



TOOLKIT FOR PROTECTING YOUR LAKE FROM AQUATIC INVASIVE SPECIES

Invasive Species Awareness and Monitoring Program for Lakes Education in Ontario

INTRODUCTION

Aquatic invasive species are a major threat to the economic and ecological integrity of our waters. Early detection is essential to protect our lakes and rivers from the negative impacts aquatic invaders have on these key ecosystems.

With funding from the Ministry of the Environment, Conservation and Parks' Great Lakes Local Action Fund, the Invasive Species Centre partnered with the Federation of Ontario Cottagers' Associations to help community members prevent, detect, and monitor aquatic invasive species in inland lakes.

The Invasive Species Awareness and Monitoring Program for Lakes Education in Ontario (IsampleON) trained volunteers to collect water samples from 25 lakes in the Lake Huron, St. Lawrence and Lake Ontario watersheds that met the "at-risk" criteria for invasive mussels and spiny water flea invasion. This included lakes with high calcium levels as well as lakes with high-use boat launches as boating acts as a pathway for introducing zebra and quagga mussels into new territory and calcium provides the preferred habitat for establishment.

IMPORTANCE OF COMMUNITY SCIENCE

The success of this project depended on the participation of our network of community scientists. This program was created to increase local awareness of aquatic invasive species and encourage public involvement in preventing their spread to inland lakes.

METHOD OF SAMPLING

We selected 25 lakes based on water calcium levels through expert consultation, and those that had public access. FOCA connected with these lake associations through their membership, sent 25 sampling kits and through training webinars and materials, 50 volunteers from 25 associations were trained prior to sampling. Materials sent included nets, gloves, pipettes, sampling jars and more. Volunteers collected three samples from their lake. It was recommended that samples be taken from public boat launches, or marinas (locations with high boat traffic), the deepest location in the lake and one from the windward side of lakes (veligers and spiny water flea are passive swimmers and can be detected on the windward side of lakes). Using the materials provided, volunteers used plankton haul nets and their boats to collect samples and ship them back to the Invasive Species Centre for analysis.

MEET THE INVADERS

ZEBRA & QUAGGA MUSSELS



Native to Eurasia and brought to the Great Lakes via ballast water. These mussels are typically found attached to objects, surfaces, or other mussels by threads extending from underneath the shells. The larvae are highly mobile as they are free-floating in water. This stage contributes to their rapid dispersal throughout the waterways subsequently leading to the colonization of water supply pipes of hydroelectric and nuclear power plants, public water supply plants, and industrial facilities. Zebra and quagga mussels primarily consume phytoplankton and zooplankton which may have effects through the food web to fish.

SPINY WATER FLEA



Spiny waterflea is also native to Eurasia and was introduced into the Great Lakes from ballast water from ships. Now, spiny waterflea is present in all five Great Lakes and in over 100 nearby inland lakes. They are best known for their barbed tail, used as a defense mechanism to deter predation by small fish. In total, spiny waterfleas are just visible at approximately 1.5 cm in length. This invasive zooplankton outcompetes native species for food, which can have cascading impacts to the entire food web. Jelly-like masses of spiny waterfleas impact recreation and commercial fishing when they are caught in fishing equipment and commercial netting and trawling lines.

SUMMARY OF WATER SAMPLING RESULTS

Lake	Veligers Detected	Spiny Water Flea Detected
Bennet Lake	Positive	Negative
Big Cedar Lake	Positive	Positive
Buckshot Lake	Negative	Negative
Cedar Lake	Negative	Negative
Chandos Lake	Negative	Negative
Coe Island Lake	Negative	Negative
Crowe Lake	Positive	Negative
Crystal	Negative	Negative
Denna Lake	Negative	Negative
Desert Lake	Negative	Negative
Fourteen Island Lake	Negative	Negative
Mink Lakes	Positive	Negative
Gananoque Lake	Positive	Negative
Knowlton Lake	Positive	Negative
Lake Clear	Positive	Negative
Limerick (Bass) Lake	Negative	Negative
Malcolm Lake	Positive	Negative
Ardoch Lake	Positive	Negative
Miller Lake	Negative	Negative
Mississagagon Lake	Positive	Negative
Opinicon Lake	Positive	Negative
Little Silver Lake	Negative	Negative
Six Mile Lake	Negative	Negative
South Lake	Negative	Negative
Steenburg Lake	Negative	Negative

WHAT DO YOUR RESULTS MEAN?

