Environmental Guide for Managing Invasive Phragmites (*Phragmites australis australis*) – Best Management Practices

Ministry of Transportation

Indigenous Relations and Environmental Policy Branch

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Environmental Guide for Managing Invasive Phragmites (*Phragmites australis australis*) – Best Management Practices
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Acknowledgements

This document was updated in consultation with various groups within the Ontario Ministry of Transportation (MTO) as well as external stakeholders including the Ministry of Natural Resources (MNR).

This best management practices guide is intended to be a living document that will be reviewed and revised as required. It is applicable to works undertaken by, or on behalf of, the MTO.

Comments and Suggestions

MTO welcomes comments and suggestions on ways to improve the document with the objective of providing a practical and pragmatic approach to environmental management in the Province of Ontario. MTO anticipates that changes will be warranted to clarify, improve, and incorporate new information. Comments can be directed to the Manager of MTO's Environmental Policy Office.

The format of the document is designed to accommodate such changes. Such revisions and amendments will be incorporated in later editions of this document. MTO will not formally respond to unsolicited comments submitted in response to the document.

VERSION HISTORY

VERSION #	DATE	DESCRIPTION OF MAJOR CHANGE
1.0	2025	Original publication.

Disclaimer

Cette publication hautement spécialisée (Environmental Guide for Managing Invasive Phragmites – Best Management Practices) n'est disponible qu'en anglais conformément au Règlement 671/92, selon lequel il n’est pas obligatoire de la traduire en vertu de la Loi sur les services en français. Pour obtenir des renseignements en français, veuillez communiquer avec le ministère des Transports de l’Ontario au: 416-585-6310.

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1. Introduction

This document is a summary of procedures and best management practices employed by the Ontario Ministry of Transportation (MTO) to manage and/or treat invasive *Phragmites* (*Phragmites australis australis*) (hereafter referred to as *Phragmites*) within MTO's infrastructure. The preparation of this document was an initiative of MTO's Environmental Policy Office (EPO) in collaboration with MTO's Vegetation Management Working Group (VMWG). These best management practices include new techniques and lessons learned from ongoing trials and will be updated based on new information as it becomes available.

There is no single solution to reducing the spread of *Phragmites.* Collaboration between MTO's Operations Division (OD), Integrated Policy and Planning Division (IPPD) and Transportation Infrastructure Management Division (TIMD) is required to ensure a multi-faceted strategy for managing this invasive species along provincial highways.

The purpose of this document is to provide guidance to all MTO staff and Service Providers to ensure best practices are employed to protect the environment when undertaking *Phragmites* management activities. Practices within this document should be implemented upon distribution.

In all cases, applicable acts and regulations and contract documentation supersede the direction within this document.

1.1 General Information on *Phragmites*

Phragmites is an invasive, non-native perennial grass that was transported from Eurasia; it was first found along the St. Lawrence River in 1916, and since has spread across North America. It has been identified as one of Canada's worst invasive plants by Agriculture and Agri-food Canada.

In Ontario, established populations of invasive *Phragmites* have been identified across the southern part of the province, with scattered occurrences as far north as Georgian Bay, and Lake Superior, and as far west as the Ontario/ Manitoba border, with populations occurring primarily along highway corridors.

Phragmites can grow up to 5 metres high and its roots can grow 2 metres deep. It can achieve densities of over 200 stems/m^2. Generally, it is spread through the roots (rhizomes); however, seeds and plant fragments can also be transported via human activity, water, and wind.

1.1.1 *Phragmites* Identification

The invasive subspecies (*australis*) of *Phragmites* is similar to a non-invasive, native species (subspecies *americanus*), which is also present within Ontario. Unlike the invasive strain, native *Phragmites* rarely develops into monoculture strands, does not negatively alter habitats, and does not deter wildlife. There is potential for native and invasive *Phragmites* to crossbreed creating a hybrid lineage of *Phragmites*, which has been observed in a few locations in the United States of America (USA). These hybrid plants have not yet been observed in Ontario.

It can be difficult to tell native and invasive *Phragmites* apart through a visual inspection therefore genetic analysis may be necessary. See Appendix A for further information on identifying native and invasive *Phragmites.*

1.2 Impacts of *Phragmites*

Phragmites is an aggressive plant that spreads quickly and out-competes native species for water and nutrients. It produces toxins (allelopathic) in the soil that hinder the growth of and kill surrounding plants, such as native vegetation.

Negative effects of *Phragmites* include:

- Loss of biodiversity and species richness
- Loss of habitat for wildlife and species at risk
- Changes in hydrology
- Changes in nutrient cycling
- Physical and structural damage to infrastructure
- Human safety hazards (dead stands create fire hazards and block sightlines along highways)
- Delays and increased cost in construction activities
- Aesthetic degradation and blocking of property views
- Impeding access to infrastructure and utilities

Specific negative impacts that *Phragmites* has on MTO infrastructure include reduced safety (e.g., restricted sightlines for drivers and impeding the movement of wildlife) and impediments to infrastructure function (e.g., drainage impediments by blocking culvert ends or obstructing ditches).

1.3 *Phragmites* Habitat

Phragmites grow in aquatic, semi-aquatic and terrestrial habitats. Areas conducive to *Phragmites* include disturbed habitats, such as roadsides and ditches. It prefers standing water found in wetlands, banks, lakeshores, beaches, and wet fields but can also survive in drier areas. It has an extensive root system that can reach up to 40 m in

length, enabling it to grow in a wide range of habitats. *Phragmites* is very salt-tolerant, allowing it to thrive along roadside ditches where other plant species cannot easily survive.

1.4 Life Cycle of *Phragmites*

In general, growth of *Phragmites* follows these timelines, but exact timing will be site-dependent:

Table 1: Life Cycle of *Phragmites*

Dormant:	November - March (stalks remain standing through the winter)
Germination:	April – May
Primary Vegetative Growth:	June – July
Flowering:	August – September
Translocation of nutrients:	September - October (stalks die back but leaves remain green and plant still produces biomass)

1.5 Invasive Species Act

Phragmites is regulated as a restricted invasive species under the *Invasive Species Act*, 2015 by the MNR and as such, it is illegal to import, deposit, release, breed/grow, buy, sell, lease or trade this restricted invasive species. However, MTO (including its staff or agents carrying out MTO work) is not specifically bound to the *Invasive Species Act,* 2015.

When working on a highway that passes through a Provincial Park or Conservation Reserve, great care shall be taken to ensure equipment and materials are free of any potential *Phragmites* contamination. Despite MTO not being bound to the *Invasive Species Act,* 2015, when planning a capital construction project through a Provincial Park or Conservation Reserve where *Phragmites* is present, a management and treatment plan may need to be developed in consultation with the Ministry of the Environment, Conservation and Parks (MECP).

