Relative to the baseline characterization, most upland ecosystems remain abundant, intact, and well distributed across the RSA in the Cumulative Effects Assessment. The contribution of the Project footprint, and RFDs to cumulative effects on upland ecosystems in the RSA is not expected to change the self sustaining and ecologically effective status of this criterion. Consequently, cumulative effects on upland ecosystems are predicted to be not significant.

6.4.10.4 Wetland Ecosystems

Ecosystem Availability

Cumulative effects include the effects from the Project in addition to the effects by past, present and RFDs. The RFDs that did not have footprints available at the time of analysis and reporting (Section 9; Table 9.9-1; Table 6.4-32) are expected to contribute to decreases in the availability of wetland habitats. RFDs that were quantified are summarized (Section 6.4.10.1) for the Project footprint below. Below is a summary of cumulative effects to wetland ecosystem availability in the RSA (Table 6.4-32):

- Loss of 435 ha (0.6% change of baseline characterization) to wetland ecosystems in the RSA.

- Largest predicted loss by percent change and absolute value (ha) is Swamp general habitat type with a 0.6% change from baseline characterization and an absolute loss of 435 ha in the RSA.
- The RFDs are not expected to disturb the least common general habitat type bog in the RSA.

Table 6.4-32: Wetland Ecosites in the Cumulative Effects Assessment of the Regional Study Area

Wetland Ecosites: General Habitat Type	RSA Baseline Characterization (ha)	RSA Cumulative Effects (ha)	RSA Change in Area (ha)	RSA Percent Change (%)
Bog	606	603	3	0.5%
Fen	16096	16054	42	0.3%
Marsh	10399	10367	32	0.3%
Swamp	51910	51552	358	0.7%
Wetland Total	79011	78576	435	0.6%

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

RSA = Regional Study Area; ha = hectare; % = percent.

Forest Management Plans and Other Factors of Change to Wetland Ecosystems

Future forestry activities would change the availability, distribution and composition of wetland ecosystems in the RSA. The goal for FMPs is to reach target levels for forest diversity and composition, wildlife habitat for provincially significant species, and locally featured species and species at risk. Overall, the FMPs seek to achieve a level of forestry operation and harvest that meets market demand while incorporating sustainable forest practices and environmental values to meet a desired forest composition. Meeting these targets is expected to support the maintenance of self sustaining and ecologically effective wetland ecosystems within and beyond the RSA.

- Boundary Waters FMP – The 2020-2030 management plan outlines that potential impacts on wetlands not protected through Conservation Reserve or Park status will be avoided through implementation of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (2010), including practices such as winter harvesting, proper road and water crossing construction techniques to minimize site damage and the disruption of water flows in these areas (MNRF 2022a).
- Dog River-Matawin FMP – The 2021-2031 management plan prohibits harvest, renewal, or tending operations in woodland pools that would result in deposition of sediment or a reduction of the water holding capacity (MNRF 2023). When roads must cross wetlands, frequent cross drainage culverts must be provided so that surface water is equalized, and recognizable ephemeral streams, springs, seeps and other areas of groundwater discharge connected to lakes, ponds, rivers or streams and small unmapped wetlands should be avoided when road location and landings within the approved corridor are being finalized (MNRF 2023).
- Dryden FMP – The 2021-2031 management plan indicates the total area of Black Spruce Lowland Forest unit (SBLOW) is projected to have no change (MNRF 2022b). No contamination of wetlands or woodland pools is permitted, specifically affecting the use of and storage of fuels, as well as no equipment maintenance within 15 m of non-forested wetlands or high-water mark of pools (MNRF 2022b).
- English River FMP – The 2019-2029 management plan projects levels of lowland conifer old growth to increase at the start through the medium term, and then remain stable. Black spruce lowland forests are projected to see minimal increase over the planning horizon (MNRF 2022c).
- Lakehead FMP – The 2020-2030 management plan indicates no harvest, renewal or tending operations are permitted that will result in significant damage to wetland vegetation or disruption of hydrological function. Over the 100-year planning cycle, Other Conifer Lowland (OCLow) forest unit area decreases slightly, while Black Spruce Lowland (SbLow) forest unit area increases marginally (MNRF 2022d).

- Wabigoon FMP – The 2019-2029 management plan indicates that 17 hectares of OCLow and 4,548 ha of Black Spruce Lowland (SBLOW) are available to be harvested, of which 17 ha and 4,538 ha, respectively, are planned to be harvested (MNRF 2022e).

Climate Change

Changes in wetland ecosystems due to climate change are qualitatively discussed in this assessment and summarized for all boreal ecosystems in Section 6.4.10.2. Wetland ecosystem availability may be negatively affected by climate change in the Cumulative Effects Assessment. Wetlands are considered to be one of the ecosystems most sensitive to predicted climate changes because they are at the interface between terrestrial and aquatic ecosystems (ECCC 2017). Increases in evapotranspiration and decreases in surface water flow could cause wetlands to reduce in size and in extreme cases to convert to a drier habitat in upland ecosystems (Dove-Thompson et al. 2011, Mortsch 1998, Lemmon and Warre 2004). The diversity of plants and animals in wetlands is linked to water level fluctuations and, therefore, predicted decreases in water levels may lead to concerns for species diversity (Dove-Thompson et al. 2011, Mortsch et al. 2003). The reliance on precipitation to maintain function in bogs makes them especially vulnerable to climate change, and a decline in precipitation could lead to drying of peatlands and altered distribution and abundance of bog vegetation (Dove-Thompson et al. 2011). Consequently, in the Cumulative Effects Assessment, wetland ecosystem availability could be further reduced in the LSA, RSA and beyond the RSA due to climate change, although the extent of wetland reduction is not known.

Ecosystem Distribution

The distribution of wetland ecosystems in the RSA is best described by the distribution in the baseline characterization with ongoing anthropogenic and natural changes. The predicted loss of wetland ecosystems in the RSA that would result in localized changes in wetland distribution from RFDs are effects that are assumed to be permanent as reclamation plans are not available for RFDs. The distribution of wetland ecosystems may be further affected because of changes to hydrology and drainage patterns associated with future mining activities, and potential hydrologic changes brought on by climate change. The extent to which wetland ecosystem distribution would be affected by these factors could not be quantified. Climate change effects on ecosystems found in the RSA are discussed in Section 6.4.10.2.

Most notable changes to wetland habitat distribution are predicted to occur within the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine where the cumulative effects of mining would increase fragmentation of existing wetland habitat in the RSA.

Ecosystem Composition

New development may lead to a greater exposure of wetland edges to disturbance and could result in increased potential for invasion by noxious weed species and invasive species. Effects of climate change on invasive species abundance may also contribute to changes in wetlands (MNR 2012; ECCC 2017). For example, temperature increase may allow invasive species such as purple loosestrife *(Lythrum salicaria*) to expand their northern range in the province (ECCC

2017). Invasive plants can affect wetland species diversity through direct competition with native plants; therefore, it is expected that with implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor. Most wetlands in the RSA have retained buffers of natural vegetation and therefore, despite their proximity to disturbance, should be largely intact. However, invasive species may become more prevalent near other developments in the RSA (e.g., forestry roads, new access roads on private timberlands), which may not be managed to the same degree as the Project.

Warmer temperatures could create conditions that may be inhospitable to some species while favoring others, thereby affecting community composition (Huff and Thomas 2014, Varrin et al. 2007). In particular, climate change is expected to result in an increase in temperature and evapotranspiration, and reduction of moisture and water availability. While considering a transition to drier habitat conditions, species reliant on higher soil moisture content are expected to be impacted first. Species with a coefficient of wetness level between -2 and -5, or species with lower tolerance to dry conditions, were documented throughout the RSA. Species such as tamarack, velvet-leaved blueberry (*Vaccinium myrtilloides*) and Labrador tea may be among the first species to be impacted.

The reduction in wetland ecosystem condition in the Cumulative Effects Assessment relative to the baseline characterization is not predicted to greatly alter the ecological function of wetlands on the landscape because most wetlands would remain intact. For both the Project footprint and RFDs, over 99% of wetlands present in the baseline characterization are predicted to remain unchanged in the RSA.

6.4.10.4.1 Characterization of Cumulative Effects Assessment

A summary of the characterization of cumulative effects from the Project footprint, in addition to past, present and RFDs on wetland ecosystems are provided for each indicator in Table 6.4-33.

