

FAQs: Common Reed (*Phragmites australis*) management with Glyphosate at Grenadier Pond

What is an invasive species?

Invasive species are non-native species that out-compete native species and invade and disrupt the ecosystems they colonize.

What is European Common Reed (*Phragmites australis*)?

European Common Reed, commonly known as Phragmites, is an invasive perennial grass that was transported from Eurasia for ornamental use and is causing severe degradation to wetlands, shorelines, waterways and beaches in North America.

Why does it need to be managed?

Phragmites invades wet or moist areas and threatens biodiversity. It thrives in disturbed habitats and is often one of the first species to colonize a new area.¹ The last few decades have seen a noticeable increase in Phragmites populations where monocultures are common (where nothing grows except Phragmites). Phragmites changes the biochemistry of the soil by releasing toxins from its roots, thus stopping the growth of neighbouring plants.² It can lower water levels and change nutrient cycles in wetlands.³ It forms dense stalks that create a wall around wetlands and decreases the area for native plants, thus reducing habitat for wetland birds, amphibians and reptiles.⁴ It also greatly affects human enjoyment of wetlands, beaches and waterways by obstructing access and views, and it affects property values.⁵

Phragmites reproduces by dispersing seeds (approximately 2000 seeds/head) through water, air, animal movement, and through human actions (horticultural trade, salt use on roads and trails) and equipment movement (boats, trailers, and heavy machinery). In addition to seed dispersal, Phragmites has an intricate system of roots and rhizomes under the ground which allows it to spread easily and aggressively (approximately 200 stems/m²).⁶ This enables it to regenerate quickly because most management efforts only target the part of the plant that is above ground.⁷ Considering this, Phragmites, like all invasive plants, is difficult to eradicate once it has become established.

Why manage Phragmites at Grenadier Pond? What should I expect to see?

¹ Ontario Ministry of Natural Resources. *Invasive Phragmites – Best Management Practices*. 2011. Ontario Ministry of Natural Resources.

² Ibid.

³ *Invasive Species Control: Phragmites*. 2017. <http://conservationhamilton.ca/wp-content/uploads/sites/5/2017/01/Invasive-Species-Management.pdf>

⁴ Sargeant, H. *Chemical Control of Invasive Phragmites and the Seedbank*. Retrieved on September 5, 2018 from <https://georgianbayforever.org/2016/04/11/2204/>

⁵ Isley, P., Nordman, E.E., Howard, S., Bowman, R. *Phragmites Removal Increases Property Values in Michigan's Lower Grand River Watershed*. 2017. *Journal of Ocean and Coastal Economics*, 14 (1): Article 5.

⁶ Ontario Ministry of Natural Resources, *Invasive Phragmites – Best Management Practices*, Ontario Ministry of Natural Resources, Peterborough, Ontario. Version 2011. 15p

⁷ Sargeant, H. *Chemical Control of Invasive Phragmites and the Seedbank*. Retrieved on September 5, 2018 from <https://georgianbayforever.org/2016/04/11/2204/>

Grenadier Pond is an important aquatic system both for the natural environment and for the local community. It provides habitat for a wide variety of wildlife and is treasured by area residents, as well as tourists. The invasion of Phragmites into terrestrial and aquatic areas decreases the pond's value to wildlife and hampers human enjoyment of the area. Working with the City of Toronto, TRCA will develop a long-term management strategy for Grenadier Pond that will see the control of Phragmites over the next 3 to 5 years. We do not expect to completely eradicate Phragmites, but we expect to reduce the number and density of the plant so that the shoreline and wetland areas can be successfully restored to native plant communities. Over the long-term, regular Phragmites control will be required, but the extent and duration of this control will be drastically reduced from where we are today.

In 2018, TRCA will control only the Phragmites that grows in the terrestrial or dry area of the pond shoreline. We will let the stems remain throughout the winter to reduce effects of erosion and to provide habitat for wildlife. In spring 2019, we will return to knock down the dead stems and you should see fewer Phragmites stems in the treated areas. Removing the dead stems is required because they can still remain standing for 2-3 years and the removal allows native species to re-establish. In the fall of 2019, we will return to re-treat the terrestrial areas and undertake Phragmites control in the aquatic areas. Treatment of the Phragmites in the aquatic areas requires a permit from the Ministry of Environment, Conservation and Parks, as well as the use of special application techniques to avoid entry of glyphosate into the water.