2. *Phragmites* Inventory

Provincial inventory efforts for *Phragmites* stands located within the MTO right-of-way were first initiated in 2016 at the regional level and are still ongoing. The inventory data was collected using the ArcGIS Collectors app, allowing it to be viewed in mapping

software. MTO's Regional Maintenance Offices take the lead for *Phragmites* inventory activities, which may involve third-party Service Providers.

The purpose of a *Phragmites* inventory is to:

- Identify *Phragmites* stands, in some cases including native *Phragmites* which requires no treatment;
- Quantify the extent of the infestation along MTO's highways;
- Establish a baseline to assess the effectiveness of MTO's *Phragmites* management program;
- Identify priority locations for treatment through maintenance activities; and,
- Identify locations that intersect with the capital construction program, within which *Phragmites* treatment could be included.

Planning an inventory of *Phragmites* should consider the following:

- Annual inventory - Due to the rate of spread, and to monitor the effectiveness of treated areas, an inventory of *Phragmites* should be completed annually. If an annual inventory is not possible, priority highway corridors could be identified for annual inventory and other corridors inventoried on a bi-annual basis.
- Staff capacity and training - A *Phragmites* inventory can be labour intensive. Ensure there are adequate staff resources available who are trained in identifying *Phragmites,* distinguishing between non-native vs. native species, and working in the required field conditions (such as along 400 series highways), if applicable. In order for the inventory to be a useful tool for comparison from year to year, the level of effort and expertise needs to be replicated each year.
- Utilize best available technology for inventory- The simplest and most efficient method for collecting and compiling the *Phragmites* inventory is to utilize mobile applications (apps) designed for field data collection. For the 2017 and 2018 inventories, MTO regional staff (or their Service Providers) utilized the ArcGIS Collector application. This application allowed for the data to be collected while driving the highway shoulder. The ArcGIS Collector application allows the user to sketch the limits of the *Phragmites* stand on aerial imagery, obtaining a more accurate measurement of an area in square metres (polygon) versus taking a length and width.
  To view this mapping data, contact MTO's Regional Maintenance Office for the region you are interested in.
- Utilize consistent methods - When planning to conduct digital inventories, a consistent approach should be followed by all MTO regional offices to allow inventory data to be combined into a provincial dataset.
- Use of TIMD's natural science retainers - TIMD's Environmental Delivery Office has natural science retainers that may be available as an option to support regional inventories. The retainer consultants are qualified in plant identification and mapping and are familiar with working within the MTO right-of -way. The retainers can survey and map *Phragmites* stands and determine whether they are invasive or native plants. Part of the retainer assignment can be to take random samples for genetic laboratory testing to confirm their field identification

of invasive vs native. This is an important option because it can be outsourced to industry professionals.

- Consider the surrounding landscape - It is important to observe the surrounding lands, to determine if there are large stands that are not within MTO property. If so, there will be a greater chance that the *Phragmites* will return compared to a site without any stands adjacent. The sites with neighbouring land that has *Phragmites* will likely require coordination with adjacent landowners, and more subsequent years of consistent treatment.
- Post-treatment monitoring - In some cases, monitoring after a treatment program may be beneficial to evaluate effectiveness of the treatment. These targeted post-treatment monitoring programs may use a similar approach to inventorying efforts, but may also require specific considerations (e.g., higher frequency). Specific post-treatment monitoring programs can be developed for target areas as part of the overall management plan for Phragmites in that area.

3. *Phragmites* Management

The primary method of treatment utilised by MTO includes a combination of herbicide spraying and cutting. This integrated management approach is recognized as being most effective for *Phragmites* management in the province (e.g., Cleland *et al*. 2021) and is the preferred method when treating large areas such as a highway right-of-way. Used on its own, cutting is not a means to eradicate *Phragmites* as it does not impact the root system. Cutting can slow its spread and can reduce the height when the stands are too tall or dense and are impeding motorist visibility or when spraying cannot occur. Herbicide treatment or cutting should not be done during restricted activity windows for various species (see Species at Risk Timing Window in Section 4 below).

3.1 Duty to Consult

Vegetation management activities have the potential to trigger MTO's duty to consult First Nation and Métis communities. The duty to consult is the Crown's legal obligation to consult First Nation and Métis communities it has knowledge of an existing or asserted Aboriginal or treaty right (e.g., to hunt, fish, trap or gather vegetation), and contemplates conduct that may adversely affect the right in question. MTO has internal processes to determine any duty to consult obligations that may need to be fulfilled prior to any vegetation management activities. Such activities must be conducted in accordance with requirements identified by MTO in the contract documents. Any questions regarding duty to consult can be directed to the MTO Contract Administrator.

3.2 Site Screening Prior to Management

Prior to undertaking herbicide spraying or cutting of *Phragmites*, a site screening should be completed to identify environmental features within the project limits.

The site screening assessment identifies areas of water (ditches, ponds, watercourses, wetlands), native vegetation and any signs of wildlife that could be affected. In advance of treatment, screening for species at risk should be undertaken (for more information see section 4). The screening should assess adjacent land use (e.g., commercial, residential, etc.) and vegetation as the land use and presence of other vegetation will influence the method of treatment (e.g., backpack sprayer or truck with a boom). Any adjacent vegetation to be retained or other sensitive features should be delineated in the field.

A licensed Contractor is also required to undertake a screening, particularly with the presence of water. See section 5.4.1 for more information.

It may also be beneficial to review any ongoing or proposed *Phragmites* management activities in adjacent areas by other organizations or practitioners, in order to enhance coordination of efforts.

3.3 General Sequence of *Phragmites* Management

The following is a general guideline of the sequence and steps involved in treating *Phragmites*:

1. Identify stands through regional inventory or project specific need.
2. Undertake site screening in the year of treatment.
3. Apply selected herbicide.
4. Cut treated stands after herbicide application.
5. Monitor the following year for re-growth.
6. Reapplication for 3 years for effective management.
7. Monitor the following years to determine if additional treatment is required.

Timing of these steps (and timing between the steps) will depend on several factors including location, approved management program, type of herbicide, etc.

In areas of dense stands that are scheduled for capital construction, it is preferable to treat impacted areas for three successive years in advance of capital construction. Treating in advance will limit the spread during construction and will reduce the quantity of plant-impacted material to be disposed of (see Section 4 for further information).