All mitigation measures to avoid and minimize effects from the Project footprint in the Net Effects Assessment apply to the Cumulative Effects Assessment. It is expected that RFDs will be required to implement similar mitigation measures that will limit cumulative effects on wetland ecosystems.

Effects from RFDs to ecosystem availability and distribution are likely less than certain (i.e., probable or possible) due to the uncertainty in the construction and operation of these projects. However, to avoid underestimating the potential significance of effects, changes in ecosystem availability and distribution from RFDs were classified as certain (i.e., precautionary approach). Similarly, for the purpose of this assessment, the predicted loss of wetland habitat due to the RFDs is permanent as reclamation plans are not available for these projects, and medium term for temporary Project components that are expected to be reclaimed. The effects from climate change are uncertain but would influence the magnitude of development-related changes in wetland ecosystems and the geographic extent of effects would occur beyond the RSA.

Table 6.4-33: Description of Cumulative Effects Assessment for Wetland Ecosystems

Indicators	Cumulative Effect	Direction	Magnitude	Geographic Extent	Duration / Reversibility	Frequency	Likelihood of Occurrence	Significance
Wetland Ecosystem	• Ecosystem Availability	Negative	• Availability of wetlands is predicted to decrease by 435 ha (0.6% change) in the RSA relative to the wetland baseline characterization. No loss to the least common and available general habitat type Bog in the RSA. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Wetland Ecosystem	• Ecosystem Distribution	Negative	• The distribution of wetland ecosystems in the RSA in the cumulative effects would be similar to the distribution in the baseline characterization. There would some predicted loss and fragmentation of wetland ecosystems throughout the RSA. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Wetland Ecosystem	• Ecosystem Composition	Negative	• Small changes in water quality and flow and potential introduction of invasive species may alter wetland species abundance and richness. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Possible	Not significant

RSA = Regional Study Area; ha = hectares; % = percentage.

6.4.10.4.2 Assessment of Significance

Changes in surface water and groundwater quantity and quality from RFDs, particularly mining developments, may alter the availability, distribution and condition of wetlands. However, it is expected that such projects would be constructed and operated under provincial and federal regulations to meet water quality standards, and water license permits. Future forestry activities would also change the availability, distribution and composition of wetland ecosystems in the RSA. However, the goal for FMPs is to reach target levels for forest diversity and composition, and wildlife habitat for provincially significant species, and locally featured species and species at risk. Overall, the FMPs seek to achieve a level of forestry operation and harvest that meets market demand while incorporating sustainable forest practices and environmental values to meet a desired forest composition. Meeting these targets is expected to support the maintenance of self sustaining and ecologically effective wetland ecosystems within and beyond the RSA. Disturbance adjacent to wetlands also has potential to alter species composition. Invasive plants can affect wetland species diversity through direct competition with native plants. With the implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor. Similar mitigation measures would be expected from RFDs to avoid and minimize cumulative effects to wetlands.

Wetlands are considered to be one of the ecosystems most sensitive to climate change (ECCC 2017). Increases in evapotranspiration and decreases in surface water flow could cause wetlands to convert to drier habitat conditions, which in turn would affect the diversity of plants and animals in wetlands reliant on water level fluctuations (Dove-Thompson et al. 2011, Mortsch 1998, Mortsch et al. 2003). Therefore, predicted decreases in water levels may lead to concerns for species diversity. Consequently, in the Cumulative Effects Assessment, wetland ecosystem availability could be further reduced beyond the RSA due to climate change, although the magnitude and spatial extent of wetland reduction is not known.

In the Cumulative Effects Assessment, wetland ecosystem availability would be reduced by 0.5% in the RSA relative to the baseline characterization. The most notable change from RFDs in wetland habitat distribution is predicted to occur from the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine, where the effects of mining would increase fragmentation of the existing wetland habitat. Wetlands that are less common on the landscape (i.e., Bogs) are also expected to remain well connected, with no predicted loss within the RSA. The RFDs that could not be quantified (e.g., gold mines and transportation projects) also have the potential to interact and reduce the availability and distribution of wetlands in the RSA, but these projects would also be expected to mitigate effects to wetland ecosystems.

Overall, changes to ecosystem availability, distribution and composition from the Project and RFDs are predicted to be within the resilience limits and adaptive capacity of wetland ecosystems. The reduction in wetland ecosystem condition in the Cumulative Effects Assessment relative to the baseline characterization is not predicted to greatly alter the ecological function of wetlands on the landscape because most (>99%) wetlands would remain intact and well distributed across the RSA. Despite changes in wetland condition during the baseline characterization, existing wetlands remain well connected to support a diversity of plant and wildlife species in the region. The contribution of the Project footprint and RFDs to cumulative effects on wetland ecosystem availability, distribution and condition in the RSA indicates that this ecosystem would continue to be self sustaining and ecologically effective for this criterion. Consequently, cumulative effects on wetland ecosystems are predicted to be not significant.

6.4.10.5 Riparian Ecosystems

Ecosystem Availability

Cumulative effects included in this assessment are the combined effect from the Project in addition to the effects by past, present and RFDs. Future developments that did not have footprints available at the time of analysis and reporting (Section 9; Table 9.9-1; Table 6.4-34) are expected to contribute to decreases in the availability of riparian habitats. The RFDs that were quantified (Section 6.4.10.1) are summarized below. Similar to upland and wetland ecosystems, riparian habitats may be positively or negatively influenced by alterations in water flows and levels through the effects of climate change. Below is a summary of cumulative effects to riparian ecosystem availability in the RSA (Table 6.4-34:

- Riparian ecosystem loss of 144 ha (0.4% change of baseline characterization) to the Project footprint and RFDs in the RSA.
- 99.6% in the RSA of naturally vegetated areas are predicted to remain intact adjacent to watercourses and waterbodies in the Cumulative Effects Assessment.

Ecosystem Distribution

The distribution of riparian ecosystems in the RSA is best described by the distribution in the baseline characterization with ongoing anthropogenic and natural changes. The fragmentation of riparian ecosystems in the RSA associated with individual RFDs (including projects that were not quantified) would result in localized changes in riparian distribution and these effects are assumed to be permanent. The distribution of riparian ecosystems may be further affected by changes to hydrology and drainage patterns associated with future mining activities, and potential hydrologic changes brought on by climate change (Section 6.4.10.2). The extent to which riparian ecosystem distribution would be affected by these factors could not be quantified. Overall, riparian habitat is predicted to remain well connected in the Cumulative Effects Assessment. Therefore, changes in distribution due to RFDs are predicted to have no to little effect on the ecological function of riparian ecosystems in the RSA.

Most notable changes to riparian habitat distribution are predicted to occur within the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine where the cumulative effects of mining would increase fragmentation of existing riparian habitat in the RSA.

Table 6.4-34: Riparian Ecosites in the Cumulative Effects Assessment of the Regional Study Area

Riparian Habitat / Ecosite Grouping	General Habitat Type	RSA Baseline Characterization (ha)	RSA Cumulative Effects (ha)	RSA Change in Area (ha)	RSA Percent Change (%)
Upland Ecosites	Coniferous Forest	15,072	15,019	53	0.3%
Upland Ecosites	Deciduous Forest	7,809	7,782	27	0.3%
Upland Ecosites	Mixed Forest	549	547	2	0.3%
Upland Ecosites	Shrub	172	171	1	0.4%
Upland Ecosites	Field	58	58	0	0.3%
Upland Ecosites	Meadow	136	125	11	8.2%
Upland Ecosites	Barren	77	76	1	1.8%
Upland Ecosites	**Upland Total**	**23,873**	**23,779**	**94**	0.4%
Wetland Ecosites	Bog		0	0	
Wetland Ecosites	Fen	19	10	9	49.7%
Wetland Ecosites	Marsh	3,295	3,280	15	0.5%
Wetland Ecosites	Swamp	5,339	5,313	26	0.5%
Wetland Ecosites	**Wetland Total**	**8,653**	**8,603**	**50**	0.6%
Upland and Wetland Ecosites	**Total**	**32,526**	**32,382**	**144**	0.4%

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

RSA = Regional Study Area; ha = hectare; % = percent.