These treatments will be repeated in subsequent years until the coverage and density of Phragmites has been sufficiently reduced to allow for wetland and shoreline restoration (estimated between 3-5 years). During this process, we will see a significant decrease of the Phragmites population, but we understand that managing Phragmites will be a long-term process. We will implement additional removal techniques that work on a smaller scale (i.e. spading) once the bulk of the Phragmites has been removed. The continuous use of these manual techniques, even after the 5 year timeline, will help to ensure that the Phragmites population is kept at bay and that native communities are able to thrive.

What is glyphosate?

Glyphosate is a non-selective systemic herbicide that is applied directly to plant foliage.⁸ Glyphosate, the active ingredient in Roundup, is the most widely used herbicide in Canada for controlling many weeds and toxic plants.⁹

How does it work?

Plants exposed to glyphosate display stunted growth, loss of green coloration, leaf wrinkling or malformation, and tissue death. Death of the plant may take from 4 to 20 days to occur.^{10,11}

⁸ Tomlin, C. D. S. *The Pesticide Manual: A World Compendium*, 14th ed.; British Crop Protection Council: Hampshire, UK, 2006; pp 545-548.

⁹ *Glyphosate labels to change, Health Canada announces.* (2017, April 28). Retrieved September 20, 2018, from CBC: <https://www.cbc.ca/news/health/glyphosate-1.4091495>

¹⁰ Vencill, W. K. *Herbicide Handbook*, 8th ed.; Weed Science Society of America: Lawrence, KS, 2002; p 231-234.

¹¹ Franz, J. E., Mao, M. K., Sikorski, J. A. *Glyphosate: A Unique Global Herbicide*; American Chemical Society: Washington, D.C., 1997; pp 521-527, 604-605, 615.

As a non-selective herbicide glyphosate moves systemically through the plants once it has entered the waxy leaf cuticle. However, since it is highly water soluble, it doesn't penetrate waxy cuticles well and requires the use of a surfactant (a detergent) to support the transfer across this protective barrier.¹² Once inside of the plant, glyphosate kills plants by inhibiting a specific enzyme that allows plants to make amino acids.¹³

How long does it take Glyphosate to break down in the soil?

Glyphosate's persistence in soil is highly dependent on soil and climate conditions; however studies have determined that glyphosate residues rapidly dissipated within 10 to 12 days after application.¹⁴ Glyphosate degrades primarily through soil microbial action, and its residues are expected to be immobile in soil because it is very strongly bound to organic matter and clay particles in soils.^{15,16} Glyphosate is therefore deactivated by soils and does not have the ability to control plants sprouting from seeds in the soil seed bank or from roots or rhizomes of untreated plants.

Why is the TRCA using glyphosate?

Herbicides are one of the most effective tools to control invasive plants. TRCA oversees the application of glyphosate by contractors for the purpose of removing invasive plant species, including Phragmites. Specifically, TRCA uses "Roundup WeatherMAX® With Transorb2 Technology Liquid Herbicide" at strategic locations with a heavy presence of invasive species where reasonable control can be achieved. All environmental and safety restrictions and precautions are followed during the application of the herbicide to ensure its safe use.

Chemical control of invasive plants is often the only effective means of eradication in large areas. Removing Phragmites by hand, especially in areas with established, dense populations, is not feasible as the plant reproduces through its roots and rhizomes. Every part of the plant must be removed to ensure it does not grow back, which is very difficult to achieve without extensive disturbance of the shoreline and wetland.¹⁷ Glyphosate that is applied to Phragmites in the fall will move to the plant's roots and kill the plant.¹⁸

Has similar work been done before?

Several parks and natural areas in Southern Ontario have successfully controlled Phragmites with

¹² Thompson, D.G., Pitt, D.G. 2011. *Frequently Asked Questions (FAQs) On the Use of Herbicides in Canadian Forestry*. Frontline: Forest Research Applications. Technical Note No. 112. Natural Resources Canada. Retrieved September 20, 2018 from <http://www.cfs.nrcan.gc.ca/pubwarehouse/pdfs/32344.pdf>

¹³ Ibid.

¹⁴ Thompson, D. G., Pitt, D. G., Buscarini, T. M., Staznik, B., Thomas, D. R. *Comparative fate of glyphosate and triclopyr herbicides in the forest floor mineral soil of an Acadian forest regeneration site*. Canadian Journal of Forest Research. 2000, p 1814.

