Summary Monitoring Plan for the Emergency Use Registration Phragmites Control Project - 2019

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Ontario Parks, Southwest Zone

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1.0 Introduction

Phragmites (*Phragmites australis* (Cav.) Trin. Ex Steud) is an invasive plant within the coastal wetland marshes at Rondeau and Long Point, which is impacting numerous species at risk and threatening the ecological integrity of these critical habitats. Phragmites is a perennial grass that forms dense mono- specific stands, growing to heights exceeding five metres, with an extensive underground network of roots and rhizomes.

To address the continued and exponential growth of Phragmites in wet areas in Rondeau Provincial Park and the Long Point region (includes Long Point, Turkey Point and Big Creek Watershed), the Ministry of Natural Resources and Forestry (MNRF) was approved by Health Canada's Pest Management Regulatory Agency for an Emergency Registration)as a pilot project to allow for application of an herbicide (Roundup Custom ® For Aquatic & Terrestrial Use Liquid Herbicide (active ingredient - glyphosate)) in wet areas. Between 2016 and 2018, approximately 1250 ha of Phragmites have been addressed at Long Point (~1130 ha) and Rondeau Provincial Park (~120 ha) as part of the emergency registration. In 2016 and 2017, aerial herbicide application by helicopter was the primary method of application to access the remote terrain of these coastal wetlands and treat large infestations of Phragmites. In 2018, control work shifted primarily to ground based herbicide applications to address low density regrowth, and smaller populations, or sites that were unsuitable for aerial application.

In 2019, the Ministry of Natural Resources and Forestry (MNRF)in collaboration with the Ministry of Environment, Conservation and Parks (Ontario Parks), Canadian Wildlife Service and the Nature Conservancy of Canada will be continuing ground herbicide treatments within aquatic habitats at Rondeau and Long Point area) between mid-August and the end of October. This work builds upon previous and on-going Phragmites control efforts that have been undertaken at the two sites in terrestrial habitats, prior to 2016.

Glyphosate (N-(phosphonomethyl) glycine) is a broad-spectrum systemic herbicide that has been registered by the U.S. Environmental Protection Agency since 1971 for use in aquatic environments. It is very effective for the control of perennial weeds, such as Phragmites, because it is quickly translocated from the leaves of treated plants to other parts of the plant, including rhizomes and tubers. Its use as an aquatic herbicide in

wetland restoration initiatives within the Great Lakes basin has been well documented, with large scale treatments resulting in significant reductions in Phragmites and increased plant biodiversity (Getsinger et. al. 2006, Ailstock et. al. 2001, Teal and Peterson 2005, Lombard et, al. 2012, Back and Holomuski 2008).

Glyphosate is a valuable tool within ecosystem restoration initiatives because it is relatively nontoxic to fish and wildlife (its mechanism of action is specific to plants (Tu et al. 2001)) and it adsorbs strongly to soil particles once it enters the water, thus preventing excessive movement in the environment (Schuette 1998). In water, the two primary means of dissipation are binding to sediments and microbial breakdown. Glyphosate is readily degraded to aminomethylphosphoric acid (AMPA) by soil microbes and carbon dioxide. AMPA is non-toxic and degrades microbially more slowly than its parent compound (Tu et al. 2001). There is a significant body of literature that indicates that the risk to aquatic organisms from the use of glyphosate in wetlands and overwater situations is negligible or very small (Solomon and Thompson 2003).

To minimize the amount of herbicide required for the application, the addition of a non-ionic adjuvant is required. An adjuvant is a molecule or compound that reduces the surface tension of water, enabling the herbicide to wet and penetrate the leaf foliage. The pilot project will use the adjuvant Aquasurf® in combination with glyphosate. The adjuvant to be used by MNRF for the pilot project is prescribed on the glyphosate label and has been approved by PMRA based on its low environmental risk. Aquasurf® is already registered and classified for use in Canada and Ontario respectively.

