



Aquatic Ecosystem Monitoring Volunteer Program for 2020

Objectives

1. To increase understanding, awareness and response to reduce the spread and mitigate the impacts of invasive species including Starry Stonewort and other aquatic invasive species in Stoney, Clear and White Lakes.
2. To inspire and engage youth volunteers and cottagers to participate in citizen science in collecting and reporting wildlife observations, including species at risk.
3. To initiate research and monitoring projects that support long term ecosystem monitoring objectives to monitor and report on the state of aquatic ecosystem health. This will enable a proactive and science informed response to development proposals on the lakes.

Background

Despite our increased understanding of the impacts of invasive species, environmental management authorities are often constrained in their ability to deal with them due to limited budgets and limited tools. In Ontario, there are 19 species of invasive aquatic plants, some, like *Myriophyllum spicatum* (Eurasian watermilfoil) are well established and widespread and managed for mitigation rather than immediate eradication; others however are new to the province and are still at a stage where eradication is possibility. There are essentially three types of management options available to managers as it relates to reducing the abundance of this type of vegetation: cultural control (i.e. mechanical harvester, hand-pulling, benthic mats, winter drawdown), chemical removal, and biological control.

Successful control of the unwanted species in all three options is largely dependent upon the establishment of a healthy native plant community that can outcompete the non-native and thus prevent the recolonization of the area by the unwanted invasive.

Starry stonewort (*Nitellopsis obtusa*) is a charophytic green algae that has been spreading amongst the inland lakes and rivers in the Great Lakes region of North America. Ironically, while it appears to be having much competitive success in this region of North America, populations are reported as declining in its native range throughout Europe and Japan. Reproductively, it is a dioecious species (meaning that male and female reproductive organelles are located on separate plants), but to date only male plants have been documented in North America.

Thus dispersal of the plant is achieved by asexual methods largely through fragmentation of adult plants as well as the production of turion-like bulbils. It is often hypothesized that the plant will effectively outcompete native macrophyte species and alter habitats for fish communities, but there are actually very few studies that have documented these impacts in the long term. In Pigeon Lake and Lake Scugog, we've seen Starry Stonewort replace large patches of the non-native Eurasian milfoil (*Myriophyllum spicatum*), but have also observed that several of the native species are able to co-exist, especially free-floating and rooted floating macrophyte species. Finally, given the fact that it can occupy large portions of the water column due to its maximal growing height of up to 1m and mainly occupies the nearshore regions of our lakes, it is a plant that disrupts recreational activities by shoreline residents. In upper Buckhorn Lake we've seen large boats fully incapacitated by having large amounts of plant accumulating on their propellers.

The recent invasion of Starry Stonewort, is just one of many stressors impacting our aquatic ecosystems and overall lake health. Stoney, Clear and White Lakes are subject to growing pressures from shoreline alterations and development, water level fluctuation and drawdown, nutrient and chemical inputs impacting water quality and climate change. Each stressor has multiple impacts to biological diversity and ecosystem function. For example, the introduction of Starry Stonewort may impact the diversity of aquatic benthic invertebrates that are so important in the food chain for fish. As a result, we need to move to an ecosystem approach to link monitoring and research projects to monitor and mitigate impacts on an ecosystem scale.

An ecosystem approach will take significant collaboration and engagement of multiple partners to design and implement it, however, we can begin to develop and implement monitoring protocols for key indicator species like benthic invertebrates, aquatic macrophytes and turtles. This year for example, the site selection for aquatic benthic invertebrate sampling is being coordinated with the site selection for aquatic macrophyte monitoring. By coordinating these monitoring activities we can begin to combine the research to assess the broader ecosystem response to Starry Stonewort. Overtime, as we build capacity, we can add research and monitoring projects to support an ecosystem model.

Collaboration of multiple partners (First Nations, government, universities, colleges and environmental organizations) is a key first step to engaging others on a common path forward. While this role is much bigger than Environment Council's role, we can help facilitate and promote activities to support moving toward aquatic ecosystem monitoring in local lakes.

Work Plan

1) Collaboration (underway)

Engage Federal/Provincial Governments, Ontario Invasive Plant Council and Fleming College to:

- Update/finalize the SSW Risk Assessment for Ontario

- Drafting ‘Best management practices’ to guide cottagers and businesses on control methods and how to reduce the spread.
- Updating a guide to invasive aquatic plants and “watch list” for local lakes.
- Seek TSW support to implement the DFO CLEAN, DRAIN and DRY program in the TSW.
- Seek TSW leadership for invasive species communications, regulations, monitoring, research and enforcement in the TSW.

2) Education & Outreach

a) EC website - Starry Stonewort Information about reporting new sites, identification, mapping, monitoring and sharing information about SSW(to be linked to municipal sites) including:

- Special Alert - Starry Stonewort, May 2020
- Best Management Practices

b) EC Website - Youth/citizen science

Best management practices and what they can do to help prevent the spread.

3) Youth/Citizen Science Volunteer Engagement (see Appendix I, below)

Youth (17-26 years) who actively participate in these training sessions and citizen science will be eligible for an Environmental Bursary Award of \$500 to \$1000 to support

post secondary studies in a related environmental program.

i) Aquatic Macrophytes / Starry Stonewort Training (1st week of July)

- Identification and reporting of SSW and other plant or wildlife species
- Basic macrophyte identification
- How to do site visits to verify, map and photograph new areas
- How to prevent spread when checking new sites
- Volunteers follow-up on reported new locations to verify SSW algae and take photographs. Map extent of SSW posted on EC website to confirm and update SSW locations and spread

ii) Application of Starry Stonewort Best Management Practices (end of June)

- On-site or by zoom depending on COVID-19 restrictions
- Share updated information and techniques

iii) Citizen Science Wildlife Observations & Reporting (early July) - training on how to report observations.