Generally, when zebra mussel veligers are first detected in a lake, there is about a two-year period before adult mussels become noticeable. Thus, if veligers are discovered in your lake, it will give you a chance to heed the warning and prepare for the negative impacts of the zebra mussel. However, it cannot be overemphasized that a negative result is NOT a guarantee that zebra mussels, spiny water flea and other invading species do not exist in your lake, proper precautions should always be taken in order to prevent the potential spread of invading aquatic species.

When selecting lakes, it was important to check the calcium levels as veligers require certain levels to build their shells and survive. Lakes with calcium over 25 mg/L are at high risk for mussel survival. Lakes under 25 mg/L are still at high risk, but other factors such as pH can play a role. Calcium levels below 20 mg/L are at a lower risk for survival.

Lake	Veligers Detected	Spiny Water Flea Detected	Calcium
Bennet Lake	Positive	Negative	27.10
Big Cedar Lake	Positive	Positive	26.51
Buckshot Lake	Negative	Negative	9.2
Cedar Lake	Negative	Negative	42.80
Chandos Lake	Negative	Negative	22.6
Coe Island Lake	Negative	Negative	22.10
Crowe Lake	Positive	Negative	23.09
Crystal Lake	Negative	Negative	34.05
Denna Lake	Negative	Negative	24.53
Desert Lake	Negative	Negative	22.05
Fourteen Island Lake	Negative	Negative	23.1
Mink Lakes	Positive	Negative	35.8
Gananoque Lake	Positive	Negative	31.85
Knowlton Lake	Positive	Negative	34.85
Lake Clear	Positive	Negative	36.66
Limerick (Bass) Lake	Negative	Negative	36.51
Malcolm Lake	Positive	Negative	34.72
Ardoch Lake	Positive	Negative	30.40
Miller Lake	Negative	Negative	34.16
Mississagagon Lake	Positive	Negative	31.12
Opinicon Lake	Positive	Negative	24.23
Little Silver Lake	Negative	Negative	17.2
Six Mile Lake	Negative	Negative	22.6
South Lake	Negative	Negative	20.5
Steenburg Lake	Negative	Negative	23.14

Calcium Data Source: [Lake Partner Program – Sampling Results & Assistance | FOCA](#)

POSITIVE: NOW WHAT?

Now that you know invasive mussels are present, the most important actions are to prevent the spread of invasive mussels to neighboring lakes. Make other cottagers on the lake and visitors to the lake aware of the invasion. Add signage at public boat launches that state the presence of invasive mussels and the importance of Clean, Drain, Dry. Consider setting up equipment for boat washing at your public boat launches. Knowledge is key.

The presence of invasive mussels in your lake, may also mean some extra work on your part. Invasive mussels can attach to many hard surfaces which can cause clogging of water intake pipes and mechanical issues with boat motors. The good news is there are some tools and strategies you can use to help mitigate some of these consequences.

- **Intake lines and foot valve maintenance:** Draining and drying water intake lines and foot valves can help reduce the risk of blockages. Freezing lines and foot valves after draining

is even more effective than simply drying.