¹⁵ Roberts, T. R. *Metabolic Pathways of Agrochemicals – Part 1: Herbicides and Plant Growth Regulators*; The Royal Society of Chemistry: Cambridge, UK, 1998; pp 396-399.

¹⁶ *Reregistration Eligibility Decision (RED): Glyphosate*. September 1993. Environmental Protection Agency. Retrieved September 20, 2018 from https://www3.epa.gov/pesticides/chem_search/reg_actions/reregistration/red_PC-417300_1-Sep-93.pdf.

¹⁷ *Invasive Species Control: Phragmites*. 2017. <http://conservationhamilton.ca/wp-content/uploads/sites/5/2017/01/Invasive-Species-Management.pdf>

¹⁸ Ibid.

the use of glyphosate. In 2015, the Royal Botanical Gardens and Hamilton Conservation Authority sprayed 7700m² of Phragmites at the Cootes Paradise wetland. The following summer, 85% of the treated Common Reed was destroyed.¹⁹

Wetlands in Rondeau Provincial Park and the Long Point region were overtaken by Phragmites. Ducks Unlimited, the Ministry of Natural Resources and Forestry, and the Nature Conservancy of Canada teamed up to spray over 1500 hectares of Phragmites, which resulted in a success rate of over 80%.²⁰

The key to success is collaboration. Organizations and working groups must come together to bring the Phragmites issue forward and increase public awareness. By sharing knowledge and effective techniques and putting forth joint efforts, they can help eliminate the invasive species and save our wetlands and shorelines.

Are there non-chemical alternatives to herbicides?

Across the country, scientists have tested alternatives to herbicide use including natural regeneration, mulch mats, bio-controls and grazing livestock.²¹ Unfortunately, these techniques do not work as well as modern herbicides like glyphosate in terms of effectiveness, reliability, cost and environmental reliability.²²

Even if alternatives are more costly and maybe don't work as well as herbicides, wouldn't it still be better to use them because they are safer?

All options carry some sort of risk to either the environment or to humans. The technique of mechanical site preparation with large machinery can cause harm to wildlife, soil compaction, increased erosion, excessive burning of fossil fuels, and often still result in Phragmites invasion due to disturbance.²³ Prescribed burns as a technique for removal are challenging to successful complete in wet areas.

With herbicide use, the risks are known and are thus regulated by measures that are put into place to mitigate the effects of these risks. This includes buffer zones, signage, and advanced application techniques to optimize targeting and reduce the potential of non-target application.²⁴

What are the Best Management Practices? What techniques are used? When will spraying occur?

Best management practices are designed and used so that exposure levels are at a minimum. Application rates, techniques and mitigation strategies are specifically outlined so that exposure levels for wildlife are below toxicological effect thresholds, while also ensuring that the herbicide

¹⁹ Ibid.

²⁰ *Fighting Back Against Invasive Phragmites*. (23 February 2018). Ducks Unlimited Canada. Retrieved September 20, 2018 from <http://www.ducks.ca/stories/partnerships/fighting-back-invasive-phragmites/>

²¹ Thompson, D.G., Pitt, D.G. 2011. *Frequently Asked Questions (FAQs) On the Use of Herbicides in Canadian Forestry*. Frontline: Forest Research Applications. Technical Note No. 112. Natural Resources Canada. Retrieved September 20, 2018 from <http://www.cfs.nrcan.gc.ca/pubwarehouse/pdfs/32344.pdf>

²² Ibid.

²³ Ibid.

²⁴ Ibid.

is effective for the objectives. In Ontario, herbicide storage, use, transport, and sale is regulated under the Pesticides Act and Regulation 63/09.

Best management practices include:

- Appropriate application techniques and personal protective equipment (PPE)
 - Posting signage at least 24 hours before application to inform the public that there is restricted entry to the sprayed area for 12 hours after application.
 - During mixing, loading, application and cleanup, wear long-sleeved clothing and chemical-resistant gloves. Wear safety glasses or a face shield to avoid eye contact.
 - Spray buffer zones are required as per the Health Canada Pest Management Regulatory Agency (PMRA) to protect non-target terrestrial and aquatic habitats.²⁵ This includes a vegetative strip between the treatment area and the edge of a body of water.
 - Glyphosate will be applied by using a spot spray technique; only the harmful, invasive plants will be targeted and all other native plants will not be spot sprayed.