4. Species at Risk

Monocultures of *Phragmites* significantly reduce biodiversity and damage native ecosystems. However, stands may be used by some animals including federal and provincial species at risk birds, turtles, reptiles and amphibians. In addition, *Phragmites* stands may be used by migratory birds protected under the Federal Migratory Birds Convention Act and the associated regulations. It is important to avoid adverse ecological impacts to help minimize unintended effects. Regardless of the control method selected, it is important to note that animals, including nesting birds, turtles, frogs, toads or snakes, may be present. Control activities should be timed to reduce potential harm or mortality to wildlife. Birds will nest in the standing dead stalks from previous year's growth. Cutting or flattening these stalks before spring will reduce the potential for nest establishment while also improving control efficiency.

Wet ditches tend to have more animal presence (e.g., amphibians, reptiles, etc.) and cannot be treated with terrestrial herbicides or cut as easily. Timing treatment to account for time for these ditches to dry out can reduce potential harm to wildlife and increase control options and efficiency.

Completing habitat assessments and recording species occurrences should take place prior to management and ideally can be incorporated into monitoring practices during and after management activities. Species occurrence data collected throughout management phases may also be useful in assessing performance targets for management projects (e.g., to show an increase in species occurrence after *Phragmites* removal).

For more information regarding avoiding or minimizing impacts to species at risk and their habitat, please see MTO's Best Management Practices for Species at Risk Protection During Maintenance Activities - Vegetation Management section and MTO's Fisheries Best Management Practices Manual for Riparian vegetation management in existing highway right-of-way:

- https://www.library.mto.gov.on.ca/SydneyPLUS/TechPubs/Portal/tp/tdViews.aspx

For more information regarding avoiding or minimizing impact to migratory birds and their habitat, please see:

- Environment Canada's Guidelines to reduce risk to migratory birds - Canada.ca

4.1 Timing of Work

Management of *Phragmites* should be scheduled to avoid or minimize impacts to species at risk and/or fish and fish habitat. This will ensure work is not taking place during sensitive life stages for the species (e.g., nesting, hibernation, reproduction, rearing). If work cannot be scheduled outside of sensitive life stages for species at risk,

work may proceed if work modifications are applied. The timing of sensitive life stages for certain species may vary over a geographic region and/or from year-to-year based on climate and other environmental factors. Therefore, it may be appropriate to adjust the timing of work. A qualified person may make the determination if this applies to the region and may provide a window to complete work in. In addition, refer to Ontario's In-water Work Timing Window Guidelines.

For more information, please review MTO Best Management Practices for Species at Risk Protection During Maintenance Activities and MTO's Fisheries Best Management Practices Manual. Both documents are available on MTO Technical Publications.

For more information, please review Environment Canada's General Nesting Periods for migratory birds along with each nesting zone:

- General nesting periods of migratory birds - Canada.ca

4.2 Legislative Obligations

It is important to determine what permits/authorizations may be required in the location you will be working in before beginning work (Refer to Table 2 below). Where work cannot be modified to avoid impacts, identify whether an authorization (e.g., permit, registration, etc.) may be required to comply with environmental legislation and/or regulations and follow the requirements and conditions outlined therein. Authorizations can take time and this uncertainty will need to be factored into work planning. Endangered Species Act (ESA) authorizations may be required and are the most common type of authorization required when undertaking *Phragmites* management activities. ESA authorizations allow MTO to proceed with work while meeting the conditions of the authorization. MTO TIMD - Environmental Delivery Office's have completed registrations for common maintenance activities, including *Phragmites* management, under Ontario Regulation 242/08.

It is important to identify previous permits/authorizations in the location you will be working in to determine if there are any outstanding conditions and/or agreements that need to be considered before beginning work (i.e., downstream fisheries or wildlife mitigation measures implemented as a result of a permit or other authorization). Contact MTO TIMD - Environmental Delivery Office in the region of work, as they will be able to support identifying any existing or outstanding agreements/conditions that may be relevant.

MTO has developed a Best Management Practices Manual for Species at Risk Protection During Maintenance Activities. As noted within this document, Best Management Practices for specific maintenance activities including vegetation management have been created to avoid or minimize impacts to species at risk and their habitat. Please refer to Appendix A for an excerpt from MTO's Best Management Practices Manual for Species at Risk Protection During Maintenance Activities – Vegetation Management.

Table 2: Environmental Legislation, Regulations & Guidance

***** This table provides an overview of legislation and regulations relevant to fish and fish habitat, species at risk and migratory birds (as they relate to provincially or federally protected species and habitats). This table is not comprehensive and does not cover all applicable legal frameworks.

Environmental Factor	Legislation and Regulations	Purpose	Authorizations	Policy and Guidance
Fisheries	*Fisheries Act, R.S.C., 1985, c. F-14* *Ontario Fishery Regulations*	No person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish. No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat. No person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.	DFO - issued Fisheries Act authorization	MTO Environmental Guide for Fisheries (Fish Guide) MTO Environmental Guide for Fisheries – Best Management Practices Manual (Fisheries BMPs) MTO Environmental Guide for Fisheries – Maintenance Works (Maintenance Guide) MTO Project Notification Form DFO Request for Review form DFO Code of Practice: End-of-Pipe Fish Protection Screens for Small Water Intakes in Freshwater * Policies and guidelines are updated on an as need basis and it is the duty of responsible agent to ensure that they use the appropriate most up to date policy.
Species at Risk	*Species at Risk Act, 2002* and associated Regulations *Ontario Endangered*	Protection for species at risk and their habitat. No person shall kill, harm, harass, capture or take species at risk.	Environment and Climate Change Canada issued SARA permit (terrestrial species at risk) DFO issued Species at Risk	MTO Best Management Practices for Species at Risk Protection During Maintenance Activities, 2017

	Species Act, 2007 and associated Regulations *O. Reg. 242/08 (General – Exemptions)* *O. Reg. 830/21 (Exemptions – Barn Swallow, Bobolink, Eastern Meadowlark and Butternut)* *O. Reg. 230/08, ESA (Species at Risk in Ontario List)*	No person shall damage or destroy species at risk habitat.	(SARA) permit (aquatic species at risk) MECP issued ESA permit (provincial species at risk) Ontario Regulation 242/08 or Ontario Regulation 830/21 exemption through self-registration for eligible activities and species	MTO Environmental Guide for Fisheries (Fish Guide) MTO Environmental Guide for Fisheries – Best Management Practices Manual (Fisheries BMPs) MTO Environmental Guide for Fisheries – Maintenance Works (Maintenance Guide) DFO Request for Review form Permitting under the *Species at Risk Act* MNR Rare Species Reporting Form Ontario Species at Risk Handling Manual * Policies and guidelines are updated on an as need basis and it is the duty of responsible agent to ensure that the use the appropriate most up to date policy.
Migratory Birds	*Migratory Bird Convention Act (MBCA), 1994.* *Migratory Bird Regulations, 2022* Canadian Wildlife Service. Incidental Take of Migratory Birds in Canada.	Protecting and conserving migratory birds — as populations and individual birds — and their nests. The Migratory Birds Regulations, 2022, improve the ability to effectively manage migratory birds in Canada. In particular, the regulation protects nests when they have a higher conservation value for migratory birds. The species and timelines listed in Schedule 1 of the regulation, whose nests are reused by migratory birds, continue to have year-round nest	Damage or Danger Permit may be issued if direct impacts to migratory bird nests cannot be avoided, and it is determined that an incidental take of a migratory bird nest is required. Such a permit must be carried at all times by the permit holder during the activity. *Note that some migratory birds may	Avoiding harm to migratory birds - Canada.ca Migratory bird permits - Canada.ca Fact sheet: Nest Protection under the Migratory Birds Regulations, 2022 - Canada.ca * Policies and guidelines are updated on an as need basis