- **Water intake pipe filter:** Consider a filter for your intake pipes that feed your cottage water supply to prevent mussels from attaching to the inside of the pipe. This works well for year-round cottage use and with planned maintenance.
- **Lift motor or boat out of water:** After each use, lift your boat motor, propellers and all, up out of the water to decrease the chances of invasive mussels attaching themselves to the motor. Or better yet, consider investing in a boat lift or ramp to completely remove your boat from the water.
- **Flush boat motor regularly:** Microscopic veligers can be drawn up through the water inlet of the motor and settle inside, causing blockages as it matures. Frequently using a motor flusher or motor muffs can decrease the risk of this occurring.
- **Wear water shoes:** Mussels can have very sharp shells that hurt to step on, especially for children. Invasive mussels can grow in such abundance they become difficult to avoid. Consider wearing protection on your feet such as water shoes to avoid injury.

Although there are no recommended management options available in Ontario at this time, there is some research and pilot projects being done, in particular in the United States. Check out the [Invasive Mussel Collaborative](#) to learn about some of the projects that are underway and some of the hope for management options in the future.

WHAT CAN YOU DO?

Understand the pathways of introduction

One characteristic of invasive species is how easily they can spread and establish, especially in aquatic environments. Invasive mussels for example, can attach themselves to boats, trailers or fishing equipment, and microscopic villagers can go undetected in the bilge water and live wells. Aquatic invasive plants often reproduce asexually through fragmentation, it only takes a small plant piece attached to a boat prop or trailer and moved to a new area to start to grow and root. For these reasons, it is important to understand that recreational boating can be a vector or pathway for spreading aquatic invasive species.

On January 1st 2022, the Ontario Government made amendments to the *Invasive Species Act, 2015*. These changes include draining plugs and other devices to control drainage of water from the watercraft, and taking reasonable measures to remove any aquatic plants, animals or algae from the watercrafts, equipment, any vehicle, or trailer that has been in contact with water before moving to a new waterbody.

Clean Drain Dry

Clean any plants, mud, mussels and debris from your boat and equipment. **Drain** all standing water from your bilge, motor and live well. **Dry** your boat and fishing equipment for 2-7 days and/or disinfect with hot, pressurized water. Below are some common places invasive species may be hiding:



Don't Dump Your Bait

Juvenile fish species can often be difficult to distinguish and invasive fish species such as Asian carp could be present in your bait. It is the responsibility of the angler to learn to identify their bait fish and empty bait buckets at least 30 meters away from the waterbody shoreline on dry land. Learn more about bait regulations in Ontario [here](#).

Don't Let It Loose

Buy native aquarium and aquapond species and never release into the natural environment. It is against the law to introduce a plant or animal into a waterbody where it is not native. If it isn't where you got it, it isn't where it goes! Here are some ways to dispose of pets, plants and aquarium/aquapond waste:

- Try finding them a new home
- Return them to your retailer
- Ask a veterinarian about how pets can be humanely euthanized
- Seal them in plastic bags and dispose of in the garbage

Continue monitoring for invasive species

Local residents and cottagers are the first to notice changes in their lakes and forests. Being familiar with the area and its characteristics will help to notice subtle changes as they occur. Have an awareness about you while you are enjoying yourself outside and you might make an early detection.

Learn

Take part in webinars and workshops to learn about the invasive species present or threatening to invade your area. Learn what features to look for and how to identify invasive species or distinguish them from the native species in your area. There are plenty of resources on the Invasive Species Centre's [website](#) and many past webinars can be found on [YouTube](#) as well.

Take Action

Host a community science event to survey your lake for invasive species. This can be a fun way to get everyone involved of all ages and experiences. It's also great to have a baseline for (a) what invasive species are present, (b) where are they located so you can avoid the area, and (c) to what extent are they spreading. Simply observing to increase awareness can make a large impact.

Please note, should anyone wish to remove or manage any aquatic invasive species, there are rules and regulations in place, and you may need to consult your local MECP, Ministry of Northern Development, Mines, Natural Resources and Forestry offices or experts in the field.