- Application in the fall season (mid-September to October)
 - Wetlands have lower water levels, so there is a larger area of the plants that are out of the water and able to be sprayed.
 - Most native plants have stopped growing and will not be affected by the herbicide.
 - Phragmites is still active in the fall as it pulls energy into its root system. Thus, it is vulnerable to glyphosate and will transfer the herbicide to its root and kill it.

- Application only occurs when weather conditions are favourable
 - Application should be avoided during rain events to increase effectiveness.
 - It is important to wait a few days after a rain event before application near wetlands in order to let the water levels decrease to normal.
 - Application should be avoided during high winds and unfavourable wind directions cease to eliminate the potential for drift.

Can Glyphosate Affect the Environment? Can it Harm Wildlife?

Glyphosate does not pose a significant risk of direct acute or chronic toxicity to terrestrial wildlife species. Indirect, but temporary effects may result from the change in vegetation or food availability depending on species' habitat preferences. At Grenadier Pond this is expected to be negligible in 2018 since only small areas of terrestrial Phragmites will be controlled. Due to the small area being treated and application timing (migration of reptiles and amphibians out of the area), no direct impact of the herbicide to aquatic wildlife is expected.

Buffer zones are used to delineate terrestrial habitats from aquatic ones. The herbicide application at Grenadier Pond in fall 2018 will be strictly terrestrial, with a buffer zone in place to prevent any runoff of glyphosate to aquatic areas and to non-target plants. A multi-year management strategy for Grenadier Pond will improve this ecosystem for native plants and local wildlife populations such as turtles, and enhance human enjoyment of the area.

²⁵ Tomlin, C. D. S. *The Pesticide Manual: A World Compendium*, 14th ed.; British Crop Protection Council: Hampshire, UK, 2006; pp 545-548.

Can Glyphosate Affect Human Health?

Pesticides are registered for use in Canada only if the level of exposure to Canadians does not cause any harmful effects, including cancer²⁶. Currently, no pesticide regulatory authority in the world, including Health Canada, considers glyphosate to be a carcinogenic risk of concern to humans²⁷.

Potential exposure to glyphosate can occur through food and water, by entering treated sites, or when handling and applying products that contain the herbicide. Dietary risks from food and water are not of concern as there were found to be no adverse health effects for the general population and all subgroups including infants, children, teenagers, adults and seniors.²⁸

If a person without PPE enters recently treated sites, there are no risks concerning skin contact or inhalation. There are also no concerns for handlers or applicators as long as the precautions and directions for use on original product labels are followed.²⁹

Based on the weight of available scientific evidence, several regulatory and independent scientific review panels conclude that glyphosate is non-carcinogenic, does not cause birth defects or genetic alterations, and does not act as an endocrine disruptor in whole animal systems under realistic exposure regimes.^{30 31} Glyphosate itself is poorly absorbed via dermal penetration through skin tissues³² or across membranes in the digestive tract, which inherently limits the potential dose to other critical body organs and tissues.

What are the first aid treatments if I am exposed to glyphosate?³³

If swallowed: Call a poison control centre (1-800-268-9017) immediately for treatment advice. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give any liquid to the person. Do not give anything by mouth to an unconscious person.

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15–20 minutes. Call a poison control centre for treatment advice.

²⁶ *Glyphosate labels to change, Health Canada announces.* (28 April 2017). CBC. Retrieved September 20, 2018 from <https://www.cbc.ca/news/health/glyphosate-1.4091495>

²⁷ Ibid.

²⁸ Ritter, L. *Glyphosate: Summary of the Pest Management Regulatory Agency Proposed Re-evaluation Decision.* 2015.

²⁹ Ibid.

³⁰ Williams, G. M., Kroes, R., Munroe, I. C. *Safety evaluation and risk assessment of the herbicide Roundup and its active ingredient, glyphosate, for humans.* Regulatory Toxicology and Pharmacology, 2000, 31:117-165.

³¹ Mensink, H. *Environmental health criteria 159-glyphosate.* World Health Organization, 1994; Geneva, Switzerland. Retrieved September 20, 2018 from <http://www.inchem.org/documents/ehc/ehc/ehc159.htm>

³² Durkin, P.R. 2003. Glyphosate - Human health and ecological risk assessment report. Syracuse Environmental Research Associates Inc. March 1, 2003 Contract No.: SERA TR 02-43-09-04a.

³³ Ibid.

If inhaled: Move person to fresh air. If person is not breathing, call 911 then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control centre for further treatment advice.

If in eyes: Hold eye open and rinse slowly and gently with water for 15–20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control centre for treatment advice.

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