	Environment Canada, 2014.	protection, unless they have been shown to be abandoned within the designated wait times.	also be species at risk.	and it is the duty of responsible agent to ensure that they use the appropriate most up to date policy.

5. Including *Phragmites* Treatment in Contract Documents

Areas of *Phragmites* that construction Contractors are to treat as part of a construction contract through spraying, cutting, or cutting and spraying shall be entered onto the Quantities – Miscellaneous 1 sheet in square meters by station location or GPS co-ordinates. Position information must clearly indicate the extent, by edge-of-pavement offset of each individual area to be treated. Offsets shall only be provided when they can be determined within 1 metre accuracy.

When the contract drawings include plans, the *Phragmites* locations shall be shown on Removal drawings, using different hatching symbols to denote areas to be treated by spraying; cutting; or cutting and spraying. For contracts that do not include Removal drawings, the area for *Phragmites* treatment shall be shown on the Location plan.

The type(s) of vegetation to be treated (i.e., *Phragmites*) shall be included in a table on the Removal drawing or Location plan by name(s) and number(s), with a number corresponding to the type of vegetation. In addition to *Phragmite*s, this approach may be followed for other invasive and noxious vegetation areas to be treated.

In the case that *Phragmites* management is being requested as a contract alteration (e.g., via a change order/variance request or scope change for contracts that are underway that did not include provisions for *Phragmites* management, or where a change to the specified approach to *Phragmites* management is being requested), the MTO Project Team or MTO Regional Maintenance shall identify the need for the change and support the request (e.g., by reviewing a change order/variance or scope change request, meeting with Service Providers to understand the request, etc.).

5.1 Special Provisions for MTO Contracts

Special Provisions for MTO contracts have been developed to provide consistent direction to Contractors when treating *Phragmites* or other invasive/noxious vegetation species by cutting and/or spraying and then managing the excavated soil containing *Phragmites*. Up to date specifications are located on MTO's Contract Preparation System (CPS). If you are unable to locate a copy, please contact MTO's EPO for further support.

The Project Team, including the Regional Environmental Planner should identify the need for inclusion of these contract provisions (including any project-specific modification requirements) during design phase.

5.1.1 Invasive and Noxious Vegetation Cutting and Spraying (ENVR0011)

Non-Standard Special Provision (NSSP) ENVR0011 for MTO contracts has been developed to provide consistent direction to Contractors on how to properly cut and spray invasive and noxious species including *Phragmites*.

NSSP ENVR0011 includes:

- Description of controlling the herbicide application, locations to be treated by herbicide spraying as specified in the Contract Documents, herbicides shall not be sprayed where invasive or noxious vegetation is located in standing water, or in environmentally sensitive areas as specified in the Contract Documents. Buffer zones as recommended on herbicide manufacturers' labels shall be maintained around these areas at all times.
- Description of controlling the spread, Soil from areas impacted by invasive and noxious vegetation shall not be stockpiled for reuse. Debris including earth clods and invasive and noxious vegetation material attached to the outside surfaces of the equipment is prohibited from entering the Working Area. Equipment coming on site shall be inspected as close to the site entrance as possible for debris, and if present debris shall be completely removed and shall be collected and managed as specified prior to the equipment proceeding to the Working Area.

5.1.2 Invasive and Noxious Vegetation Disposal and Burial

An NSSP for MTO contracts has been developed to provide consistent direction to Contractors on how to properly manage excavated soil containing *Phragmites* (see Section 6 for further information).

Some landfill sites are reportedly already refusing to accept excess soil containing *Phragmites*, so landfill disposal is not always viable.

- MTO should work to manage this material within the highway right-of-way where possible, or explore off-site treatment/management to minimize the amount going to landfill.
- The need and feasible locations for offsite disposal of *Phragmites*-impacted soils should be determined during design phase of a project.

5.2 Herbicide Spraying

Herbicides can be applied to a stand of *Phragmites* through a variety of methods, including spraying and wicking. Choosing an appropriate method will depend on the characteristics of the site, as well as the logistics of the overall management plan for the area. Because the approved herbicides are broad spectrum, meaning they are non-specific in their effects on other vegetation, it is important to target monocultures or stands that are composed mostly of *Phragmites*. Further, target application to the upper canopy, there by avoiding native vegetation growing in the understory. Even in lower density stands, the use of herbicides can be effective, since less chemical is needed to control a stand and native species often respond well once the *Phragmites* is successfully treated.

Spraying herbicides is effective for dense monoculture stands and spraying directly onto the leaves using high pressure is common, and a small backpack sprayer or a larger boom sprayer attached to an all-terrain vehicle (ATV) or similar vehicle may be used. Backpack spraying allows for targeted spraying and is effective in areas where a boom sprayer cannot easily gain access, and in mixed vegetation or previously treated stands. Larger sprayers effectively target dense stands in larger areas (the Contractor will decide when to use backpacks and hand-spraying versus a truck and a boom). When spraying, weather and wind conditions must be considered to limit any non-target drift to other plants or wildlife present in the area. All herbicide spraying shall be completed in specified areas in a manner that avoids vapour and/or physical drift of herbicides from coming into contact with vehicles travelling on the roadway.

The most effective time of year to spray herbicide to treat *Phragmites* is from late spring to early fall, due to fewer areas of water and the ability of the plants to translocate the herbicide better, resulting in more effective treatment outcomes. Earlier applications can be beneficial in preventing seed head formation. This ensures that with subsequent applications, the nutrients will go down the stem with the herbicide. Treatment should occur when plants are ~1.5 m tall with sufficient leaf surface, up until the first heavy frost. The Contractor shall refer to the herbicide label for instructions to ensure application methods and timing are accurate.