2.0 Monitoring

2.1 Objectives

Although the pilot project's proposed use of glyphosate in aquatic habitats for control of Phragmites is not unique in the United States, it is a novel approach in Canada. As such, the results of this pilot project may inform similar control initiatives in the future within Ontario, and Canada. MNRF has partnered with the University of Waterloo and other partners (including the Nature Conservancy of Canada, and Bird Studies Canada) to monitor and analyse the following, as part of the pilot project:

1. Efficacy of the herbicide treatment in eradicating Phragmites;

2. Effects of the control activity on sensitive emergent coastal marsh vegetation communities;
3. Effects of the control activity on fish and fish habitat;
4. Fate of glyphosate, AMPA and the adjuvant at the treatment sites, and their dispersal from treatment sites; and risks to aquatic biota and the wetland food-web.
5. Glyphosate concentrations in surface water samples adjacent to community of Long Point, Turkey Point and residences near the outlet of Big Creek

2.2 Monitoring Summaries

To address the five monitoring objectives identified above, a suite of approaches will be required. What follows below is a brief outline of the proposed monitoring techniques. Detailed methodologies for some aspects of the monitoring program are available upon request within Appendices A, B, C and D, which have been prepared in collaboration with partners including the University of Waterloo and the Canadian Wildlife Service.

2.2.1 Herbicide Treatment Efficacy

This monitoring will address monitoring objective #1 (Monitor the efficacy of the herbicide treatment in eradicating Phragmites). Twenty plots within treatment sites and 20 control plots were established at both Long Point's Crown Marsh and Rondeau Provincial Park in August 2016 prior to aerial herbicide application in September 2016. These sites were selected to include both medium and high density Phragmites patches and were evaluated post-treatment in 2017 and 2018 and will be resampled in 2019 and 2021, to determine mortality and/or survivorship of Phragmites as well as the recovery of desirable native species. In 2018, an additional 40 monitoring plots were established in Long Point Crown Marsh within ground treatment sites to enable comparison of efficacy with the aerial treatment sites (from 2016 and 2017). The methodology for implementation is outlined in Appendix A. A similar protocol for assessment of efficacy is being initiated by the Canadian Wildlife Service at the new treatment sites at the Long Point and Big Creek National Wildlife Areas and is outlined in Appendix B.

2.2.2 Effects on Sensitive Emergent Coastal Marsh Communities

This monitoring will address monitoring objective #2 (Monitor effects of the control activity on sensitive emergent coastal marsh communities). The protocol for this monitoring is also incorporated in Appendix A. Complementary monitoring is also being undertaken by Canadian Wildlife Service, and is outlined in Appendix B.

Vegetation Composition

In 2016, the 20 treated sites and 20 control areas at Long Point and Rondeau were inventoried prior to control, to establish the baseline vegetation composition in Phragmites invaded marsh where water depth is 10-50 cm deep. In 2017 and 2018, these locations were inventoried to determine the post-treatment vegetation composition. Follow-up monitoring is planned to continue in 2019 and 2021, to establish mid-term recovery of treated areas and contrast this with vegetation composition in untreated control areas.

It should be noted, that the most integral component of the monitoring program for assessing effects on the coastal marsh communities is documentation of vegetation changes. Vegetation is the most sensitive component of the biota to glyphosate application. Work by Dr. Laura Borgeau-Chaves at Michigan Tech Research Institute on Phragmites control with herbicide demonstrated that the biotic integrity of vegetation, measured using the Great Lakes Coastal Wetlands Consortium's IBI, was most responsive to control efforts in comparison with birds and amphibians. Experimental treatment of wetlands with glyphosate from the Gagetown Experimental Wetland Complex in New Brunswick (Dr. Leanne Baker, Dr. Jeff Houlahan, and Dr. Karen Kidd, among others) also concluded that vegetation is the most sensitive component of the biota to glyphosate application. In this series of experimental additions of glyphosate to wetlands, the effects observed in higher trophic levels were attributed to the indirect mechanism that glyphosate affected the plant community, and the algae and chironomids responded to changes in the vegetation. Further, sensitive ecological communities identified by NatureServe are of explicit conservation concern in Rondeau Provincial Park, and these are defined by their vegetation. Thus, vegetation composition serves as a sentinel for potential effects of glyphosate application on higher trophic levels.

