

Long Lake Stewardship: Eurasian Watermilfoil in 2016 – Where Are We Now?

2011-2013 Eurasian Watermilfoil Abatement/Weevil Program

2014 Milfoil & Native Aquatic Plant Monitoring Program

Summaries: Long & Grant Lakes

Following approval of a proposal brought to City Council by the Greater Sudbury Watershed Alliance (GSWA) in early 2011, the City of Greater Sudbury retained the services of EnviroScience Inc. (ES) for a 3-year contract (2011-2013) to conduct biological control of Eurasian Watermilfoil (EWM) on six lakes within Greater Sudbury using the Milfoil Weevil.

Specifically in Long Lake, 4 sites were stocked in the eastern end of lake in 2011. Over the course of 3 stocking seasons from 2011-2013, Long Lake received 44,000 weevils. Of these 4 sites, 2 were restocked in 2012, and 1 site in 2013. A new site was stocked in 2013. Major declines in milfoil density were observed following the first season of stocking. Since some sites were not stocked consecutively, it was anticipated that the number of weevils used from year to year would also decrease thereby affecting the reduction of milfoil present. However, site 2 at the eastern end of the lake was stocked only in 2011, yet its milfoil density dropped from 90% in 2011, to 40% in 2012, to the lowest of all Long Lake sites in 2013. It was apparent that other factors also impacted milfoil and weevil densities.

The goal of biological control is to build a sustainable population of weevils that is capable of maintaining the milfoil at low levels. In the EWM abatement pilot project, it was evident that common criteria was necessary for weevil success – shallow depth of water, distance of milfoil bed from shore, external factors (eg. predators, temperature), shoreline buffers for overwintering. In addition, since the use of weevils worked well in some lakes but not in others, the need for more research re: the effectiveness of weevils in EWM reduction was apparent.

The 2011-2013 EWM abatement program generated a number of observations and conclusions:

1. Milfoil Weevil

A method using a biological control agent ... NOT eradication

Two conditions for effective control:

1. Adequate densities of control agents
2. Proper target weed response

Complexity of factors exist affecting weed and biocontrol agent

2. Milfoil/Weevil Interactions

Significant milfoil reduction within 1 to 4 years after stocking is possible in some areas

Factors affecting EWM – nutrients (N in sediment), lake depth, turbidity, time of season, control insect density (weevil, Acentria moth)

Weevil densities: < 0.1 weevils/stem – effects unlikely

> 1.0 weevils/stem – significant effects likely

Factors affecting weevils and their effects on EWM:

- lake temp
- pH
- conductivity
- milfoil type
- density and depth
- weevil predators
- overwintering sites
- number of weevil generations per season
- milfoil nutrient levels and milfoil chemical defences
- milfoil metal content (?)
- native plant colonization

< 10°C – weevils will not develop

19°C – takes 32 days from egg to adult

30°C – best performance

15°C – weevil egg laying begins

27°C – takes 17 days from egg to adult

>34°C – if sustained will be lethal

- Acentria* moth larvae perform better in cool water (<19- 22°C)
- better in shallow water (< 2m) but *Acentria* better in deeper water
 - highly variable - good results at some sites and poor results at others
 - cannot predict when and where herbivore populations will reach sufficient densities nor when or where declines and suppressions will occur

3. 2011-2013 Survey Limitations

- Experiment versus Monitoring
- Absence of a good baseline
- Reduced number of variables and simplified sampling
- Reduced number of samples
- Controls versus Untreated Sites
- More qualitative than quantitative
- Consider 'thirds': low, medium, high

Greater Sudbury Watershed Alliance (GSWA), who worked in partnership in the EWM abatement program, felt that a three year project was not long enough to see significant results, especially given the hot and sunny 2012 summer which spurred intense EWM growth. GSWA was disappointed in the results reported and in the quality of data presented in the report. Of concern were a lack of control sites and the selection of weevil stocking sites. GSWA also encouraged the support of the research by College Boreal led by Andre Ferron into the overwintering of weevils in the laboratory. Issues of better stewardship of lakes with this invasive aquatic species, and of public education about EWM, were also discussed. The continuation of a EWM abatement project was proposed to the City.

2014 Milfoil & Native Aquatic Plant Monitoring Program

In 2014, following the three-year stocking program City staff agreed to:

- 1) Retain EnviroScience Inc (ES) to monitor for a fourth year the EWM beds that had been stocked with milfoil weevils during the 2011-2013 period and to also monitor some EWM beds that had not been stocked with weevils.
- 2) Conduct a survey of the stocked lakes, specifically mapping and identifying the native aquatic vegetation (macrophytes) and the EWM beds not surveyed by ES.

