

Invasive Species Pilot Project: Site Visit Report

Waterbody: Eagle Lake
Visit Date: July 29th, 2017

Preamble

The following study was conducted as part of the Federation of Ontario Cottagers' Associations (FOCA) 2017 Aquatic Invasive Species Program. Invasive species are one of the top threats to the integrity of aquatic ecosystems, to the quality of the recreational experience on the water and to the economic success of rural communities. FOCA is very concerned about the potential impacts of introduced species and the effect they will have on our quality of life in Ontario.

Through the involvement of local residents and their associations we will be better able to address the important challenge of preventing the introduction of invasive species, controlling their spread and mitigating their impact. FOCA thanks the local association for their dedication and commitment to the ongoing stewardship of our valuable freshwater resources.

Visit Overview

The Eagle Lake Conservation Association (ELCA) had a number of concerns regarding phragmites on their lake, primarily related to the distinction between native and invasive subspecies and management options for shoreline phragmites adjacent to a proposed boat launch development site. Awareness of phragmites on Eagle Lake by the ELCA began around 2015/2016 when this species was observed at the future municipal boat launch site. Interviews with other shoreline residents indicate that this plant may have been present in the lake for between 5-10 years.

Sites

The site visit for Eagle Lake consisted of a tour (by land) of seven areas around the waterbody (**Figure 1**) with members from the ELCA and the local municipal council. These sites included established phragmites populations, potential phragmites habitat and other areas/species of concern sent in by members of the ELCA. Site descriptions and field notes can be found in **Table 1**. The coordinates for all sites visited on July 29th are listed in **Table 2**.

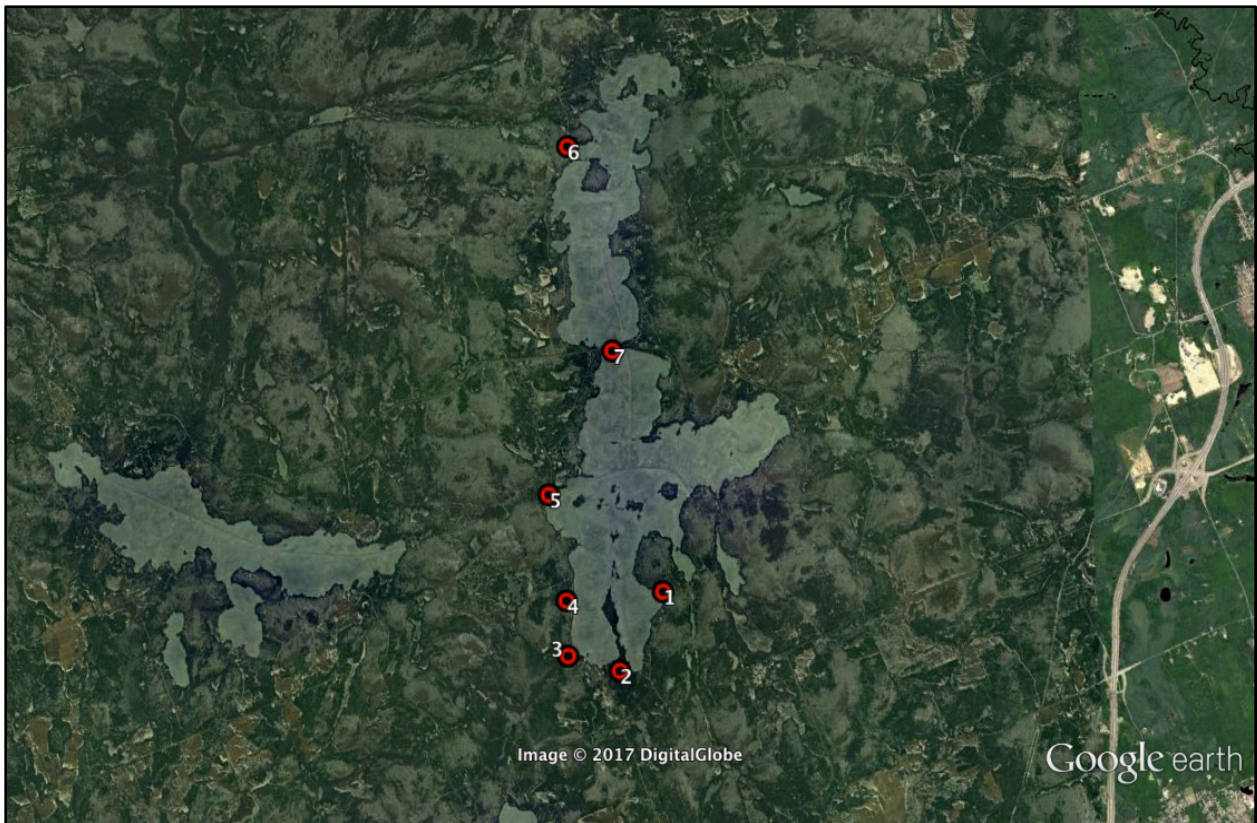


Figure 1: Map of sites visited around Eagle Lake on July 29th.