Marsh Birds and Frogs

MNRF is working with the Nature Conservancy of Canada, Bird Studies Canada and Ducks Unlimited Canada to support additional monitoring of frogs and birds, through existing initiatives such as the Great Lakes Marsh Monitoring Program (GLMMP). The GLMMP has collected data at survey locations at both Rondeau and Long Point for several decades, to assess populations of frogs and birds within individual marshes (such as at Long Point and Rondeau) and within the Great Lakes basin. The data

collected at Rondeau and Long Point survey locations will help to identify changes to frog and bird populations due to Phragmites control. In addition, Bird Studies Canada established survey stations in 2018 within Long Point Crown Marsh to support targeted monitoring of the pilot project.

2.2.3 Effects on Fish and Fish Habitat

The ministry will work with the Canadian Wildlife Service and the Nature Conservancy of Canada to address monitoring objectives 6 and 7 (Monitor effects of the control activity on wetland biota habitat use and critical fish habitat), and the requirements of a permit issued by Fisheries and Oceans Canada under Section 73 of the Species at Risk Act. The protocols for this monitoring are outlined in Appendix C.

The ministry will work with the Canadian Wildlife Service to address monitoring objectives 6 and 7 (Monitor effects of the control activity on wetland biota habitat use and critical fish habitat), and requirements of a permit issued under Section 73 of the Species at Risk Act. The protocols for this monitoring are outlined below.

2.2.4 Pesticide Fate in the Environment

This monitoring will address monitoring objective #4 (Assess the fate of glyphosate, AMPA and the adjuvant at the treatment sites and their dispersal from the treatment sites). Monitoring conducted over the past 3 years has provided valuable data indicating that the herbicide treatments present a very low risk to the aquatic environment. Glyphosate levels from herbicide treatments have never approached the short-term and long-term thresholds (.800 ppm and 27 ppm respectively) of the Canadian Water Quality Guidelines for Glyphosate for the Protection of Aquatic Life. For example, in 2018 water samples immediately taken after herbicide treatment (24 hours), and one-month post-treatment at Long Point, were orders of magnitude below the threshold, measuring below detection limits for glyphosate (0.001 ppm). Similarly, measurements of alcohol ethoxylate (surfactant) in water were also below the level of detection (0.03 ppm).

2.2.4.1 Assessing maximum exposure risk

In 2019, the pilot project will be conducted at much smaller scale, focusing on ground-based re-treatments as needed to ensure that regrowth from the seed bank, newly colonising plants or remnant individuals do not spread. These sites are typically small

populations of Phragmites sparsely located across a large landscape. The total volume of herbicide used to address these sites is expected to be significantly less, and ground application will be a more time and labour-intensive effort.

Monitoring in 2017 and 2018 of retreatment sites demonstrated that the risk of follow up retreatments is minimal due to the low levels of herbicide used. Given these results, the monitoring program for 2019 will focus on continuing to evaluate the risk of herbicide application in new areas where the volume of herbicide applied is greatest and presents the maximum exposure risk to aquatic biota.

This will involve collection of surface water and bottom sediment samples from the new treatment areas at the Big Creek and Long Point National Wildlife Areas, as well as sites at Long Point Crown Marsh, and the inner Long Point Bay prior to treatment (baseline) and within 24 hours and 30 days post herbicide application. The samples will be analysed for glyphosate, AMPA and total alcohol ethoxylates.

The concentration of glyphosate, AMPA and total alcohol ethoxylates in all water and sediment samples collected in 2019 will be compared to established guidelines, including the Canadian Council of Ministers of the Environment (CCME) guidelines on glyphosate and AMPA, as well as the Human and Environmental Risk Assessment (HERA) guidelines on alcohol ethoxylates.

