

2012 Progress Report of the Milfoil Solution[®] Program in

Wolfe Lake

Prepared for:

Westport Association

Prepared by:



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1.0 Introduction

Eurasian watermilfoil (*Myriophyllum spicatum*, hereafter referred to as milfoil) is an exotic-invasive aquatic plant that tolerates a wide range of growing conditions and out-competes native vegetation. Monocultures of milfoil limit recreational use, reduce biodiversity, and can cause detrimental changes to water temperature and dissolved oxygen in severe infestations. Wolfe Lake is a 955-hectare lake bordering Leeds and Grenville County and Frontenac County near Westport, Ontario. In recent years, residents of Wolfe Lake and the Westport Association noticed a rapid change in aquatic plant composition within Wolfe Lake. This change was facilitated by the widespread establishment of Eurasian watermilfoil (*Myriophyllum spicatum*) throughout the waterbody. In the summer of 2012, the Westport Association employed the use of **Milfoil Solution**[®], a biological control of milfoil using the milfoil weevil (*Euhrychiopsis lecontei*).

This weevil is native to North America and is a specialist herbivore of milfoil. It inhibits the plant in multiple ways with the most significant impacts caused by weevil larvae as they damage the meristem (growing tip) and burrow through the stem. Nutrient flow in the plant is disrupted and the stem loses buoyancy and collapses in the water column. A cascading effect pulls neighboring plants lower into the water column and the rate of photosynthesis is significantly reduced in these stems.

The table below outlines the Milfoil Solution[®] program for Wolfe Lake, including site establishment and number of weevils stocked:

Site	Initial Survey/ Stocking Date	Final Survey Date	Number of Weevils
S1	July 24, 2012	August 30, 2012	6,500
M2	July 24, 2012	August 30, 2012	-

2.0 Survey Methods

An initial survey is performed prior to weevil stocking and a follow-up survey is conducted four to eight weeks later. These surveys are integral in monitoring changes

that occur in both the augmented weevil population and the health of the milfoil over the course of the program in order to make informed management decisions. Qualitative observations in these surveys include the overall density and health of milfoil, identification of native plant species present, and the presence of weevils and weevil-induced damage. Quantitative measurements include milfoil density and weevil population density. Milfoil density is determined by randomly collecting stems throughout the milfoil bed using a quadrat (See Table 2). This sample is then converted to the number of stems per square meter (stems/m²). Weevil population density (number of weevils per stem) is determined through lab analysis of 30 stems sampled from three transect lines at each site (See Table 1).

3.0 Wolfe Lake Survey and Weevil Stocking

On July 24, 2012, biologists from Milfoil Solution, LLC. located ideal stocking and monitoring locations within Wolfe Lake for the Milfoil Solution[®] program. Once identified, initial surveys were performed to record qualitative site characteristics as well as sample collection to determine milfoil density (stems/m²) and weevil density (weevils/stem) prior to weevil stocking. After completing the initial surveys, a total of 6,500 weevils were stocked in the designated stocking site (S1). Sites were then marked with a buoy and the GPS co-ordinates were recorded.

On August 30, 2012 biologists returned to the stocking and monitoring sites to perform a follow-up survey. Although the most positive results are observed over multiple seasons of weevil stocking, initial progress is able to be inferred over the first season. The following is an overview of the results from the 2012 weevil stocking program in Wolfe Lake:

- **Site 1 (S1)**

S1 at Wolfe Lake was established and stocked with 6,500 weevils. Prior to stocking, milfoil at this site composed roughly 95% of the plant community with a milfoil density of 157.41 stems/m². In addition, approximately 20% of the milfoil had reached the surface of the water. A native weevil population was present

and weevils were observed in all life stages (eggs, larvae, pupae and adults) with a weevil density of 1.07 weevils/stem at the time of sampling.

During the follow-up survey in late August, milfoil at the site had noticeable weevil damage and was located roughly 20-60cm below the surface of the water. Milfoil composed approximately 75% of the plant community and had a density of 164.77 stems/m². Weevil density was lower at S1 in samples collected during the follow-up survey at 0.53 weevils/stem. However, it is important to note that weevils were observed throughout the milfoil bed while performing the follow-up survey in the adult, larval and pupal life stages. In addition, roughly 60% of the milfoil stems appeared to have weevil damage suggestive of a healthy weevil population.

- **Monitoring Site (M1)**

M1 was established as a monitoring site to compare the success of S1 to an area that did not receive any management. During the initial survey, the vast majority of the plant community was composed of healthy, green milfoil. Milfoil density at this site consisted of 110.96 stems/m². A native population of weevils was identified at M1 during the initial survey with a weevil density of 0.40 weevils/stem with weevils observed in the egg, larval and adult life stages.

During the follow-up survey, milfoil at this site composed the vast majority of the plant community and was healthy and green. Milfoil density at M1 was observed to increase from the initial survey to 151.14 stems/m². Weevils were observed during the follow-up survey in the egg, larval and adult life stages. Weevil density remained consistent with the initial survey consisting of 0.40 weevils/stem. In addition weevil damage was observed on 20% of the milfoil stems at M1.