Table 1: Site descriptions and field notes from sites visited on Eagle Lake on July 29th

Site	Site Description	Field Notes
1	<ul style="list-style-type: none"> -Two shoreline phragmites patches adjacent/partially filling in a natural boat landing area; future site of a proposed municipal concrete ramp installation -Patch origin: ~2015/2016 -Approximate patch area: 1300m² (combined); plants extend ~20m from shoreline into the water and ~3m into shore -Plant samples collected 	<ul style="list-style-type: none"> -Mixed density stands: mature, more dense plants in patch interior; younger plants establishing in open water and shoreline habitat -Phragmites growing up through landowner's dock, obscuring view of water and filling open water habitat in front of boat landing -Evidence that plants are actively trying to colonization available habitat -Plant communities: low richness/phragmites monoculture in patch interior; competition with aquatic and wetland species such as: <i>P. cordata</i>, <i>N. odorata</i>, <i>E. aquaticum</i>, <i>M. gale</i>, <i>A.rugosa</i>, <i>Carex sp.</i> and <i>Eleocharis sp.</i>, on patch edges
2	<ul style="list-style-type: none"> -Phragmites patch in ditch (standing water) at end of a cul-de-sac ~100m from shoreline; numerous other phragmites patches were visible along the shoreline within the bay 	<ul style="list-style-type: none"> -Mixed density stands: mature, more dense plants in patch interior; younger plants establishing in open water and shoreline habitat -Landowner was forced to remove their

	-Patch origin: uncertain (~3 years) -Approximate patch areas: ditch- 40m ² ; shoreline- multiple patches similar in size to site 1, not accessible for detailed measurements	dock due to phragmites growth; -Low plant community diversity with some competing <i>P. cordata</i> , <i>E. aquaticum</i> , <i>M. gale</i> and <i>Eleocharis sp.</i>
3	-Primary water outflow from Eagle Lake -Outlet flows through a culvert under a road and flows into a creek	-No phragmites detected on the lake or creek side at this site
4	-Roadside patch on shoreline ~750m north of the site 3 outflow -Approximate patch area: 30m ²	-Small, establishing stand -Low/medium density
5	-Historic/illegal public boat landing area	-No phragmites detected
6	-Roadside/ditch site with suspected phragmites introduction identified by an ELCA member	-Plant in question was not phragmites
7	-Phragmites patches along beach/recreation areas on the south side of causeway -Approximate patch areas: not measured; numerous patches similar in size to site 1 -Plant samples collected	-Mixed density stands: mature, more dense plants in patch interior; younger plants establishing in open water and shoreline habitat -Evidence of active colonization -Plant communities: low richness/phragmites monoculture in patch interiors; competition with aquatic and wetland species such as: <i>P. cordata</i> , <i>N. odorata</i> , <i>E. aquaticum</i> , <i>Carex sp.</i> and <i>Eleocharis sp.</i> , on patch edges

Table 2: Coordinates for Eagle Lake sites visited on July 29th

Site	Latitude	Longitude
1	45.80473	-79.49430
2	45.7920	-79.50228
3	45.79718	-79.51143
4	45.80397	-79.51062
5	45.81692	-79.51407
6	45.85927	-79.50912
7	45.83423	-79.50213

Biology

Phragmites australis (phragmites), **Figure 2**, is a perennial grass that grows in roadsides, ditches and shoreline wetlands across North America. There are two subspecies of this plant in Ontario. The native phragmites (*Phragmites australis* subsp. **americanus**), typically grows in low-density stands and will form diverse communities with other plant species. The invasive phragmites (*Phragmites australis* subsp. **australis**), has high growth rates and is a very aggressive colonizer, quickly replacing native vegetation with dense, monoculture phragmites stands.

Invasive phragmites is a prolific species that quickly generates biomass throughout the growing season and reproduces using seeds, rhizomes and stolons. Individual flowers from this subspecies have been shown to contain thousands of seeds,

making containment of invasive phragmites populations difficult. Established invasive phragmites stands can reach near impenetrable density and mature plants can grow up to five meters in height.

Natural spread of invasive phragmites can occur through the wind, wave and animal related dispersal of its seeds and clonal growth of its vegetative propagules. Human related dispersal from the horticultural trade, shipping, boat trailers etc., is the most significant long distance dispersal mechanism for the continued spread of this species. Negative impacts of invasive phragmites introductions include: loss of biodiversity and native species, nutrient reductions, agricultural damage, real estate value decrease and loss of shoreline accessibility and aesthetic.