DIY Dock Hangers

Continue to monitor for adult Zebra or Quagga mussels by installing dock hangers! All you need is some rope and a small terracotta pot!

What to do:

1. String the rope through the hole in the bottom of the pot
2. Tie a knot on the inside to prevent the pot from falling
3. Hang the pots from your personal dock for a season
4. Check regularly for zebra mussel establishment
5. Be sure to remove them at the end of the season to avoid winter damage

Note: You can even use several pots at different depths along the same rope!



Report sightings of invasive species

Once you have an awareness of your surroundings and an idea of what invasive species to keep an eye out for, make sure you know how to report them.

What you need to make a report:

1. **Pictures** of the species
2. **Location** found
3. If possible, **identification** of what you think it is

Here are a list of places to report invasive species:

- [EDDMapS](#) App or Webpage (Early Detection and Distribution Mapping Systems)
- [iNaturalist](#) App
- Invading Species Awareness Hotline: **1-800-563-7711**

EDDMapS

EDDMapS is a reporting tool developed specifically for invasive species. It is simple to use and there is no need to have previous experience or expertise. Simply take a photo or two, and make a report, even if you are unsure about the identity of the species you found. When a report is made, it is sent directly to experts in the field that confirm the identification. Once the report is verified, it is added to the distribution map. If a report is made of a high priority species (ie. Asian

carps, Water Soldier etc.), it enacts a rapid response by authorities and organizations to follow up and work towards eradicating or containing populations before they spread further.

INaturalist

INaturalist is a more generalized reporting tool used to capture biodiversity. INaturalist uses Artificial Intelligence to help narrow down an identification, however some knowledge is needed to field through the results. Although reports of invasive species can be made through iNaturalist and are then pulled into EDDMapS, these reports are peer-reviewed and will take longer to be confirmed and enact a response by authorities.

Continue the conversation

Continue to spread the awareness of invasive species through your networks. Let people know if you have invasive species present in your lake. Talk about it with your friends and family.

- Post signage at public boat launches about Clean, Drain, Dry or about the invaders present.
- Distribute zebra mussel and other invasive species brochures at your lake association meetings, local marinas, bait and tackle shops and tourism offices (copies of available brochures are included in the monitoring kit and online sources are provided in the Appendix)
- Encourage other lake residents to install dock hangers on their docks too and check them regularly.
- Write articles on aquatic nuisance species in your association or community news sources.
- Share invasive species related materials on social media (Some great social accounts specific to invasive species include Invasive Species Centre, Invading Species Awareness Program, Ontario Invasive Plant Council, Asian Carp Canada, Play Clean Go, NAISMA or NAISMAorg)

APPENDIX

Here is a list of many resources available online for more information on invasive mussels, spiny water flea and aquatic invaders in general.

Government Rules and Regulations:

- [Ontario Invasive Species Act, 2015](#)
- [Federal Aquatic Invasive Species Regulations](#)
- [Ontario Fishing Regulations](#)

Identification Resources:

- [Invasive Aquatic Plants - A Quick Reference Guide](#)
- [Invasive Invertebrates - A Quick Reference Guide](#)
- [Invasive Fish - A Quick Reference Guide](#)
- [Bait Fish Primer](#)

Species Resources:

- [Invasive Mussels Species Profile](#)
- [Spiny Water Flea Species Profile](#)
- [ISAP Invasive Mussels Species Profile](#)
- [ISAP Spiny Water Flea Species Profile](#)
- [ISC Species Profiles](#)

Management Resources:

- [Best Management Practices Database](#)

Community Science Opportunities:

- [Take Action with the ISC](#)
- [EDDMapS](#)
- [Lake Partner Program – OVERVIEW | FOCA](#)
- [Healthy Waterfronts](#)
- [Mysterysnail Management and Removal Project](#)
- [Operation Bait Bucket](#)
- [Volunteer Water Steward Program](#)
- [Community Science Tree Check Form](#)