The Contractor shall maintain accurate records of all herbicide applications including:

a) Date
b) Highway number
c) Specified spraying location (e.g., station location or GPS co-ordinates)
d) Type of vegetation sprayed (e.g.,. *Phragmites*, Wild Parsnip, etc.)
e) Herbicide name, application rate, quantity and additives used
f) Square metres treated
g) Weather at time of spraying
h) Name of applicator(s) and their exterminator’s licence number; and
i) Any general comments relating to the herbicide spraying.

The Contractor shall supply this information to the Contract Administrator weekly. There is a legal requirement to create an annual pesticide report by the Pesticides Act. This report is to be completed and available by January of each year.

The Contractor must be Integrated Pest Management (IPM) accredited by the IPM Council of Canada to spray on the right-of-way. The Contractor is required to provide proof of a valid pesticide application license issued by the MECP for each worker who will operate any herbicide application equipment that will be used for the completion of the work to the Contract Administrator. All personnel operating such equipment must hold a valid exterminator's licence of the prescribed class (Land – Industrial Vegetation License), and that is IPM accredited by the IPM Council of Canada.

5.2.1 Herbicide Products

In North America, there are two active herbicide ingredients shown to be effective for treating *Phragmites*: glyphosate and imazapyr. Glyphosate is the active ingredient in most Roundup products, whereas Imazapyr is the active ingredient in most Arsenal products, however both are formulated into products under a range of common or brand names.

Roundup and Arsenal products can only be applied on dry land where surface water is not present. Dense stands of *Phragmites* may reduce the ability of the herbicide to reach the leaf surface, thereby impacting the efficacy of the herbicide. Combining herbicide treatment with additional management techniques (e.g. cutting) is recommended to reduce dead standing biomass, facilitate regeneration of native vegetation, and increase the effectiveness of management.

Management plans that combine the two herbicides can decrease costs while maintaining high levels of efficacy. Alternating application of herbicide active ingredients can decrease the chances of *Phragmites* developing resistance to one or the other herbicide. It is up to the Contractor to select which herbicide is used, as the Contractor is subject to the inspection and warranty requirements described below in Section 5.2.3.

Habitat Aqua is an Imazapyr product that is specifically formulated for aquatic site use and is discussed in Section 5.2.2 in further detail.

5.2.2 Spraying near Water

It is the Contractor's responsibility to visually check the spray sites for the presence of water in advance of spraying, to document these 'no spray' areas (e.g. water), and to have that information relayed to the spraying crew. All locations identified as having water present shall be reviewed on a weekly basis until the completion date to check for the presence of water.

If *Phragmites* site is within or near water, the onus is on the Contractor to follow all herbicide label directions. Typically, there is a 15-metre buffer near water, where no herbicide can be sprayed. The label may indicate if this can be reduced; for example, if a backpack sprayer is used.

Any areas that have water present throughout the life of the contract shall be deemed 'no spray' areas and shall not be subject to quality assurance inspections other than to verify that water is still present.

In 2021, Canada's Pest Management Regulatory Agency (PMRA) issued a decision statement granting registration for the sale and use of Habitat Aqua, containing Imazapyr, to control certain invasive plants including *Phragmites* that grow in and around aquatic sites. Best practices remain to adhere to timing windows. Application to aquatic sites will be made directly to the emerged parts of the plants rather than to the waterbody. Projects that intend to use Habitat Aqua to treat *Phragmites* in and around aquatic sites will require a permit from MECP under the Pesticides Act to perform an aquatic extermination. Additional authorizations may be required under the *Fisheries Act* and/or *Endangered Species Act*, depending on the location of work.

5.2.3 Inspection and Warranty

Inspection and warranty shall be in accordance with the contract documentation. Additional guidance is provided herein.

Equipment should be inspected by the Contract Administrator upon entry to or exit from the Working Area for evidence of *Phragmites* debris attached to the outside surfaces of the equipment (see section 7.1 Equipment Cleaning for more information).

All locations to be treated by spraying and/or cutting will be inspected by the Contract Administrator to verify that treatment has been completed as evidenced by plant necrosis for herbicide spraying and/or plant height for cutting, and that areas identified to have water present remain 'no spray' areas at Contract Completion or prior to winter shutdown.

Treatment of areas with herbicide spraying shall be deemed to be acceptable under the following conditions:

a) The Contractor has provided the Contract Administrator with complete and accurate records of all herbicide applications.

b) 30 Days after herbicide application, 100% of treated vegetation shows symptoms characteristic of herbicide necrosis.

When spraying has occurred too late in the season to confirm that expected results have been achieved within the duration of the warranty period, the warranty inspection will occur in the following year.

The warranty shall cover any defects in material and workmanship. The Contractor shall re-spray any treated area that is found to be unacceptable and that does not meet the expected results within the duration of the warranty period at the Contract Administrator's discretion.

Areas identified to be 'no spray' areas due to water at Contract Completion may be sprayed the following year, provided there is no water present. Aquatic herbicide applications may be considered for areas with the continued presence of water. All areas to be treated by herbicide spraying will be inspected by the Contractor Administrator at the specified timing interval. The Contractor shall receive written notification of any areas to be re-sprayed from the Contract Administrator.

In order to achieve eradication, it may be necessary to re-apply herbicide to *Phragmites* for at least three consecutive years. Due to the dense nature of the plant and because of the regeneration from seeds or other underground parts, repeat treatments on an annual basis may be necessary.

5.3 Cutting

Cutting can be used in conjunction with spraying to increase the effectiveness of herbicide treatment; to reduce further spreading by cutting off the seed head prior to flowering; to remove biomass where prescribed burning is not a viable option; or as a maintenance activity to restore sightlines and improve motorist visibility, or to gain access to an area of the right-of-way.

Phragmites shall be cut to a height of 30 cm or less. Cutting should be used in conjunction with spraying because it allows for increased efficacy of herbicide application due to the greater ability of the herbicide to reach the plants.

If cutting is used as a treatment method in conjunction with spraying, spraying should not take place until the cut *Phragmites* has regrown to a height of 1.0 m, but should be completed before it reaches a maximum height of 2.5 m. The height is more important than the actual date of cutting. Depending on the weather and conditions, the plant could grow faster or slower (i.e., every year is different).

Cutting should take place prior to seed head formation. This will reduce the spread of active seed and allow sufficient time for regrowth if spraying is required. After applying herbicides, any additional cutting should take place a minimum of three weeks after herbicide treatment, to allow for the active ingredient to translocate to the root system. Cutting is encouraged in the late fall after spraying to get dead stalks out of the way in larger dense stands enabling better treatment coverage of emerging growth the

following year. Spoils from cutting may be left on-site or disposed of in accordance with Section 6 below.