Ecosystem Composition

Riparian habitat near anthropogenic disturbance can be degraded relative to habitats that are farther away from disturbance because they are at greater risk of invasive species, changes in microclimate, windthrow and avoidance by wildlife. Effects of climate change on the abundance of invasive species may also contribute to changes in riparian habitats. Invasive plants can affect riparian species diversity through direct competition with native plants; therefore, it is expected that with implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor. Most riparian habitat in the RSA has retained buffers of natural vegetation and therefore, despite their proximity to disturbance, they should be largely intact.

Drainage patterns and flow rates of tributaries may change due to mining activities; changes in river flows may alter the condition of associated riparian habitat. Mining projects in the RSA may also contribute to reduction in water quality; however, it is expected that these projects would be constructed and operated under provincial and federal regulations to meet water quality standards and water license permits.

Trees contribute to wooded structure used by wildlife (e.g., nesting and foraging) and to shading that helps maintain fish habitat (Environment Canada 2013). Continued forestry in the RSA may cause some temporary loss of these functions. However, rooted vegetation such as shrubs would still be present, which would contribute to sediment filtering. It is the responsibility of the MNRF to manage forests in a sustainable manner and provide healthy forests for future generations (MNR 2012).

The reduction in riparian habitat condition in the Cumulative Effects Assessment relative to the baseline characterization is predicted to not greatly alter ecological function on the landscape because most riparian habitat would remain intact, including habitat within 100 m of disturbance due to environmental setbacks and best management practices. Where riparian habitat buffers are removed during forestry, partial function (i.e., sediment filtering) would be maintained. The negative effects are temporary and riparian habitat is predicted to recover.

6.4.10.5.1 Characterization of Cumulative Effects Assessment

A summary of the characterization of cumulative effects from the Project footprint, in addition to past, present and RFDs on riparian ecosystems in the Cumulative Effects Assessment are provided for each indicator in Table 6.4-35.

All mitigation measures to avoid and minimize effects from the Project footprint in the Net Effects Assessment apply to the Cumulative Effects Assessment. It is expected that RFDs will be required to implement similar mitigation measures that will limit cumulative effects on riparian ecosystems.

Effects from RFDs to ecosystem availability and distribution are likely less than certain (i.e., probable or possible) due to the uncertainty in the construction and operation of these projects. However, to avoid underestimating the potential significance of effects, changes in ecosystem availability and distribution from RFDs were classified as certain (i.e., precautionary approach). Similarly, for the purpose of this assessment, the predicted loss of riparian habitat due to the RFDs is permanent as reclamation plans are not available for these projects, and medium term for temporary Project footprint components that are expected to be reclaimed. The effects from climate change are uncertain but would influence the magnitude of development-related changes in riparian ecosystems and the geographic extent of effects would occur beyond the RSA.

Table 6.4-35: Description of Cumulative Effects Assessment for Riparian Ecosystems

Indicators	Cumulative Effect	Direction	Magnitude	Geographic Extent	Duration / Reversibility	Frequency	Likelihood of Occurrence	Significance
Riparian Ecosystems	• Ecosystem Availability	Negative	• Availability of riparian habitat is predicted to decrease by 144 ha (0.4% change) in the RSA relative to the baseline characterization. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Riparian Ecosystems	• Ecosystem Distribution	Negative	• There would some loss and fragmentation of riparian habitat throughout RSA relative to the baseline characterization, but riparian ecosystems remain well connected. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Riparian Ecosystems	• Ecosystem Composition	Negative	• Small changes in water quality and flow and potential introduction of invasive species may alter riparian species abundance and richness. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Possible	Not significant

ha = hectare, RSA = Regional Study Area; % = percent.

6.4.10.5.2 Assessment of Significance

The cumulative effects showed a reduction in riparian habitat availability in the RSA and it could be further reduced by the spread of noxious and invasive species. However, with the implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor. Similar mitigation measures would be expected from RFDs to avoid and minimize cumulative effects to riparian habitats. Drainage patterns and flow rates of tributaries may also change due to RFDs (including non-quantifiable projects), particularly from mining activities, which can alter the composition of riparian ecosystems. It is expected that these projects would be constructed and operated under provincial and federal regulations to meet water quality standards, and water license permits, which would minimize cumulative net effects to riparian habitats.

Increases in evapotranspiration and decreases in surface water flow from climate change could cause decreases in the amount of available riparian habitat. For example, water inflow into lakes may be decreased as a result of reduced run-off due to increased temperature, decreased precipitation and an increase in evaporation (Dove-Thompson et al. 2011). Therefore, effects from climate change to riparian areas are uncertain, but would likely have effects beyond the RSA.

The cumulative effects assessment showed a reduction of riparian habitat availability by 0.5% in the RSA relative to the baseline characterization. The most notable change from RFDs in riparian habitat distribution is predicted to occur from the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine, where the effects of mining would increase fragmentation of the existing riparian habitat. Connectivity and condition of riparian habitat would likewise decline due to the combined effects of the Project and RFDs. The RFDs that could not be quantified (e.g., gold mines and transportation projects) also have the potential to interact and reduce the availability and distribution of riparian habitats in the RSA, but these projects would also be expected to mitigate effects to ecosystems.

Overall, cumulative changes in riparian habitat indicators from development are not predicted to exceed the limits of resilience and adaptability of riparian habitats in the RSA. The Cumulative Effects Assessment indicates >99% of habitat adjacent to watercourses and waterbodies in the RSA will remain naturally vegetated, which is above the resource management criterion of 75% naturally vegetated stream length recommended by Environment Canada (2013) to prevent degradation of these ecosystems. This indicates riparian habitats will remain abundant, intact and well distributed across the RSA. The contribution of the Project footprint and RFDs to cumulative effects on riparian ecosystem availability, distribution and condition in the RSA indicates that this ecosystem would continue to be self sustaining and ecologically effective for this criterion. Consequently, cumulative effects on riparian ecosystems are predicted to be not significant.

6.4.10.6 Plant Species at Risk

Habitat Quantity

Cumulative effects include the effects by the Project in addition to the effects by past, present and RFDs. Future developments that did not have footprints available at the time of analysis and reporting (Section 9; Table 9.9-1; Table 6.4-36) are expected to contribute to decreases in the quantity of black ash habitat. RFDs that were quantified are summarized (Section 6.4.10.1) for the Project footprint below. Below is a summary of cumulative effects to black ash habitat quantity in the RSA:

- Loss of 6 ha (<0.0% change of baseline characterization) to black ash habitat (4 ha confirmed habitat and 2.5 ha candidate habitat) in the RSA attributed to the Project footprint (Section 6.4.7.5.1).
- No RFD-related changes to black ash habitat quantity attributed to the RFDs (i.e., the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine)

Forest Management Plans and Other Factors of Change to Black Ash Habitat

Black ash occurs in a variety of upland and wetland habitats where future forestry activities would change the availability, distribution and composition of these host ecosystems in the RSA. The goal for FMPs is to reach target levels for forest diversity and composition, wildlife habitat for provincially significant species, and locally featured species and species at risk. FMPs are further discussed for upland ecosystems in Section 6.4.10.3 and wetland ecosystems in Section 6.4.10.4.

Climate Change

In addition to known development footprints, climate change will also have an impact on black ash. Changes in this species' habitat due to climate change is qualitatively discussed in this assessment and summarized for all boreal ecosystems in Section 6.4.10.2. Black ash is a facultative species and is capable of inhabiting both wetland and upland vegetation communities, although it favours swamp habitats. As mentioned, wetlands are considered to be one of the ecosystems most sensitive to predicted climate changes due to increases in temperature leading to increases in evapotranspiration combined with decreases in surface water flow predicted to negatively impact present-day wetlands (Dove-Thompson et al. 2011, ECCC 2017, Mortsch 1998, Lemmon and Warre 2004). Any hydrological changes will impact the health and even cause mortality of black ash, as it is sensitive to changes in water availability such as flooding or drying of its habitat (MECP 2022).

The primary threat to black ash is an invasive beetle, the emerald ash borer. In southern Ontario, large-scale ash mortality has occurred (50-99%) due to the emerald ash borer infestation (MECP 2022). The current northern boundary of the emerald ash borer distribution is limited by the cold temperatures; however, as temperatures increase with climate change it will allow further spread of the emerald ash borer in the north, threatening present day black ash populations in the RSA. By 2100, 53-99% of the Ontario black ash range will be susceptible to infestation by the emerald ash borer and population declines of 44 to 82 million mature individuals are predicted (MECP 2022).