Figure 2: *Phragmites australis* (Loup, 2011)

Native vs. Invasive Phragmites

Before management action against phragmites can be pursued, the populations in question must be identified as either native or invasive. Since both subspecies of this plant can share similar traits and can be found within the same area, this determination must be made using a combination of morphological and ecological factors including: patch density, stem color, sheath attachment and glume length. Although invasive phragmites can be identified in this manner with reasonable surety, genetic analysis of plant tissue is the only method that will give 100% accuracy in subspecies classification.

Phragmites on Eagle Lake

Previous examination of phragmites stands on Eagle Lake by the Ontario Ministry of Natural Resource and Forestry (OMNRF) had given the plants designation as the native subspecies. Visual and quantitative observations taken from phragmites plants during the site visit for this project indicate that the invasive phragmites subspecies, *Phragmites australis* subsp. *australis*, is present at Eagle Lake. In particular, at Sites 1 and 7, where plants samples were collected and studied in the most detail. Further

consideration should be given to the fact that not every patch on the lake was assessed and some patches were not directly accessible, meaning that observations had to be made from a distance. Under these circumstances, it is reasonable to assume that native phragmites (*Phragmites australis* subsp. *americanus*) is/could also be present on the lake.

The quantitative and qualitative notes listed below (**Tables 3-4**), show phragmites plant and patch parameters that closely match identifying features for invasive phragmites. In particular, all ligule width measurements fell within the threshold values for invasive phragmites. Another important diagnostic feature, glume length, could not be measured due to lack of flowering at the sampling time. There was no evidence of the black fungal spots or bright red/chestnut stem coloration found on the native phragmites. The most mature phragmites plants on Eagle Lake were ~2-2.5m tall, which is equal to and greater than the 2m maximum height of native phragmites. The leaves were not as distinctly blue-green compared to some other invasive phragmites populations, but the stem texture and sheath attachment were reflective of the invasive subspecies. It was evident that the existing phragmites stands were undergoing active colonization of the surrounding habitat. Young rhizome and stolon generated individuals were observed growing and competing with plant communities on land, in water and in between phragmites patches. Thatch accumulation was present in the water and on shoreline areas adjacent to phragmites populations.

Maximum stem density of phragmites on Eagle Lake (~124 stems/m²) was reflective of medium-high density invasive phragmites growth, which can reach up to 200 stems/m². Native populations of this plant are generally much more sparse (10-50 stems/m²) and interspersed with local vegetation communities. Phragmites stem density on Eagle Lake was lower on the edges of patches, where the plant was encroaching onto land and into existing vegetation. This is typical of younger phragmites populations when they are still fully establishing within an ecosystem. Local plant community diversity decreased drastically towards the interior of the phragmites patches, with near monoculture communities forming in the center.

Table 3: Morphological observations from phragmites stands in Eagle Lake

Factor	Observation
Max. Stem Height (m)	~2-2.5m
Leaf Color	Green with sporadic yellowing on the edges
Stem Color	Tan-green, periodic light brown coloring isolated to nodes
Stem Texture	Roughish, stem rigid, no fungal dots
Sheath	Firmly attached
Ligule Width (mm)	Average: 0.25mm without hairs, 0.63mm with hairs (n=30)
Glume Length (mm)	N/A

Table 4: Ecological observations from phragmites stands in Eagle Lake

Factor	Observation
Patch Density (stems/m ²)	Average of 124 stems/m ² interior patch density, presence of standing dead biomass further increases patch density

Thatch	Some accumulation on shore and water adjacent to phragmites sites
Plant Species Richness	Range: Low - phragmites monoculture
Max. Water Depth	~1.5m
Patch Sediment Type	Sand, some silt and organic material

Regulations

Phragmites australis subsp. *australis* is listed as an invasive species in Ontario, meaning that it is regulated within the province and approved for removal by landowner's with/without the requirement of permit. The full regulations surrounding phragmites removal are listed under the *Public Lands Act* (1990) Activities on Public Lands and Shore Lands. In general, phragmites can be removed without a permit by landowners provided that manual methods (cutting, raking etc.) are used. Herbicides, dredging, benthic barriers and in-water work outside of a private shoreline area require a work permit.

Another concern of the ELCA was regarding the regulations around shoreline construction within an established phragmites site, specifically the proposed municipal boat launch area (Site 1). Legislation on shoreline development is somewhat outside of my area of expertise, but I found no evidence within the *Public Lands Act* (1990) or the *Invasive Species Act* (2017) to indicate that development of the boat ramp could not continue within phragmites infested lands. The *Public Lands Act* (1990) does make some provisions, however, including that all sediments and plants from the worksite that might contain invasive species must be disposed of away from the water and in a way as to not propagate the spread of that species. I would strongly recommend that the ELCA check all applicable regulations before continuing with any development or management projects.