Information to be posted on EC website about citizen science to report wildlife (e.g., birds, turtle, frogs, plants) sightings.

iv) Turtle Monitoring - training on how to monitor and report on turtle sightings.

v) Benthic Invertebrate Monitoring (August) - on site field training on how to do invertebrate sampling that will be done by Trent University in the fall 2020.

vi) Water Quality Monitoring (June - August) - team up youth volunteers with water quality monitoring volunteers to assist and learn about water quality monitoring on the lake.

4) Research & Monitoring Projects

a) Aquatic Benthic Invertebrate Monitoring

The purpose of the project is to determine the health of select lakes to provide decision makers with the data they need to make meaningful changes to the health of their lakes. This will be accomplished by:

- Developing and field testing a benthic bio-monitoring protocol.
- Providing training to engage youth to do long-term monitoring.
- Applying benthic bio-monitoring as an indicator of ecosystem health for these lakes.
- Establishing 12 long term aquatic ecosystem monitoring sites to be coordinated with aquatic macrophyte, small fish

and sampling of other key indicators of aquatic ecosystem health.

The study is designed to help answer the following questions:

- What is the baseline composition of the benthic communities of Stoney, Clear and White Lakes to assess the long term impacts of climate change, invasive species and development of the lakes.
- What is the current state of aquatic benthic invertebrates in shoreline areas adjacent to existing or proposed developments or large scale developments (e.g., golf courses and marinas) on benthic invertebrate composition. This information will be used as a reference point to assess change over time and impacts to aquatic ecosystem health.
- What are the impacts of Starry Stonewort and other aquatic invasive on the benthic community in these lakes?

b) Aquatic Macrophyte and Starry Stonewort Monitoring

Volunteer students will work directly with shoreline residents to document and map the occurrence of starry stonewort in the Stoney/Clear Lakes. Additional data will also be collected with respect to co-occurrence of native species as well as habitat characteristics of the site (depth, sediment type, aspect, shoreline characteristics).

A select number of starry stonewort sites will then be paired with control sites that exhibit similar habitat features (depth, aspect, shoreline characteristics) for the monitoring of macro-invertebrate communities. Methodologies will be drawn from the broader regional monitoring program that is being coordinated by U-links.

Outcomes: Summary report including:

- Updated mapping of SSW observations and spread in Stoney Lake
- Compilation of aquatic macrophyte and algae distribution and relative abundance for sampling locations in the lake
- An analysis and interpretation of data collected for SSW and other aquatic macrophytes in infested areas

c) Starry Stonewort Research

Recent research demonstrates the susceptibility of starry stonewort shoots and bulbils to both desiccation and freezing. Exposing bulbils to temperatures of -6 °C in a laboratory setting for 24 hours resulted in 100% mortality (Gottschalk and Karol 2020). A separate study showed that shoots (individual fragments, small and large clumps) were unable to regrow when air dried. Individual fragments were no longer viable after 2 hours of drying, small clumps after 24 hours of drying, and large clumps (<45 g) after 4 days of drying (Glisson et al. 2020). Given that we have no current management tools that will effectively control the spread and growth of this plant, this latest research suggests that water-level drawdown would be effective in the nearshore

regions of the Kawarthas. Given that water levels are often regulated by Parks Canada for the spring freshet each year, thus exposing large proportions of the littoral sediments where starry stonewort currently grows, it would be interesting to track the impacts in situ as well as establish a series of controlled experiments in the field. This latter objective will be the basis of an honour's thesis to be carried out by a 4th year Trent University student.

Funding Model

Due to Covid-19 there are very few job opportunities for students in environmental programs to gain practical field experience that is so critical to their career development. We are placing a priority on Youth / Citizen Science Engagement as "Lake Guardians" to provide field experience for many youth volunteers that are interested in participating in aquatic ecosystem monitoring projects. This funding will help to build experience for youth in environmental studies and build future capacity to monitor and manage healthy aquatic ecosystems. Several groups or organizations in the area are collaboratively supporting this project.

Collaborating partners include:

5) Federation of Ontario Cottagers Association - seeking support for 'Outreach and Education' and for 'Youth/ Citizen Science Involvement' including printing of Starry Stonewort Best Management Practices, A Guide to Invasive Aquatic Plants in the Kawartha Lakes, signs and posting signs on 'Clean, Drain and Dry' and how to prevent the spread of Starry Stonewort and other invasive species. This information that is being produced will be applicable to many other lakes and cottage associations in the Trent-Severn Waterway and beyond to help with the response to Starry Stonewort and Aquatic Invasive Plants. It will also be used to set up and host information and training sessions for volunteer youth to get involved in citizen science and reporting of invasive species.

6) Cottage/Lake Associations from Ston(e)y, Clear and White Lake are contributing resources to support 'Outreach and Education' information and coordinating training sessions for Youth/ Citizen Science Engagement on the lakes. Current funding support has been provided by Upper Stoney Lake Association, Association of Lower Stony Lake Cottagers, Kawartha Park Cottagers Association, Juniper Point Cottagers Association and Birchcliff Property Owners Association.

7) Stoney Lake Heritage Fund - to support Youth Environmental Bursary Awards and operational funding support.

8) Fleming College / Trent University to provide scientific expertise and advice on training and monitoring programs.