Additionally, climate change is predicted to result in greater frequency of extreme weather conditions that can result in further decrease of black ash populations from stresses such as increase fires, drought, heatwaves, late spring frost, strong winds and erratic winter weather (MECP 2022). Black ash, similar to other trees species of the boreal region, may begin to shift north where weather and habitat conditions are more favourable (MECP 2022). However, this will not offset the predicted dieback of black ash trees from habitat loss, the emerald ash borer and other factors.

Habitat Distribution

The predicted direct and indirect loss of black ash trees and habitat in the RSA would result in localized changes in habitat distribution from the Project footprint and RFDs. These changes are effects that are assumed to be permanent as reclamation plans for the Project footprint will include groundcover vegetation and not trees, and reclamation plans are not available for RFDs. The distribution of black ash habitat may be further affected because of changes to hydrology and drainage patterns associated with future mining activities, and potential hydrologic changes brought on by climate change (Section 6.4.10.2). The extent to which black ash habitat distribution would be affected by these factors could not be quantified.

Most notable changes to black ash habitat distribution are predicted to occur within the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine where the cumulative effects of mining would increase fragmentation of existing black ash habitat in the RSA.

Survival and Reproduction

New development may lead to a greater exposure of black ash habitat to disturbance and could result in increased potential for invasion by noxious weed species and invasive species. Forest clearing for construction of the Project and RFDs can change moisture and sunlight regimes and facilitate the ingress of noxious and invasive species, which negatively alters native plant species abundance and richness. Invasive plants can affect black ash habitat through direct competition with this species; therefore, it is expected that with implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be reduced. Black ash prefers moist and well drained soils, in addition to full sun conditions. Alterations to moisture and sunlight availability, particularly during construction activities, may impact drainage or hydrologic inputs to habitat and could, in turn, result in drier soil conditions and adversely impact black ash survival in their current habitats. However, where these species were identified in drier conditions within the RSA, they should largely remain intact.

Warmer temperatures could create conditions that may be inhospitable to some species while favoring others, especially affecting the survival and reproduction of species at risk (Huff and Thomas 2014, Varrin et al. 2007). As previously discussed in Section 6.4.10.2, climate change will increase temperature and associated evapotranspiration and decrease soil moisture. While considering a transition to drier habitat conditions, species reliant on higher soil moisture content is expected to be impacted first. Black ash maintains a coefficient of wetness of -3, suggesting it usually occurs in wetlands, but also in moist and fresh forest communities. Should the soil moisture regime of either wetlands and/or upland ecosystems begin to dry, pioneer dry species and upland hardwood species will compete for habitat, and it will inevitably adversely impact black ash populations.

The reduction in black ash habitat in the Cumulative Effects Assessment relative to the baseline characterization is not predicted to greatly alter species population. For both the Project footprint and RFDs over 97.7% of confirmed and candidate black ash habitat present in the baseline characterization are predicted to remain unchanged in the RSA.

6.4.10.6.1 Characterization of Cumulative Effects Assessment

A summary of the characterization of cumulative effects from the Project footprint, in addition to past, present and RFDs on black ash habitat are provided for each indicator in Table 6.4-36.

All impact management measures to avoid and minimize effects from the Project footprint in the Net Effects Assessment apply to the Cumulative Effects Assessment. It is expected that RFDs will be required to implement similar impact management measures that will limit cumulative effects on black ash habitats (wetland and some upland ecosystems).

Effects from RFDs to habitat quantity and distribution are likely less than certain (i.e., probable or possible) due to the uncertainty in the construction and operation of these projects. However, to avoid underestimating the potential significance of effects, changes in habitat quantity and distribution from RFDs were classified as certain (i.e., precautionary approach). Similarly, for the purpose of this assessment, the predicted loss of black ash habitat due to the RFDs is permanent as reclamation plans are not available for these projects, and medium term for temporary Project components that are expected to be reclaimed. The effects from climate change are uncertain but would influence the magnitude of development-related changes in black ash habitat and the geographic extent of effects would occur beyond the RSA.

Table 6.4-36: Description of Cumulative Effects Assessment for Plant Species at Risk

Indicators	Cumulative Effect	Direction	Magnitude	Geographic Extent	Duration / Reversibility	Frequency	Likelihood of Occurrence	Significance
Plant Species at Risk	• Habitat Quantity	Negative	• Availability of black ash (confirmed and candidate) habitat is predicted to decrease by 6.5 ha (<0.0% change) in the RSA relative to the baseline characterization. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Plant Species at Risk	• Habitat Distribution	Negative	• There would some loss of black ash habitat throughout the RSA relative to the baseline characterization, but candidate ecosystems remain present. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Plant Species at Risk	• Survival and Reproduction	Negative	• Small changes in water quality and flow and potential introduction of invasive species may alter the survival and reproduction of black ash species. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Possible	Not significant

ha = hectare, RSA = Regional Study Area; % = percent.

6.4.10.6.2 Assessment of Significance

Quantifiable impacts from the Project footprint will result in predicted loss of black ash habitat, while RFDs are not predicted to impact black ash habitat. In addition to the Project footprint, future forestry activities would also change the habitat quantity, habitat distribution and survival and reproduction of black ash in the RSA. However, with FMPs in place, their goal is to reach target levels for forest diversity and composition, and wildlife habitat for provincially significant species, and locally featured species and species at risk, such as black ash. Overall, the FMPs seek to achieve a level of forestry operation and harvest that meets market demand while incorporating sustainable forest practices and environmental values to meet a desired forest composition. Meeting these targets is expected to support the maintenance of self sustaining and ecologically effective ecosystems within and beyond the RSA. Disturbance adjacent to black ash habitat also has potential to alter species composition. Invasive plants can affect black ash presence through direct competition with this native plant. With the implementation of a suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be reduced. Similar mitigation measures would be expected from RFDs to avoid and minimize cumulative effects to black ash.

Wetlands are considered to be one of the ecosystems most sensitive to climate change and therefore black ash's soil moisture requirements are also considered to be sensitive to climate change. Climate change is expected to alter habitat conditions, specifically changes in water availability preferred by black ash, and increase negative effects by the emerald ash borer, as this will potentially influence its migration northwards. Since migration is a slow process, mortality is predicted. Consequently, in the Cumulative Effects Assessment, black ash habitat availability could be further reduced beyond the RSA due to climate change, although the magnitude and spatial extent of black ash habitat reduction is not known.

In the Cumulative Effects Assessment, black ash habitat quantity would be reduced by 2.3% in the RSA relative to the baseline characterization. The most notable change from RFDs in black ash habitat distribution is predicted to occur from the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine where the effects of mining would increase fragmentation of the existing black ash habitat. The RFDs that could not be quantified (e.g., gold mines and transportation projects) also have the potential to interact and reduce the quantity and distribution of black ash habitat in the RSA, but these projects would also be expected to mitigate effects to SAR.

The Project and other RFDs would contribute to negative changes in habitat quantity, habitat distribution, and survival and reproduction of black ash; however, these changes are predicted to be within the resilience limits and adaptive capacity of existing black ash habitat. Relative to the baseline characterization, most black ash habitat remains present, intact and well distributed across the RSA in the Cumulative Effects Assessment. The contribution of the Project footprint and RFDs to cumulative effects on black ash habitat in the RSA is not expected to change the self sustaining and ecologically effective status of this criterion. Consequently, cumulative effects on black ash habitat are predicted to be not significant.

6.4.10.7 Plant Species of Conservation Concern

Habitat Quantity

Table 6.4-11 identifies SOCC included in the assessment; also discussed are SWH rare vegetation community (i.e., sensitive orchid community) and the regionally rare Ragged fringed orchid found within the RSA.