From July to September, 2014, five lakes were surveyed: Hannah, Long, McFarlane, Richard and St. Charles. The surveys were conducted from a boat and survey involved two parts: 1) a visual survey of milfoil and native aquatic plants on the surface of the lake and just below the water line and, 2) rake tosses to determine the type and percentage of native aquatic plant species and EWM growing under water. Rake tosses were done at the weevil stocked sites as well as other EWM beds in the lakes.

Long Lake surveys were conducted on July 11, 14, 17, 18 and August 8, 18, 28. Long Lake had sparse to moderate EWM throughout the different times of the summer survey. The EWM beds were 0.5 to 1.0 meters below the surface and had larvae and adult weevils present and visible stem damage. Surface EWM was absent in the Birch Hill bays at the east end of the lake making it easy to navigate the boat right under Long lake road through the culvert. Long Lake had moderate native aquatic vegetation beds. Long Lake had the most native macrophytes with 22 species.

A control site was established for comparison of stocked and non-stocked sites. (See U1 on the map.)

In addition to the monitoring program work, a weevil collection project was conducted by College Boreal in efforts to successfully overwinter weevils in a lab. From August to September, students snorkelled milfoil beds in 5 Long Lake sites.

Long Lake Stocking Weevil Sites # 1-5



Long Lake Control Site (U1)



LONG LAKE	2014 Results	
	Milfoil Damage	Weevil Presence
Long (S1)	0%	0 w/stem None observed
Long (S2)	<10%	0 w/stem None observed
Long (S3)	<10%	0.03 w/stem None observed
Long (S4)	<10%	0 w/stem Larvae
Long (S5)	50%	0 w/stem Larvae Adults
Long (U1)	40%	0 w/stem All life stages

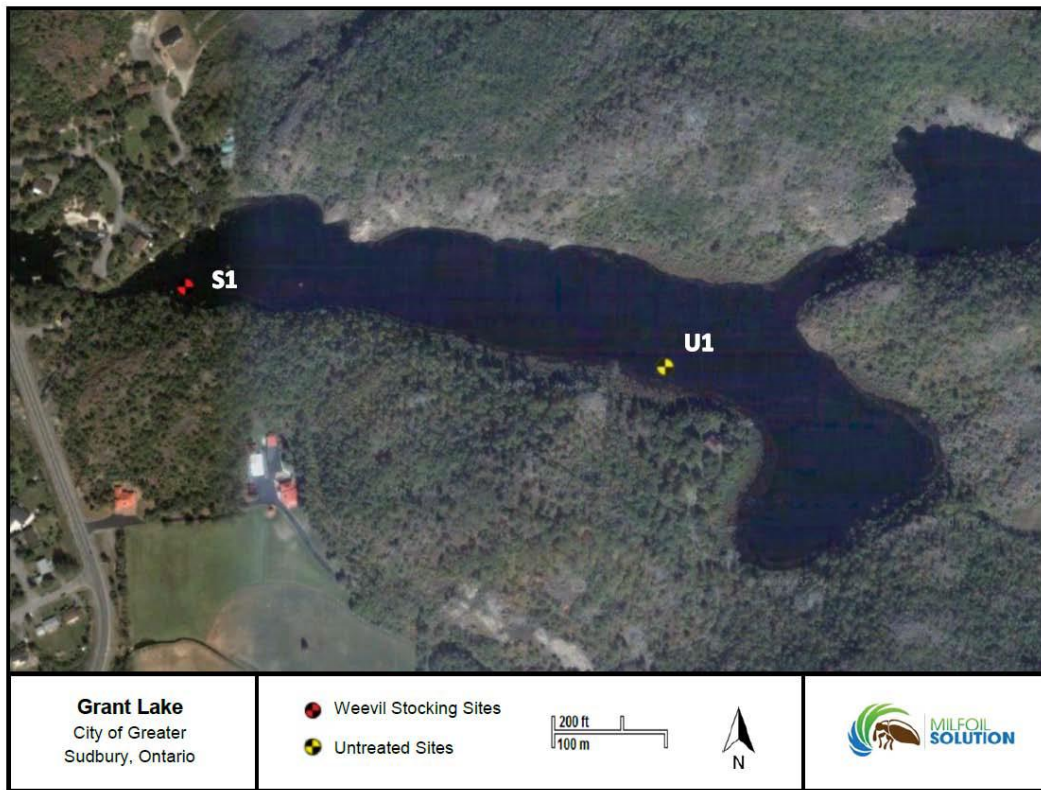
Long Lake

Native Plant (% of Community)