6. Management of Waste Material Containing *Phragmites*

When working in areas where *Phragmites* is present, care shall be taken to ensure excavated materials that contain seeds, stems, above and below-ground roots or root pieces are effectively managed to reduce the risk of spreading the plants within the right-of-way or to adjacent property.

An NSSP for MTO contracts has been developed (as noted in Section 5.2), to provide consistent direction to Contractors on how to effectively manage excavated soil containing *Phragmites* (e.g., earth or plant material from excavation). Some landfill sites are already reportedly refusing to accept excess soil containing *Phragmites* (i.e., landfill disposal of soils impacted with *Phragmites* may not always be possible). Disposal of excavated soil containing *Phragmites* may be accepted at Class 1 Soil Management sites where soil is treated prior to final placement. It is imperative to consider viable disposal options during the planning phase of a project/works.

Waste materials containing *Phragmites* are typically generated during the following activities:

- Cutting
- Ditch clean-out/ditching
- Earth excavation for culvert and bridge replacements
- Earth/ swamp excavation for platform widening or new construction
- Other construction or maintenance activities

For construction or maintenance activities where the excavated material contains *Phragmites* seeds, stems, above and below-ground roots or root pieces, a management strategy shall be developed during detail design or maintenance planning. When undertaking ditch clean-out/ditching in areas, the entire depth of excavated material shall be considered impacted with *Phragmites* (typically to a maximum depth of 1m).

When earth or low-lying and wetland excavation will take place in an area where *Phragmites* is present, the plant material, root mass and underlying soil shall be removed first as a separate operation and managed separately as per the contract requirements. The depth of the soil material considered to be impacted by *Phragmites* extends 0.25-0.3 metres below the bottom of the root mass.

Contractors shall provide a *Phragmites* Management Plan that addresses procedures including treatment and disposal methods, and equipment cleaning protocols.

When cutting *Phragmites*, it is acceptable to leave the cut plant stocks in place where they were cut. If it is necessary to remove the cuttings from the right-of-way, options include burial or treatment offsite at a *Phragmites* management location.

Soil from areas impacted by *Phragmites* shall not be stockpiled on site for reuse or managed as disposable fill on private property. Excavated *Phragmites* material must be securely contained, to ensure seeds or other viable plant parts do not escape while on route to the disposal site.

Other legislative requirements (e.g., Ontario Regulation 558/00 which regulated general waste management, Ontario Regulation 406/19 which regulates the management of excess soils, etc.) may apply. Conformance to all application legislative requirements must be included during the development of waste *Phragmites* materials.

6.1 Management by Burial Within the Right-of-Way

Material generated from earth ditch clean-out /ditching or excavation containing *Phragmites* may be buried in the right-of-way where site conditions are suitable. The assessment of appropriate site conditions and details on burial will be determined on a project specific basis during detail design and should be included as part of the Phragmites Management plan. When considering burial in the right-of-way as an option, the following should be assessed to determine if site conditions are suitable:

- A minimum cover of 1m of material with no *Phragmites* shall be placed on the buried *Phragmites* material in order to prevent regrowth. Placing a geotextile on top of the *Phragmites* material prior to backfilling with non-impacted soil will further impede any potential regrowth.
- *Phragmites* material should be buried in areas containing coarse dry soils, or granular material where there is less likelihood of regrowth.
- *Phragmites* should be buried as close to the source site as possible. Ensure the location for burial is not immediately adjacent to private property or any sensitive environmental receptors such as wetlands.
- Burial should take place in a location where the soils are already disturbed. Following burial, final cover should be applied (i.e., seed and cover or matrix) to prevent erosion and to stabilize the site.

As per MTO’s NSSP, when burying invasive vegetation, underlying soil and root mass;

- When burial is specified to occur below grade, the excavated invasive and/or noxious vegetation and underlying soil and root mass shall be placed in the excavation and covered with geotextile a minimum of 1.0 metre below original grade and backfilled with material from the excavation to meet original grade.
- When burial is specified to occur above grade, the excavated invasive and/or noxious vegetation and underlying soil and root mass shall be placed to a maximum depth of 1 metre and then covered with geotextile and 1.0 metre of earth according to OPSS 206 generated from within the Contract limits as specified in the Contract Documents. burial (1 metre)

6.2 Disposal as Non-Hazardous Solid Industrial Waste

When plant material and underlying soil and root mass must be removed from the site, it shall be managed as follows:

1) Treatment off site at a *Phragmites* management location.

2) Disposal at a certified landfill site or Class 1 Soil Management Site as a final option and only if the landfill will agree to accept it. This option will not be available starting in 2025. Some landfills are currently requiring bagging and special measures before they accept (at a higher cost), so it is important to confirm these requirements in advance of selecting this option. Class 1 Soil Management Sites may have treatment options available, including bioremediation (which involves the removal or neutralization of contaminants in the waste material).

The following documentation and information shall be provided to the Contract Administrator 2 Business Days prior to transportation of the waste to the waste disposal site:

a) A copy of the MECP Environmental Compliance Approval for a Waste Management System valid for transportation of non-hazardous solid industrial waste or, a copy of the Environmental Activity and Sector Registry confirmation for transportation of non-hazardous solid industrial waste; and

b) The address, location, and MECP Environmental Compliance Approval number of the waste disposal site or Class 1 Soil Management Site to which the waste is to be taken for disposal.

Copies of weigh bills and waste disposal receipts for disposal of the waste to the waste disposal site shall be provided to the Contract Administrator within two business days after transportation of the waste to the waste disposal site.

Vehicles used to transport material to a waste disposal site shall also be inspected for debris prior to leaving the Working Area. Any debris shall be removed and managed along with waste from the Working Area to be disposed of to a waste disposal site, and in a manner that prevents vehicles from coming into further contact with *Phragmites* within the Working Area.

Soil and other materials containing *Phragmites* shall be fully contained within the vehicle(s) being used to transport it such that none of the material can escape during transport.

7. Working in and around Phragmites

When working in, or around areas where *Phragmites* is present, appropriate steps shall be taken to prevent and stop the spread of the plant within the working area, or to areas outside of the working area.

- Avoid entering or passing through areas of *Phragmites* and locate staging areas and field offices in areas free of this species.
- Minimize soil disturbance whenever possible. *Phragmites* can easily establish in areas of disturbed soil.
- If erosion is occurring or if soil has been disturbed, seeding the area with a native seed mix is recommended as quickly as possible. As most areas of *Phragmites* are adjacent to the highway and graded in a way that may cause erosion. A strong cover material, such as bonded fibre matrix should be used with the native cover seed.
- Monitor recent work sites for the emergence of *Phragmites* for a minimum of three years after project completion, when possible. Herbicide application and re-application may be required for up to three years post eradication.