2.2.4.2 Transect sampling at Long Point and Big Creek National Wildlife Areas

To evaluate the risk of exposure to herbicide over distance and time, the treatment sites at the Long Point and Big Creek National Wildlife Areas will also be used to compare concentrations of glyphosate, AMPA, and alcohol ethoxylates in water and bottom sediment along transects with sampling stations at 0m (edge of proposed treatment polygon), 15m, 30m and 60m from the polygon edge. Water and sediments samples will be collected at each of the treatment transect stations and will be analyzed for glyphosate, AMPA and total alcohol ethoxylates; prior to, within 24 hours, 30 days and 1-year post treatment.

2.2.4.3 Risks to biofilms and the food-web

Work from previous years, investigated the risks of the herbicide application to biofilms (a significant proportion of which are periphyton or "attached algae") and the wetland food web. To further explore this risk assessment, laboratory experiments are planned by the University of Waterloo in 2019 to investigate the effects of consumption of

biofilms exposed to glyphosate and AMPA on the growth and development of fathead minnows -a fish species that occurs naturally in Long Point

2.2.4.4 Surface water sampling adjacent to communities of Long Point, Turkey Point and residences near the outlet of Big Creek

This monitoring will address monitoring objective #5 (Monitor glyphosate concentrations in surface water samples adjacent to the community drinking water intakes that are near the herbicide application areas at Long Point, Turkey Point and the mouth of Big Creek). The methodology for collection of these samples is described in Appendix D and includes a description of the notification and contingency plans to be undertaken if the water samples collected exceed the Ontario Drinking Water Quality Standard for glyphosate.

3.0 Reporting

The results of the monitoring plan will be summarized in one or more reports, and shared with other agencies, such as MECP, DFO, and PMRA to inform analysis of efficacy of the pilot project to control Phragmites and future requests for Emergency Use Registration of glyphosate for the control of Phragmites in aquatic habitats.

Results of the pilot project and the monitoring plan will also be shared with the public, through presentations to local community groups, and at provincial forums such as the Ontario Invasive Plant Council's Provincial Webinar Series and the Ontario Phragmites Working Group's annual meeting.

Scientists with the University of Waterloo also intend to publish the results of the research and monitoring for this pilot project within peer reviewed journals, and present information on the pilot project at scientific conferences.

References

Ailstock, S.M., C.M. Norman, and P.J. Bushman. 2001. Common reed Phragmites australis: control and effects upon biodiversity in freshwater nontidal wetlands. Journal of Restoration Ecology. 9(1): 49-59

Back, C.L., and J.R. Holomuzki. 2008. Long-term spread and control of invasive Common Reed (Phragmites australis) in Sheldon Marsh, Lake Erie. Ohio Journal of Science 108:108–112.

Getsinger, K. D., L. S. Nelson, L. A. M. Glomski, E. Kafkas, J. Schafer, S. Kogge, and M. Nurse. 2006. Control of Phragmites in a Michigan Great Lakes Marsh. Unpublished Report. Michigan Department of Natural Resources. Lansing, Michigan, USA. 48pp.

Lombard, K.B., D. Tomassi, and J. Ebersole. Long term management of an invasive plant: lessons from seven years of Phragmites australis control. Northeastern Naturalist 19(sp6): 181-193.

Schuette, J., 1998. Environmental fate of glyphosate. Environmental Monitoring & Pest Management, pp.1-13.

Solomon, K. and Thompson, D., 2003. Ecological risk assessment for aquatic organisms from over-water uses of glyphosate. Journal of Toxicology and Environmental Health Part B: Critical Reviews, 6(3), pp.289-324.

Southwick, R.I., and A. J. Loftus, editors. 2003. Investigation and monetary values of fish and freshwater mussel kills. American Fisheries Society, Special Publication 30, Bethesda, Maryland.

Teal, J.M. and S. Peterson. 2005. The interaction between science and policy in the control of Phragmites in oligohaline marshes of Delaware Bay. Journal of Restoration Ecology. 13(1): 223-227.

Tu, M., Hurd, C. & J.M. Randall. 2001. Weed Control Methods Handbook, The Nature Conservancy, http://tncweeds.ucdavis.edu, version: April 2001.