Cumulative effects include the effects by the Project in addition to the effects by past, present and RFDs. Future developments that did not have footprints available at the time of analysis and reporting (Section 9; Table 9.9-1; Table 6.4-37) are expected to contribute to decreases in the quantity of SOCC habitat. RFDs that were quantified are summarized (Section 6.4.10.1) for the Project footprint below. Below is a summary of cumulative effects to SOCC habitat quantity, SWH sensitive orchid community, and regionally rare Ragged fringed orchid in the RSA:

- Loss of 1,137 ha (0.6% change of baseline characterization) to SOCC habitat in the RSA attributed to the Project footprint (Section 6.4.7.6.1).
  - Two species, namely scabrous black sedge and vasey's rush, occur within the Project footprint, comprising 30.6 ha and 7.9 ha, respectively, and collectively less than 1% of the footprint.
  - With respect to recorded habitat within the RSA, a 9.5% loss of scarbrous black sedge habitat and 2.5% loss of vasey's rush habitat is projected.
- No RFD-related changes to SOCC habitat quantity attributed to the digitized RFDs (i.e., the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine).
- Loss of 371 ha (0.4% change of baseline characterization) to SWH diverse and sensitive orchid community in the RSA attributed to the Project footprint and RFDs in the RSA.
- Ragged fringed orchid occurs within the ecosite identified as B139 (Appendix 6.4-A). A total of 1.8ha of this ecosite occurs within the Project footprint. Additional RFD-related potential habitat loss of 3 ha (<1% change of baseline characterization) to ragged fringed orchid habitat in the RSA.

Forest Management Plans and Other Factors of Change to SOCC

SOCC occurs in a variety of upland and wetland habitats where future forestry activities would change the availability, distribution and composition of these host ecosystems in the RSA. The goal for FMPs is to reach target levels for forest diversity and composition, wildlife habitat for provincially significant species, and locally featured species and species at risk. FMPs are further discussed for upland ecosystems in Section 6.4.10.3 and wetland ecosystems in Section 6.4.10.4.

Climate Change

In addition to known development footprints, climate change will also have an impact on SOCC occurring in both upland and wetland vegetation communities. Changes in SOCC communities due to climate change is qualitatively discussed in this assessment and summarized for all boreal ecosystems in Section 6.4.10.2. Any hydrological changes associated with an increase evapotranspiration and a decrease in surface water flow will impact the health and even cause mortality of SOCC sensitive to changes in water availability, such as drying of its habitat. The combination of environmental stress (i.e., higher temperature) paired with environmental disturbances (i.e., increase in the occurrence of fire) by climate change are expected to reduce the amount of area covered by the boreal forests in its southern boundary of their present-day distributions (Price et al. 2013, Thompson et al. 1998, Varrin et al. 2007). Depending on the rate of climate change, there may be increased forest mortality for species that are unable to adapt to changes fast enough (Thompson et al. 1998). Consequently, in the Cumulative Effects Assessment, SOCC habitat quantity could be further reduced in the RSA and beyond the RSA due to climate change, although the extent of SOCC habitat reduction is not known.

Habitat Distribution

The distribution of SOCC habitat in the RSA is best described by the distribution in the baseline characterization. The predicted loss of SOCC habitat in the RSA that would result in localized changes in habitat distribution from RFDs are effects that are assumed to be permanent as reclamation plans are not available for RFDs. The distribution of SOCC habitat may be further affected because of changes to hydrology and drainage patterns associated with future mining activities, and potential hydrologic changes brought on by climate change (Section 6.4.10.2). The extent to which SOCC habitat distribution would be affected by these factors could not be quantified.

Most notable changes to SOCC habitat distribution are predicted to occur within the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine where the cumulative effects of mining would increase fragmentation of existing and loss of SOCC habitat in the RSA.

Survival and Reproduction

New development may lead to a greater exposure of ecosystem edges to disturbance and could result in increased potential for invasion by noxious weed species and invasive species. Temperature increase from climate change may allow invasive species to expand their northern range in the province (ECCC 2017). Invasive plants can affect the survival and reproduction success of SOCC through direct competition with these native plants; therefore it is expected that with implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor. Most SOCC in the RSA are well distributed and therefore, despite individual proximity to disturbance, their populations in the RSA should remain largely intact.

Warmer temperatures could create conditions that may be inhospitable to some species while favoring others, thereby affecting the survival and reproduction of SOCC (Huff and Thomas 2014, Varrin et al. 2007). In particular, climate change is expected to result in an increase in temperature and evapotranspiration, and reduction of moisture and water availability. While considering a transition to drier habitat conditions, species reliant on higher soil moisture content is expected to be impacted first. SOCC with a coefficient of wetness level between -2 and -5, or species with lower tolerance to dry conditions, were documented throughout the RSA. SOCC such as scabrous black sedge (wetness coefficient of -3), vasey's rush (wetness coefficient of -3), slender bulrush (wetness coefficient of -5), water awlwort (wetness coefficient of -5), auricled twayblade (wetness coefficient of -3), quill spikerush (wetness coefficient of -5), ryegrass sedge (wetness coefficient of -5) and ragged fringed orchid (wetness coefficient of -3) may be among the first species to be negatively impacted. Drier habitat conditions may favor other SOCC (with wetness coefficients found between 3 to 5) specifically Clinton's rush, pale moonwort, woolly beach-heather, western wheatgrass, Franklin's phacelia and limestone oak fern. The reduction in SOCC habitat condition in the Cumulative Effects Assessment relative to the baseline characterization is not predicted to greatly alter the ecological function of habitats on the landscape because most ecosystems would remain intact.

6.4.10.7.1 Characterization of Cumulative Effects Assessment

A summary of the characterization of cumulative effects from the Project footprint, in addition to past, present and RFDs on SOCC habitat are provided for each indicator in Table 6.4-37.

All impact management measures to avoid and minimize effects from the Project footprint in the Net Effects Assessment apply to the Cumulative Effects Assessment. It is expected that RFDs will be required to implement similar impact management measures that will limit cumulative effects on SOCC habitats.

Effects from RFDs to habitat quantity and distribution are likely less than certain (i.e., probable or possible) due to the uncertainty in the construction and operation of these projects. However, to avoid underestimating the potential significance of effects, changes in habitat quantity and distribution from RFDs were classified as certain (i.e., precautionary approach). Similarly, for the purpose of this assessment, the predicted loss of SOCC habitat due to the RFDs is permanent as reclamation plans are not available for these projects, and medium term for temporary Project components that are expected to be reclaimed. The effects from climate change are uncertain but would influence the magnitude of development-related changes in SOCC habitat and the geographic extent of effects would occur beyond the RSA.

Table 6.4-37: Description of Cumulative Effects Assessment for Species of Conservation Concern

Indicators	Cumulative Effect	Direction	Magnitude	Geographic Extent	Duration / Reversibility	Frequency	Likelihood of Occurrence	Significance
Species of Conservation Concern	• Habitat Quantity	Negative	• Availability of SOCC is not predicted to decrease by RFD-related projects. Availability of SWH diverse and sensitive orchid community is predicted to decrease by 371 ha (0.4% change) and ragged fringed orchid habitat is predicted to decrease by 3.5 ha (<1% change) in the RSA relative to the baseline characterization. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Species of Conservation Concern	• Habitat Distribution	Negative	• The distribution of SOCC habitat in the RSA in the cumulative effects would be similar to the distribution in the baseline characterization. There would be some predicted loss of SOCC habitat throughout the RSA. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Species of Conservation Concern	• Survival and Reproduction	Negative	• Potential introduction of invasive species may alter the survival and reproduction of SOCC. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Possible	Not significant

ha = hectare; RSA = Regional Study Area; % = percent.

6.4.10.7.2 Assessment of Significance

Quantifiable impacts from both the Project footprint and RFDs will result in predicted loss of SOCC communities. Future forestry activities would also change the habitat quantity, habitat distribution, and survival and reproduction of SOCC in the RSA. However, the goal for FMPs is to reach target levels for forest diversity and composition, and wildlife habitat for provincially significant species, and locally featured species and species at risk, including SOCC. Overall, the FMPs seek to achieve a level of forestry operation and harvest that meets market demand while incorporating sustainable forest practices and environmental values to meet a desired forest composition. Meeting these targets is expected to support the maintenance of self sustaining and ecologically effective ecosystems within and beyond the RSA. Disturbance adjacent to SOCC communities also has potential to alter species composition. Invasive plants can affect SOCC presence through direct competition with these native plant communities. With the implementation of a suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor. Similar mitigation measures would be expected from RFDs to avoid and minimize cumulative effects to SOCC.

Increases in evapotranspiration and decreases in surface water flow could cause wet SOCC habitats to contract in size and in extreme cases to convert to dry habitats (Dove-Thompson et al. 2011, Mortsch 1998). Consequently, in the Cumulative Effects Assessment, SOCC habitat quantity could further transition from wet habitats to drier habitats or see an alteration to SOCC communities beyond the RSA due to climate change, although the magnitude and spatial extent of change is not known.