Phragmites Management

There are a number of control options for invasive phragmites in Ontario, but most are only applicable for terrestrial patches. For populations of phragmites in standing water, like those visited on Eagle Lake, most treatment methods are either prohibited or impractical to use, such as: herbicide application, rolling and prescribed burnings. Given the regulations in Ontario (to date), landowners on Eagle Lake are essentially limited to cutting/manual harvesting with the potential for tarp/benthic barrier installation, if granted permit approval. Herbicide testing for in-water phragmites treatment is ongoing, but is not ready for legal implementation as a widespread control method.

In general, phragmites management is a multi-year commitment and in some instances, becomes more a question of maintenance control than actual eradication. Integrated management plans that use several different treatment measures in conjunction with one another tend to have the greatest success with phragmites ex. A combination of spraying followed by cutting, rolling and/or tarping.

While cutting removes aboveground biomass, energy reserves from rhizomes can allow the survival of the plant and cause future sprouting to occur. Cutting must be done at regular intervals and at the right time during the growing season (mid-summer; before full emergence of seed heads) in order to slowly deplete the below ground resources of this plant. Cutting is a very labor and time intensive process and is better applied to smaller populations of phragmites.

The charity group, Georgian Bay Forever, has been successfully dealing with shoreline/in-water phragmites populations around Gregorian Bay for the last five years and has removed an estimated 35,000kg of shoreline phragmites. They have developed a consistent and detailed method for the manual removal of phragmites, which in some cases, has led to eradication within 3-5 years of treatment. I would advise that the ELCA review and adopt this method as a starting place for initial phragmites control on Eagle Lake. While in the process of being updated, the Ontario Invasive Phragmites: Best Management Practices manual, is another source for information on treatment options for phragmites. I have included the links to the Georgian Bay Forever website as well as other important learning materials in the Resources section of this report.

Next Steps

Since the colonization of shoreline areas by invasive phragmites can occur at a very rapid pace, it is generally recommended that timely organization of resources and implementation of control programs occur. Some potential next steps for the ELCA and the local municipal council in dealing with invasive phragmites on Eagle Lake are:

- 1) Educate the residents of Eagle Lake about phragmites, how to identify it and how to remove it
- 2) Identify all shoreline phragmites populations around the lake
- 3) Upload species distribution information to EDDMapS Ontario
- 4) Prioritize treatment order of phragmites sites
- 5) Organize volunteers, equipment and disposal of phragmites for manual cutting work days
- 6) Monitor untreated patches to assess yearly growth
- 7) Bag and cut seed heads from existing plants
- 8) Experiment with various treatment methods and timing on different phragmites patches around Eagle Lake to find the most effective process for control

Information and Learning Resources

- 1) List of plant species mentioned in this report:

Scientific Name	Common Name
<i>Phragmites australis</i>	European common reed
<i>Pontederia cordata</i>	Pickerel weed
<i>Nymphaea odorata</i>	White water lily
<i>Eriocaulon aquaticum</i>	Pipewort
<i>Myrica gale</i>	Sweet gale
<i>Alnus rugosa</i>	Speckled alder
<i>Carex sp.</i>	Sedge
<i>Eleocharis sp.</i>	Rush

- 2) FOCA- A Shoreline Owner's Guide to Invasive Species:
<https://foca.on.ca/invasive-species-guide/>

- 3) FOCA- Invasive Species Overview: <https://foca.on.ca/invasive-species/>
- 4) Georgian Bay Forever phragmites removal process: <https://georgianbayforever.org/the-process-steps-for-invasive-phragmites-removal-in-georgian-bay-wetlands-2/>
- 5) Ontario's Invasive Phragmites: Best Management Practices manual: <https://www.ontario.ca/document/invasive-phragmites-best-management-practices>
- 6) Early Detection and Distribution Mapping System Ontario (EDDMapS): <https://www.eddmaps.org/ontario/>
- 7) Native vs. invasive phragmites identification
 - a. Ontario Phragmites Working Group: <http://www.opwg.ca/phragmites/native-vs-invasive/>
 - b. Ontario's Invading Species Awareness Program: <http://www.invadingspecies.com/invasive-phragmites/#bwg53/191>
 - c. USDA Phragmites Field Guide: https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmctn11494.pdf
 - d. Michigan State University: <https://mnfi.anr.msu.edu/phragmites/native-or-not.cfm>
 - e. The Connecticut Agricultural Experiment Station: http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/plant_pathology_and_ecology/phragmites-factsheet.pdf
- 8) Regulations
 - a. Invasive Species Act: <https://www.ontario.ca/laws/statute/s15022>
 - b. Public Lands Act: <https://www.ontario.ca/laws/regulation/r13239#BK11>
 - c. Pesticides Act: <https://www.ontario.ca/laws/statute/90p11>
 - d. Pest Control Products Act: <http://laws-lois.justice.gc.ca/eng/acts/P-9.01/>