7.1 Equipment Cleaning

Equipment cleaning is necessary to prevent the spread of *Phragmites* from one area to another. This applies to equipment leaving an infested area and equipment entering a non-infested area may also require inspection and cleaning prior to entering a non-infested work site.

General guidelines for equipment cleaning include the following:

- Debris including earth clods and vegetation material attached to vehicles or equipment (including personal protective equipment such as work boots, protective clothing, etc.) shall not be brought into the Working Area and shall be prevented from leaving the Working Area.
- Upon entry, equipment (including personal protective equipment such as work boots, protective clothing, etc.) shall be inspected for debris as close to the site entrance as possible. Upon exit, equipment shall be inspected as close as possible to the infested area. The inspection is to look for *Phragmites* plant material and soil and seeds that may be lodged to interior and exterior surfaces. All debris shall be completely removed, collected, and managed along with other material (e.g., excavated soils) containing any traces of *Phragmites*.
- Acceptable methods of cleaning include but are not limited to high-pressure air, brushes, brooms, or other hand tools (used without water).
- Equipment (including personal protective equipment such as work boots, protective clothing, etc.) should be cleaned from sequentially, from the top of equipment to the bottom.

- Vacuuming the inside of vehicles is recommended to prevent plant material being spread to non-infested areas.
- Washing with water on-site is not recommended as wash effluent if uncontained, can release contamination of fuel or oil, and/or spread *Phragmites* in the run-off.
- Portable wash stations that capture wash effluent are not recommended due to the cost, the regulatory requirements to establish and operate, and the generation of a new waste product requiring disposal as liquid industrial waste.
- For more information regarding the 'Clean Equipment Protocol for Industry' please see this link: https://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf

8. Revegetation after *Phragmites* Management

It is important to provide vegetative cover to the areas treated as soon as it has been determined that the area is clear from future *Phragmites* growth. It is an aggressive plant that will spread or return if no new cover is created. It typically outcompetes most perennial grasses and woody plants due to its allelopathic nature. However, there is evidence that some specific plants are able to survive adjacent to *Phragmites*.

Any strategy to protect and restore the natural environment should focus on using an Ecosystem Approach. An ecosystem approach for an invasive plant management strategy aims to minimize disturbances and emphasises maintenance of genetic and species diversity in functioning native plant ecosystems, since they are more resilient to invasive species.

Some herbicides used in the treatment of *Phragmites* can impact the surrounding vegetative community, which may create an ideal condition for new invasive plants to move in. In some areas native plants will return naturally after treatment. In these cases, there are enough native plants to re-vegetate newly cleared areas through seed germination or plant spread. However, other areas may require restoration through selective seeding and/or other methods to reduce the risk of soil erosion and re-invasion by non-native plants. The management plan should include steps for restoring areas where invasive plants have been removed and areas where invasive plants could pose a problem in the future.

Some examples of restoration methods include:

- Natural colonization or succession.
- Seeding with desirable native grasses/herbaceous species.
- Planting appropriate trees and shrubs.

MTO does have anecdotal evidence that there are several plants that can thrive and survive adjacent to *Phragmites.* We are presently investigating the use of native seed mixes, pollinator species, or specialized seed mixes in areas where plants have been eradicated. Some native tall-grass prairie species can perform well in poor quality soils. The deep root systems provide excellent long-term erosion prevention and soil stability,

and some species tolerate drought and high salt concentrations. They add organic matter to the soil, making it more absorbent and these species can outgrow *Phragmites*. An added benefit is that tall-grass prairie species also capture and hold drifting snow promoting safety along MTO's highways. Sites must be carefully reviewed to determine which methods are best and will not inhibit the function of the area (e.g., ditches).

There are also some woody plants that may mitigate the spread of *Phragmites* from one area to another. These species include Staghorn Sumac (*Rhus Typhina)* and Dogwood (*Cornus spp.)*. However, these plants are not suitable for use in any ditch or swale conditions as they would block the flow of water.

This document will be updated when more information is available on these initiatives.

9. Future of *Phragmites* Management

MTO takes an active role in the evolving field of invasive species control. Participation in multi-stakeholder groups (e.g., the Great Lakes Commission's Great Lakes Phragmites Collaborative, Ontario Inter-Ministerial Invasive Species Working Group, the Highway Infrastructure Innovations Funding Program, etc.) keeps MTO abreast in cutting edge developments in the management of invasive species.

As additional management practices become available, MTO will evaluate their usefulness and adopt them as appropriate. Additional management practices may be communicated in revisions to this document or as standalone communications.

10. Conclusion

Phragmites is a threat to Ontario's highway infrastructure. It is also a negative influence on the surrounding landscape. With proper treatment, management and follow-up techniques it is possible reduce the spread and impacts of this invasive plant. These best management practices will be updated based on new information as it becomes available. It is intended to provide guidance to all ministry staff and Service Providers to help limit the spread of *Phragmites* along MTO's highways.

11. References:

1. Cleland, Eric, McFarlane, Mhairi, Gilbert, Janice and Chua, Francis. 2021. Invasive Phragmites – A Strategic Framework for Coordinated Management in Ontario. Green Shovels Collaborative. Sault Ste. Marie, ON.

2. Halloran, Joe, Anderson, Hayley and Tassie, Danielle. 2013. Clean Equipment Protocol for Industry. Peterborough Stewardship Council and Ontario Invasive Plant Council. Peterborough, ON.

3. Howell, Graham. 2017. Best Management Practices for Invasive *Phragmites* Control - A thesis presented to the University of Waterloo in fulfilment of the thesis requirement for the degree of Master of Science in Biology. Waterloo, Ontario.

4. Nichols, Gabby. 2020 (updated 2024). *Phragmites* (*Phragmites australis*) Best Management Practices in Ontario: Improving species at risk habitat through the management of *Phragmites*. Ontario Invasive Plant Council, Peterborough, ON.

5. Ontario Invasive Plant Council, Invasive Phragmites – Best Management Practice Technical Document for Land Managers, Ontario Invasive Plant Council, Peterborough, ON. Version 2024.

6. Ontario Ministry of Natural Resources, *Phragmites* – Best Management Practices, Ontario Ministry of Natural Resources, Peterborough, Ontario. Version 2011.

7. TBT Engineering Limited, 2021. Northwest Regional *Phragmites* Investigations Summary Report, Prepared for the Ontario Ministry of Transportation.