In the Cumulative Effects Assessment, SOCC habitat quantity would be reduced by <1%, SWH diverse and sensitive orchid community by 0.4%, and the ragged fringed orchid by <1% in the RSA relative to the baseline characterization. The most notable change from RFDs in SOCC habitat distribution is predicted to occur from the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine where the effects of mining would increase fragmentation of the existing SOCC communities. The RFDs that could not be quantified (e.g., gold mines and transportation projects) also have the potential to interact and reduce the quantity and distribution of SOCC communities in the RSA, but these projects would also be expected to mitigate effects to SOCC habitat.

The Project and other RFDs would contribute to negative changes in habitat quantity, habitat distribution and survival and reproduction of SOCC; however, these changes are predicted to be within the resilience limits and adaptive capacity of existing SOCC communities. Relative to the baseline characterization, most SOCC communities remain present, intact and well distributed across the RSA in the Cumulative Effects Assessment. The contribution of the Project footprint and RFDs to cumulative effects on SOCC communities in the RSA is not expected to change the self sustaining and ecologically effective status of this criterion. Consequently, cumulative effects on SOCC are not predicted to be not significant.

6.4.10.8 Plants of Traditional Use

Habitat Quantity

Cumulative effects include the effects from the Project in addition to the effects by past, present and RFDs. The RFDs that did not have footprints available at the time of analysis and reporting (Section 9; Table 9.9-1; Table 6.4-38) are expected to contribute to decreases in the quantity of plants of traditional use habitat. RFDs that were quantified are summarized (Section 6.4.10.1) for the Project footprint below. Below is a summary of cumulative effects to plants of traditional use habitat quantity in the RSA (Table 6.4-38):

- Loss of 3,287 ha (0.1% change of baseline characterization) to plants of traditional use habitat in the RSA.
- Largest predicted loss by percent change is meadow general habitat type with a 12.2% change from baseline characterization and an absolute loss of 2,102 ha in the RSA. The Project footprint will be allowed to naturally revegetation with compatible species and will result in creation of meadow habitat.The RFDs are not expected to disturb the least common general habitat type bog in the RSA.

Forest Management Plans and Other Factors of Change to Plants of Traditional Use

Future forestry activities would change the availability, distribution and composition of plants of traditional use habitat in the RSA. The goal for FMPs is to reach target levels for forest diversity and composition, wildlife habitat for provincially significant species, and locally featured species and species at risk. Overall, the FMPs seek to achieve a level of forestry operation and harvest that meets market demand while incorporating sustainable forest practices and environmental values to meet a desired forest composition. Meeting these targets is expected to support the maintenance of self sustaining and ecologically effective upland and wetland ecosystems within and beyond the RSA. The Boundary Waters FMP, Dog River-Matawin FMP, Dryden FMP, English River FMP, Lakehead FMP and Wabigoon FMP are further discussed in Section 6.4.10.3 for upland ecosystems and in Section 6.4.10.4 for wetland ecosystems.

Climate Change

Changes in habitats host to plant species of traditional use due to climate change are qualitatively discussed in this assessment and summarized for all boreal ecosystems in Section 6.4.10.2. Plants of traditional use habitat quantity may be negatively affected by climate change in the Cumulative Effects Assessment. Many plant species of traditional use prefer wetland habitats; as mentioned, these are considered to be one of the ecosystems most sensitive to predicted climate changes (ECCC 2017). Increases in temperature, increases in evapotranspiration and decreases in surface water flow could cause wetland habitats to change in the landscape by reducing their area coverage and in extreme cases to become completely dry (Dove-Thompson et al. 2011, Mortsch 1998, Lemmon and Warre 2004). The reliance on precipitation to maintain function in bogs makes them especially vulnerable to climate change, and a decline in precipitation could lead to drying of peatlands and altered distribution and abundance of bog vegetation (Dove-Thompson et al. 2011). The diversity of plants in wetlands is linked to water level fluctuations and therefore predicted decreases in water levels may lead to concerns for species diversity, including plants of traditional use (Dove-Thompson et al. 2011, Mortsch et al. 2003). The combination of environmental stress (i.e., higher temperature) paired with environmental disturbances (i.e., increase in the occurrence of fire) by climate change are expected to reduce the amount of area covered by the boreal forests in its southern boundary of their present-day distributions (Price et al. 2013, Thompson et al. 1998, Varrin et al. 2007). Depending on the rate of climate change, there may be increased forest mortality for species that are unable to adapt to changes fast enough (Thompson et al. 1998). Species that are adapted to regenerate following fire such as pine and aspen are predicted to increase in the landscape leading to a homogenization of species on the landscape (Thompson et al. 1998, Iverson and Prasad 2001, Varrin et al. 2007). Consequently, in the Cumulative Effects Assessment, plant species of traditional use habitat quantity could be further reduced in the RSA and beyond the RSA due to climate change, although the extent of habitat reduction is not known.

Table 6.4-38: Plant Species of Traditional Use in the Cumulative Effects Assessment of their Habitat in the Regional Study Area

Ecosite Grouping	General Habitat Type	RSA Baseline Characterization (ha)	RSA Cumulative Effects (ha)	RSA Change in Area (ha)	RSA Percent Change (%)
Upland Ecosites	Coniferous Forest	184,137	1,397	182,740	0.76%
Upland Ecosites	Deciduous Forest	156,667	59	156,608	0.04%
Upland Ecosites	Mixed Forest	6,460	26	6,434	0.40%
Upland Ecosites	Shrub	1,968	4	1,964	0.20%
Upland Ecosites	Meadow	2,735	77	2,658	2.82%
Upland Ecosites	Barren	1,516	74.95897	1,441	4.94%
Upland Ecosites	**Upland Total**	**355,352**	**1,638**	353,714	0.46%
Wetland Ecosites	Bog	605	3	602	0.50%
Wetland Ecosites	Fen	16,096	42	16,054	0.26%
Wetland Ecosites	Marsh	10,399	32	10,367	0.31%
Wetland Ecosites	Swamp	51,909	358	51,551	0.69%
Wetland Ecosites	**Wetland Total**	**79,009**	**435**	78,574	0.55%
Upland and Wetland Ecosites	**Total**	**434,361**	**2,073**	432,288	0.48%

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

RSA = Regional Study Area; ha = hectare; % = percent.

Habitat Distribution

The distribution of plants of traditional use habitat in the RSA is best described by the distribution in the baseline characterization with ongoing anthropogenic and natural changes. The predicted loss of plants of traditional use habitat in the RSA that would result in localized changes in habitat distribution from RFDs are effects that are assumed to be permanent as reclamation plans are not available for RFDs. The distribution of plants of traditional use habitat may be further affected because of changes to hydrology and drainage patterns associated with future mining activities, and potential hydrologic changes brought on by climate change (Section 6.4.10.2). The extent to which plants of traditional use habitat distribution would be affected by these factors could not be quantified.

Most notable changes to plants of traditional use habitat distribution are predicted to occur within the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine where the cumulative effects of mining would increase fragmentation of existing habitat in the RSA.

Survival and Reproduction

New development may lead to a greater exposure of ecosystem edges to disturbance and could result in increased potential for invasion by noxious weed species and invasive species. Temperature increase from climate change may allow invasive species to expand their northern range in the province (ECCC 2017). Invasive plants can affect the survival and reproduction success of plant species of traditional use through direct competition with these native plants; therefore, it is expected that with implementation of suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor. Most plants of traditional use in the RSA are well distributed and therefore, despite individual proximity to disturbance, their populations in the RSA should remain largely intact. However, invasive species may become more prevalent near other developments in the RSA (e.g., forestry roads and logging equipment may facilitate the spread of invasive species, particularly on private timberlands where new access roads are required), which may not be managed to the same degree as the Project.

Warmer temperatures could create conditions that may be inhospitable to some species while favoring others, thereby affecting the survival and reproduction of plants of traditional use (Huff and Thomas 2014, Varrin et al. 2007). In particular, climate change is expected to result in an increase in temperature and evapotranspiration, and reduction of moisture and water availability. While considering a transition to drier habitat conditions, species reliant on higher soil moisture content is expected to be impacted first. Plant species of traditional use with a coefficient of wetness level between -2 and -5, or species with lower tolerance to dry conditions, were documented throughout the RSA. Plant species of traditional use such as eastern white cedar (wetness coefficient of -3), highbush cranberry (wetness coefficient of -3), Labrador tea (wetness coefficient of -5), sweetgrass (wetness coefficient of -3) and wild rice (wetness coefficient of -5) may be among the first species to be negatively impacted. Drier habitat conditions may favor other plant species of traditional use (with wetness coefficients found between 3 to 5), specifically paper birch, showy mountain ash, chokecherry, common bearberry, early lowbush blueberry, saskatoon berry, Canada wild ginger, common yarrow and prickly rose.