	2011	2012	2013	2014
Long (S1)	10%		2%	70% Large-leaf Pondweed Richardson's Pondweed Bur-reed
Long (S2)	5%		10%	50% Small Pondweed dominant + 6 other species
Long (S3)	5%	5%	5%	70% Pondweed (3 species) Northern Waterweed Water Naiad
Long (S4)	20%	15%	20%	30% Large-leaf Pondweed Eelgrass
Long (S5)			20%	15% Eelgrass Fern Pondweed Northern Waterweed Water Naiad White Water Lily
Long (U1)				20% Eelgrass Large-leaf Pondweed Richardson's Pondweed Small Pondweed Water Naiad

Overall, the 2014 Milfoil and Native Plant Monitoring Program in Long Lake determined that:

1. Stocking sites #1 to 4 had less dense milfoil than the other stocked lakes;
2. New milfoil growth was about 30 cm tall;
3. More weevil damage was observed in Long Lake than in any other lake;
4. Long Lake has a good variety of native aquatic vegetation species but not in enough quantity to overtake the EWM;
5. At the non-stocked control site (park at the end of Kantola Rd.) considerable weevil damage on milfoil was evident suggesting a high weevil presence.



GRANT LAKE	2014 Results			
	Milfoil Damage	Weevil Presence	Native Plant Presence	
Grant (S1)	80%	0.2 w/stem All life stages	25%	Small Pondweed Water Naiad White Water Lily
Grant (U1)	90%	0.1 w/stem All life stages	1%	Eelgrass Large-leaf Pondweed Richardson's Pondweed Small Pondweed Water Naiad
Continuous declines in milfoil density; considerable damage				
More declines expected in 2015				

GRANT	Native Plants (% of Plant Community)			
	2012	2013	2014	
Grant (S1)	1%	15%	25%	Small Pondweed Water Naiad White Water Lily
Grant (U1)			1%	Eelgrass Large-leaf Pondweed Richardson's Pondweed Small Pondweed Water Naiad

In Grant Lake milfoil density had decreased each year since the initial stocking season from 359.26 stems/m² in 2012 to 81.48 stems/m² in 2014. Prior to stocking in 2012, milfoil composed 99% of the plant community with less than 5% of the plants showing signs of larval damage. In 2014, damage caused by larval feeding was observed on 80% of the milfoil stems at S1, with many of the stems bent over and dying back. Another positive aspect of the 2014 survey was the presence of a healthy weevil population at the control site with roughly 90% of the plants showed signs of larval damage.

Discontinuation of the Milfoil Solution Program

In November 2014 EnviroScience made the decision to suspend its milfoil weevil culturing operations indefinitely, as it had not been able to create a viable and long-term business model based out of our U.S. and Canadian locations, and citing a combination of increased regulatory requirements coupled with increasingly unpredictable weather patterns over the past few years have led to performance issues.

2016 - Where Are We Now?

Controlling EWM in Long Lake

We continue to be challenged by dense milfoil beds in various areas of Long Lake. This impacts our recreational activities and perhaps the value of our properties. Unfortunately, EWM is an aquatic invasive species which will not be eradicated in our lakes.

The overall goal is to maintain the presence of milfoil below nuisance levels.

Controlling EWM requires better stewardship on everyone's part. We can all help by:

- 1. avoiding milfoil beds with our boats and fishing gear;**
- 2. when moving from one lake to another, STOP the Spread by inspecting, cleaning and draining our boat, trailer and fishing gear;**
- 3. collecting floating milfoil stems as they wash up;**
- 4. refraining from cutting EWM stems;**
- 5. maintaining shoreline buffer zones of natural vegetation to provide over-wintering habitats for weevils.**

References

2013 Milfoil Solution® Progress Report at the City of Greater Sudbury (EnviroScience Inc.)

GSWA response to the [Enviroscience 2013 Milfoil Report](#) to the City of Greater Sudbury, March 19, 2014

2014 Milfoil Solution® Report at the City of Greater Sudbury, Ontario (EnviroScience Inc.)

2014 Proposal for Biological Control of Eurasian Watermilfoil at Long Lake, Sudbury, Ontario (EnviroScience Inc.)

ES Letter to City of Greater Sudbury, November 20, 2014

CGS 2014 Milfoil Survey Results-1.pdf

CGS Aquatic Vegetation and Eurasian Milfoil Preliminary Survey, 2014 (Lake Water Quality Program, Environmental Planning Initiatives Section)

CGS 2014 Milfoil & Native Aquatic Plant Survey Results