Appendix A: Identification of Native and Invasive *Phragmites*

Some identifying characteristics that may help tell the species apart are:

Table A1: Identifying Native vs. Invasive *Phragmites*

	Native *Phragmites americanus* (Figures A1 and A3)	***Phragmites australis* (Figure A2 and A4)**
Stand Height	No taller than 2 metres	Up to 5 metres
Stand density	Sparse, interspersed with native vegetation	Dense monoculture, can be up to 100% *Phragmites*
Stem colour	Reddish-brown	Beige, dull tan
Stem texture	Lower internodes, smooth and shiny	Rough and dull
Stem flexibility	High flexibility	Rigid
Leaf colour	Yellow-green,	Blue-green,
Leaf sheaths	Leaf will fall off in fall-winter, easily removed, thick ligule	Remain attached after growing season, difficult to remove, thin ligule
Flower timing	Early (July–August)	Intermediate (August-September)
Seedhead density	Low Density, Sparse, small, short	High Density, large, long, purplish-red

Photos provided below depict the differences between native and invasive *Phragmites.*

Figure A1. View of Native *Phragmites* stems. Please note the red coloured stems and the yellow-green coloured leaves. (Photo courtesy of MTO Environmental Delivery Northwest)

Figure A2. View of Invasive *Phragmites* stand. Please note the dense stand and beige coloured stems. (Photo courtesy of MTO Environmental Delivery Northwest)

Figure A3. View of Native *Phragmites* seedhead. Please note how sparce the seedhead is and the low density of seeds. (Photo courtesy of MTO Environmental Delivery Northwest)

Figure A4. View of Invasive *Phragmites* seedhead. Please note how dense the seedhead is and the large number of seeds. (Photo courtesy of MTO Environmental Delivery Northwest)

Appendix B: Excerpt from MTO's Best Management Practices Manual for Species at Risk Protection During Maintenance Activities – Vegetation Management.

VEGETATION MANAGEMENT

To avoid or minimize impacts to species at risk and their habitat using this BMP process, there are three (3) BMPs to consider:

- Standard BMP for Screening the Work Area for Species at Risk and Habitat; and
- Standard BMP For All Maintenance Activities; and
- Activity BMP: Vegetation Management (below).

1 SCOPE

This BMP applies to vegetation management within work areas that contain provincial species at risk.

Vegetation management may include the following activities:

- Mowing to maintain clear sightlines
- Weed control
- Brush control and tree and shrub maintenance
- Tree removal
- Ground cover rehabilitation

Vegetation management does not include:

- Activities undertaken purely for aesthetic purposes

2 ADDITIONAL REFERENCES – Not Used

3 MAINTENANCE PROCEDURES

It is important to exercise caution when proceeding with work in areas that may contain species at risk to avoid or minimize impacts to species.

Likely Impacted Species at Risk Groups

Birds (Ground, Tree, and Shrub Nesters); Mammals (Bats); Mosses, Lichens, and Vascular Plants; Snakes and Lizards; Turtles.

- Ground-nesting birds may be seen in grasses, shrubs, or open areas within the right-of-way where they may be nesting or foraging. Some species of birds are drawn to roads to feed on prey such as insects or carrion. This may increase the likelihood of interactions with vehicles on the road surface or within the right-of-way.
- Roosting bats and maternity colonies, and some nesting bird species, may be attracted to trees for nesting or roosting and may be impacted by tree removal.
- Mosses, lichens, and vascular plants may be present in the highway right-of-way and may be impacted by use of machinery, materials, and by human presence (e.g. boots on the ground). Mosses, lichens, and vascular plants growing alongside a road may also be impacted by activities which alter drainage and water movement, increase soil erosion and dust, and alter the light regime.
- Snakes and lizards can be found undertaking life processes in a variety of areas near roadways (e.g. open woodlands, small wetlands) which is dependent on the individual species.
- Turtles can be found nesting and hibernating in and around waterbodies, in the soft material found in road embankments, and road shoulders. They may also be seen crossing roads in search of mates, food, and nest sites.

Potential Impacts to Species at Risk

- Disruption of species during times the species are likely to be carrying out a life process related to hibernation, reproduction, and rearing.
- Physical impacts from use of machinery on land (e.g. mowing) may pose a risk to individual species, their habitat, and nesting sites. Risk increases during peak species movement times and nesting periods.
- Work in areas that may provide habitat (e.g. shrubs, branches) may be damaged or destroyed and may impact species that could be occupying such areas.
- Introduction of non-native species into seed mix which may out-compete native vegetation or impact food and habitat availability for species.

Operational Constraints and Protection Measures

Review the ‘Standard BMP for All Maintenance Activities’ for standard best practices that are applicable to the work, including species at risk encounter protocols and process documentation requirements.

Timing of Work

- Work should be scheduled to avoid times that species are likely to be carrying out a life process related to hibernation, reproduction, and rearing.
- For mowing, brush control, tree maintenance, and shrub maintenance activities, where operationally feasible, schedule work to occur at the following times (see ‘timing of work window’ table).

Timing of Work Window – Mowing, Brush Control, Tree and Shrub Maintenance		
Species / Region	Ground, Tree, and Shrub-Nesting Birds	Turtles, Snakes, and Lizards
West	September 16 – May 14	July 11 – April 14
Central	September 16 – May 14	July 11 – April 30
East	September 16 – May 14	July 11 – April 30
Northwest	August 2 – May 14	No protected species.
Northeast	August 2 – May 14	July 11 – April 30
The SARO List is amended from time to time which may result in changes to the timing of work window. These timing of work windows are current as of October 2016. There is no timing of work window for species at risk mosses, lichens, and vascular plants.		

- For tree removal activities, where operationally feasible, schedule work to occur at the following times (see 'timing of work window' table).

Timing of Work Window – Tree Removal		
Species / Region	Bats	Ground, Tree, and Shrub-Nesting Birds
West	October 1 – April 30	September 16 – May 14
Central	October 1 – April 30	September 16 – May 14
East	October 1 – April 30	September 16 – May 14
Northwest	October 1 – April 30	August 2 – May 14
Northeast	October 1 – April 30	August 2 – May 14
The SARO List is amended from time to time which may result in changes to the timing of work window. These timing of work windows are current as of October 2016. There is no timing of work window for species at risk mosses, lichens, and vascular plants.		

- If work can be scheduled during the timing of work window, impacts to species can be avoided. Document that the activity will take place during the timing of work window and begin the activity.
- If work cannot be scheduled during the timing of work window, work may proceed if work modifications are applied. Document the reasons the activity must take place at that time (e.g. the risk to human health or safety) and proceed with work modifications.

Work Modifications

- Mow to a minimum height of 20 cm to prevent harm to species.
- Apply the 'Standard BMP for All Maintenance Activities' where applicable.