The reduction in plants of traditional use habitat condition in the Cumulative Effects Assessment relative to the baseline characterization is not predicted to greatly alter the ecological function of habitats on the landscape because most ecosystems would remain intact. For both the Project footprint and RFDs over 99% of plants of traditional use habitats present in the baseline characterization are predicted to remain unchanged in the RSA.

6.4.10.8.1 Characterization of Cumulative Effects Assessment

A summary of the characterization of cumulative effects from the Project footprint, in addition to past, present and RFDs on plants of traditional use habitat are provided for each indicator in Table 6.4-39.

All mitigation measures to avoid and minimize effects from the Project footprint in the Net Effects Assessment apply to the Cumulative Effects Assessment. It is expected that RFDs will be required to implement similar mitigation measures that will limit cumulative effects on plants of traditional use habitat.

Effects from RFDs to habitat quantity and distribution are likely less than certain (i.e., probable or possible) due to the uncertainty in the construction and operation of these projects. However, to avoid underestimating the potential significance of effects, changes in habitat quantity and distribution from RFDs were classified as certain (i.e., precautionary approach). Similarly, for the purpose of this assessment, the predicted loss of plants of traditional use habitat due to the RFDs is permanent as reclamation plans are not available for these projects, and medium term for temporary Project components that are expected to be reclaimed. The effects from climate change are uncertain but would influence the magnitude of development-related changes in plants of traditional use habitat and the geographic extent of effects would occur beyond the RSA.

Table 6.4-39: Description of Net Effects in the Cumulative Effects Assessment for Plants of Traditional Use

Indicators	Cumulative Effect	Direction	Magnitude	Geographic Extent	Duration / Reversibility	Frequency	Likelihood of Occurrence	Significance
Plants of Traditional Use	• Habitat Quantity	Negative	• Availability of plants of traditional use habitat is predicted to decrease by 2,073 ha (0.48% change) in the RSA relative to the baseline characterization. The smallest percentage of habitat loss with respect to upland habitat is deciduous forest, while for wetland – fen. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Plants of Traditional Use	• Habitat Distribution	Negative	• The distribution of plants of traditional use habitat in the RSA in the Cumulative effects would be similar to the distribution in the baseline characterization. There would be some predicted loss and fragmentation of plants of traditional use habitat throughout the RSA. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Certain	Not significant
Plants of Traditional Use	• Survival and Reproduction	Negative	• Small changes in water quality and flow and potential introduction of invasive species may alter plants of traditional use survival and reproduction. Magnitude will depend on influences from climate change.	• Beyond regional (due to climate change)	Medium-term / Permanent	Continuous	Possible	Not significant

RSA = Regional Study Area; ha = hectares; % = percentage.

6.4.10.8.2 Assessment of Significance

Changes in surface water and groundwater quantity and quality from RFDs, particularly mining developments, may alter the habitat quantity, habitat distribution, and survival and reproduction of plant species of traditional use. However, it is expected that such projects would be constructed and operated under provincial and federal regulations to meet water quality standards, and water license permits. Disturbance adjacent to wet habitats also has potential to alter species survival and reproduction. Invasive plants can affect species diversity through direct competition with plants of traditional use. With the implementation of a suitable vegetation management procedures, the introduction and spread of noxious and invasive species would be localized and minor. Similar mitigation measures would be expected from RFDs to avoid and minimize cumulative effects to plant species of traditional use habitat.

Future forestry activities would also change the habitat quantity, habitat distribution and survival and reproduction of plant species of traditional use in the RSA. FMPs are in place and their goal is to reach target levels for forest diversity and composition, and wildlife habitat for provincially significant species, and locally featured species and species at risk. Overall, the FMPs seek to achieve a level of forestry operation and harvest that meets market demand while incorporating sustainable forest practices and environmental values to meet a desired forest composition. Meeting these targets is expected to support the maintenance of self sustaining and ecologically effective ecosystems within and beyond the RSA.

Plant species of traditional use requiring wet habitats are considered to be most sensitive to climate change. Increases in evapotranspiration and decreases in surface water flow could cause wet habitats to contract in size and in extreme cases to convert to dry habitats (Dove-Thompson et al. 2011, Mortsch 1998). Consequently, in the Cumulative Effects Assessment, plant species of traditional use habitat quantity could further transition from wet habitats to drier habitats beyond the RSA due to climate change, although the magnitude and spatial extent of change is not known.

In the Cumulative Effects Assessment, plant species of traditional use habitat quantity would be reduced by 0.9% in the RSA relative to the baseline characterization. The most notable change from RFDs in plant species of traditional use habitat distribution is predicted to occur from the Treasury Metals Inc. Goliath Gold Project and the Agnico Eagle Hammond Reef Gold Mine where the effects of mining would increase fragmentation of the existing habitats. Wetland habitat host to plants of traditional use that are less common on the landscape (i.e., Bogs) are also expected to remain well connected, with no predicted loss within the RSA. The RFDs that could not be quantified (e.g., gold mines and transportation projects) also have the potential to interact and reduce the habitat quantity and distribution of plant species of traditional use in the RSA, but these projects would also be expected to mitigate effects to these habitats.

Overall, changes to habitat quantity, habitat distribution, and survival and reproduction of plant species of traditional use from the Project and RFDs are predicted to be within the resilience limits and adaptive capacity of ecosystems. The reduction in plant species of traditional use habitat condition in the Cumulative Effects Assessment relative to the baseline characterization is not predicted to greatly alter the ecological function of habitats on the landscape because most (>99%) ecosystems would remain intact and well distributed across the RSA. Despite changes in plant species of traditional use habitat condition during the baseline characterization, existing ecosystems remain well connected to support a diversity of plant species of traditional use in the region. The contribution of the Project footprint and RFDs to cumulative effects on habitat quantity, habitat distribution and survival and reproduction of plant species of traditional use in the RSA indicates that this ecosystem would continue to be self sustaining and ecologically effective for this criterion. Consequently, cumulative effects on plant species of traditional use are predicted to be not significant.

6.4.11 Prediction Confidence in the Assessment

Prediction confidence refers to the degree of certainty in the net effects predictions and associated assessment of significance. The EA deals with predictions of future circumstances and predicts interactions between the Project footprint and other developments or activities within complex ecosystems. Scientific inference is associated with uncertainty, and prediction confidence (level of confidence in the assessment results) depends on the degree of uncertainty and how it is addressed. Primary factors affecting confidence in the predictions made in the assessment include:

- Availability, limitations, and accuracy of baseline characterization field data;
- Usage of FRI ecosite data and the riparian habitat model;
- Level of understanding of the strength of effect (i.e., mechanisms) on each criterion;
- Level of certainty associated with the effectiveness of proposed mitigation measures; and
- Level of understanding of the cumulative drivers of change in measurement indicators.

The level of certainty is considered during the effects assessment, and how uncertainty was addressed to increase confidence so that net effects will not be worse than predicted, such as building conservatism into the analysis and assessment. Uncertainty in the assessment was managed by:

- Conducting quality assurance and control on baseline characterization data;
- Assuming that listed plants and sensitive features known to occur in the ecoregions/ecodistricts would be present in ecosites (habitats) intersected by the Project footprint, independent of the availability and limitations of baseline characterization field data;
- Using the best available land cover data across the RSA for the Project footprint;
- Reviewing regional information such as FMPs;

- Acquiring local and regional data from provincial government departments to understand ecological relationships relevant to potential effects, and inform the assessment;
- Using data to make inferences about ecological interactions and mechanisms of change; and
- Comparing assessment results to relevant published literature.

For the purpose of this assessment, the predicted loss of upland, wetland and riparian ecosystems and changes in quantity of plant SAR, SOCC and traditional use plant habitat due to the Project and RFDs is assumed to be permanent (i.e., for permanent Project footprint components, and reclamation plans that are not available for planned RFDs) and long term (i.e., for temporary Project footprint components that will be reclaimed). Some ecosystems disturbed by the Project through temporary access roads and water crossings, temporary laydown areas and temporary construction camps are expected to be reclaimed, which would contribute to reducing net effects. Therefore, the confidence in predictions concerning effects to upland, wetland and riparian ecosystems from the Project footprint is moderate to high. Similarly, confidence related to SOCC and traditional use plant habitats is also considered to be high due to habitat abundance throughout the LSA and RSA. SAR, specifically black ash, was confirmed within the LSA on a few occasions and the associated ecosites were identified as confirmed habitat. Habitat not assessed in field, but based on existing FRI information, was used to identify candidate habitat. The complexity of analysis when carried out based on FRI information is discussed further below, but for the purpose of black ash, the limited habitat area throughout the LSA and RSA suggests a confidence of low to moderate.

The FRI data is developed and used to support forestry management practices. This data has the primary objective of supporting Sustainable Forest Licence (SFL) holders' decisions making in Forest Management. The classification of forested communities to "primary Ecosite" (pri_eco in the metadata) was used as a tool to assist in the development of vegetation ecosite base mapping for the Project. Given the data was captured for a purpose other than this, some inaccuracies are noted while using it for the purpose of ecosystem analysis. For instance, the delineation and classification of wetlands are not a priority of the program, and therefore not always documented. It is understood that mineral wetlands are infrequently captured and classified as wetland through spatial analysis programs (e.g., digital surface mode) and, as such, existing data may underestimate wetlands within the LSA and RSA. Given the level of error in the FRI, additional desktop and field studies were completed to verify this data for use in the EA as described in the Terrestrial Baseline Report (Appendix 6.4-A). As it relates to observations made during baseline characterization field assessments, only 53% (n=81) of the ecosites visited aligned with the existing FRI mapping. It is noted that FRI mapping was approximately 15 years old during the field assessment, thus, the landscape has undergone some alteration from development and natural processes; however, this value seems to suggest a high level of error. Actions were taken to update the data as best as reasonably possible and included incorporation of current LIO data to create a disturbance layer. It is understood much development or land alteration has occurred since collection of the FRI data, so this inclusion was meant to consider current disturbance conditions across the landscape.

It is also noted that FRI mapping overlap areas (i.e., borders of FMUs) did not always align to provide certainty in the ecosite mapping and associated analysis. Provincial FRI mapping effort was completed separately for each FMU. Ecosites that occurred in the target FMU but extended outside of the FMU were included. This method resulted in overlap areas where two FMUs abut, resulting in two ecosites assigned to the same area (Table 6.4-40). A GIS analysis tool was used to 'dissolve' ecosites to eliminate any duplication; however, it was determined that most overlapping ecosites were negligible and therefore the overlapping area has generally been assigned two unique ecosites for any one area.

Table 6.4-40: FRI Data Overlap Areas.

Forest Management Unit[1]	Overlap in LSA (ha)	Overlap in RSA (ha)
Dog River-Matawin and Lakehead	<1	<1
Dog River-Matawin and Quetico	12	29
Dog River-Matawin and Sapawe	<1	<1
Quetico and Crossroute	<1	103
Quetico and Sapawe	72	104
Sapawe and Crossroute	<1	<1
Sapawe and English River	0	0
Wabigoon and Dryden	0	0
Wabigoon and English River	<1	42
Total	**85**	**278**

1) Table 6.4-6 identifies the latest FMUs within the LSA and RSA. In 2020, two former FMU areas, Sapawe FMU and Crossroute FMU, were combined into the single, Boundary Waters FMU. Quetico Provincial Park serves as its own FRI unit.

The overlapping areas were not ground-truthed, and for the purpose of this assessment were both included in the quantitative analysis discussed throughout this report.

This uncertainty extends to include plant and vegetation community habitats that are dependent on moist or wetland ecosite types, including mineral wetlands, such as ragged fringed orchid and black ash. This uncertainty is inherent in the assessment (i.e., low level of confidence regarding predicted effects to particular wetland types), but can be reduced during construction monitoring (i.e., wetlands confirmed to be disturbed by the Project can be field verified as peat or mineral wetlands).

There is a high level of uncertainty surrounding the reclamation of peat accumulating wetlands using existing technology once the soil layers have been disturbed (Environment Canada 2013). This uncertainty has largely been managed by applying mitigation measures to avoid soil disturbance to peat accumulating wetlands such as fens and bogs, either through siting or by completing construction primarily under frozen conditions to limit potential soil disturbance and compaction. Field verification of proposed locations of temporary construction camps and temporary laydown areas will support successful avoidance of potential adverse effects to peat accumulating wetlands due to uncertainty associated with the FRI ecosite mapping.

Although climate change models predict an increase in average global temperatures in the Net Effects and Cumulative Effects Assessments, the effect of these changes on ecosystem processes could not be assessed quantitively (Deser et al. 2010, Walther 2010). Predicting how an ecosystem or an individual species will cope with climate change is difficult and many scenarios are possible (Dawson et al. 2011). Boreal tree species (e.g., black spruce, Jack pine, white spruce, balsam fir, and trembling aspen) are predicted to migrate northwards; however, because trees are long-lived species with slow migration rates, some trees are likely to have decreasing adaptive capacity to unfavourable climate conditions making them susceptible to mortality (Canadian Council of Forest Ministers 2010). Changes in water levels and flows are uncertain and may result in negative or positive effects to upland, wetland and riparian ecosystems (Gleeson et al. 2011). As expected, there is a low level of confidence in predicted effects from climate change to upland, wetland, and riparian ecosystems. However, where there was ambiguity in the response of an ecosystem to climate change, the assessment considered a precautionary outcome for each criterion (i.e., a negative effect of climate change on ecosystems in the Cumulative Effects Assessment).

6.4.12 Monitoring

This section identifies recommended effects monitoring to verify the predictions in the assessment and the effectiveness of the mitigation measures, and compliance monitoring to evaluate whether the Project has been constructed, implemented and operated in accordance with the commitments made in the Final EA Report. The objectives of the monitoring programs include:

- Evaluate the effectiveness of mitigation measures and reclamation, and modify or enhance as necessary through adaptive management;
- Identify unanticipated potentially negative effects, including possible accidents and malfunctions; and
- Contribute to continual improvement.

A summary of the monitoring activities relevant to the protection of upland, wetland and riparian ecosystems as well as plant SAR, plant SOCC and plant species of traditional use are described below:

- The development footprint will be monitored during construction for incidental sensitive features (e.g., rare vegetation communities, SWH and SAR [i.e., black ash]) that have not previously been identified on or near the anticipated footprint. In the event that a sensitive feature is identified, appropriate vegetation management procedures will be implemented;

- Soil topsoil piles will be monitored for weeds, appropriate invasive species management procedures will be implemented, when required;.
- Siting of temporary construction camps and temporary laydown areas will be field verified prior to installation to avoid organic type wetlands (e.g., bogs and fens);
- Erosion and sedimentation control measures will be monitored to avoid and minimize sediment mobilization from disturbed areas to drainages, wetlands or watercourses; and

Reclamation will be monitored and managed, and include prevention of soil erosion, provide slope stability, and revegetation.

6.4.13 Information Passed on to Other Components

Results of the assessment were reviewed and incorporated into the following components of the EA:

- Wildlife (Section 6.5).

6.4.14 Criteria Summary

Table 6.4-41 presents a summary of the assessment results by criteria for the Project.

Table 6.4-41: Vegetation and Wetlands Assessment Summary

Criteria	Assessment Summary
Upland ecosystems	• Net effects are assessed to be not significant to upland ecosystems. • Cumulative effects are assessed to be not significant to upland ecosystems.
Wetland ecosystems	• Net effects are assessed to be not significant to wetland ecosystems. • Cumulative effects are assessed to be not significant to wetland ecosystems.
Riparian ecosystems	• Net effects are assessed to be not significant to riparian ecosystems. • Cumulative effects are assessed to be not significant to riparian ecosystems.
Plant species at risk	• Net effects are assessed to be not significant to plant species at risk. • Cumulative effects are assessed to be not significant to plant species at risk.
Plant species of conservation concern	• Net effects are assessed to be not significant to plant species of conservation concern. • Cumulative effects are assessed to be not significant to plant species of conservation concern.

Criteria	Assessment Summary
Plants of traditional use	• Net effects are assessed to be not significant to plant species of traditional use. • Cumulative effects are assessed to be not significant to plant species of traditional use.

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