The following native aquatic plant species were identified throughout Wolfe Lake:

Canada waterweed (*Elodea canadensis*), coontail (*Ceratophyllum demersum*), eelgrass (*Vallisneria spiralis*), large-leaf pondweed (*Potamogeton amplifolius*), Richardson's pondweed (*P. richardsonii*), muskgrass (*Chara sp.*),

northern watermilfoil (*Myriophyllum sibiricum*), water marigold (*Megalodonta beckii*).

4.0 Discussion

Milfoil at S1 showed several positive responses to weevil stocking over the course of the 2012 season. Between the initial and follow-up survey, milfoil weevil damage throughout S1 was observed to increase from roughly 20% to 60% of the bed. In addition, milfoil also remained below the surface of the water at S1 during the follow-up survey. Milfoil density at S1 slightly increased between the initial and follow-up survey, however this was very low in comparison to the increase in milfoil density at the monitoring site (M1). These results suggest a positive establishment of the weevil population. Often, significant decreases in milfoil density are not observed in the first season; rather these significant declines are dependent on several seasons of sustaining a healthy weevil population.

Weevils were observed at both S1 and M1 during the initial survey suggesting a healthy indigenous weevil population. Weevil density remained consistent at M1 whereas a decrease was observed at S1 between the initial and follow-up survey. It is likely that this decline in weevil density is due to timing of sampling rather than a decline in population. Weevils were observed in the follow-up survey in the egg, larval and adult life stages throughout the milfoil bed. In addition, 67% of the stems collected to determine weevil density showed signs of weevil damage and 33% of the stems consisted of empty pupal chambers at S1. This damage is indicative of a healthy weevil population. It is important to note that fluctuations in weevil and milfoil populations occur within and across seasons, therefore it is best to determine the success of the stocking project over several seasons. Fluctuations between weevil populations and milfoil density are natural and reflect the predator-prey nature of biological control.

Overall, the results of the 2012 initial and follow-up surveys are highly suggestive that Wolfe Lake is capable of supporting weevil populations capable of declines of in nuisance populations of milfoil. Prior to stocking, indigenous weevil populations were

identified at both S1 and M1 suggesting the presence of weevil habitat capable of sustaining a weevil population. Often, native weevil populations do not reach densities capable of significant declines in milfoil density. Biological control of milfoil is dependent on augmenting these native weevil populations to cause significant declines in milfoil density over several seasons.

The overall stem density and infestation of milfoil is expected to decrease as the augmented weevil population grows. As a biological control, the Milfoil Solution® process is most successful when introduction of the milfoil weevil occurs over multiple, successive growing seasons to ensure that the weevil population reaches high densities in the lake to maintain the milfoil to non-nuisance levels. Signs of milfoil suppression include:

- ✓ Reduction in density of the milfoil
- ✓ Maintenance of the stems below the lake surface at a non-nuisance level
- ✓ Open areas within the stocking sites

A secondary effect of the process is that native aquatic plants replace exotic milfoil as it is outcompeted and becomes a less dominant species in the plant community. Over the course of the program, areas of infestation transition into a more natural distribution of native plants, restoring a balanced lake ecology that supports a healthier fishery while improving recreational and aesthetic value. A total of eight native aquatic species were identified throughout the survey sites and will continue to be monitored over the course of the program to monitor positive changes in the plant community.

5.0 Recommendations

The Milfoil Solution® is dependent on the successful establishment of weevil populations over several seasons. It is the recommendation of Milfoil Solution LLC./EnviroScience to continue the current Milfoil Solution® program at Wolfe Lake. In addition to focusing on the current stocking site, establishing several stocking sites throughout Wolfe Lake will contribute to a sustainable long-term weevil population capable of decreasing milfoil density.

In addition to continuation of the Milfoil Solution[®] program, there are many practices that can contribute to the success of the stocking program and decrease the potential of increasing milfoil density such as:

- Limiting the amount of boat traffic in stocked sites and dense milfoil beds. Milfoil weevils typically reside in the upper 60cm of the plant, if heavy boat traffic occurs throughout the patch these plants can be damaged and impact the weevils ability to flourish. Driving through dense patches should also be limited since fragments of the plant can be dispersed throughout the lake capable of starting a new population.
- Providing a natural shoreline can increase weevil habitat for overwintering. In the fall months, weevils move to shore to overwinter in dry duff and leaf litter, leaving a 1-3m buffer adjacent to shore where grasses can grow and leaves can collect provides suitable habitat for weevils through these winter months.
- Milfoil stems that are floating in the water or washed up on shore can be collected and removed. If left alone, these fragments can move freely through the waterbody and can root to start a new plant. Once dried or composted, milfoil is often used as mulch in gardens and flower beds.

Pease contact EnviroScience at (800) 940-4025 or at kborrowman@enviroscienceinc.com with questions regarding this report.

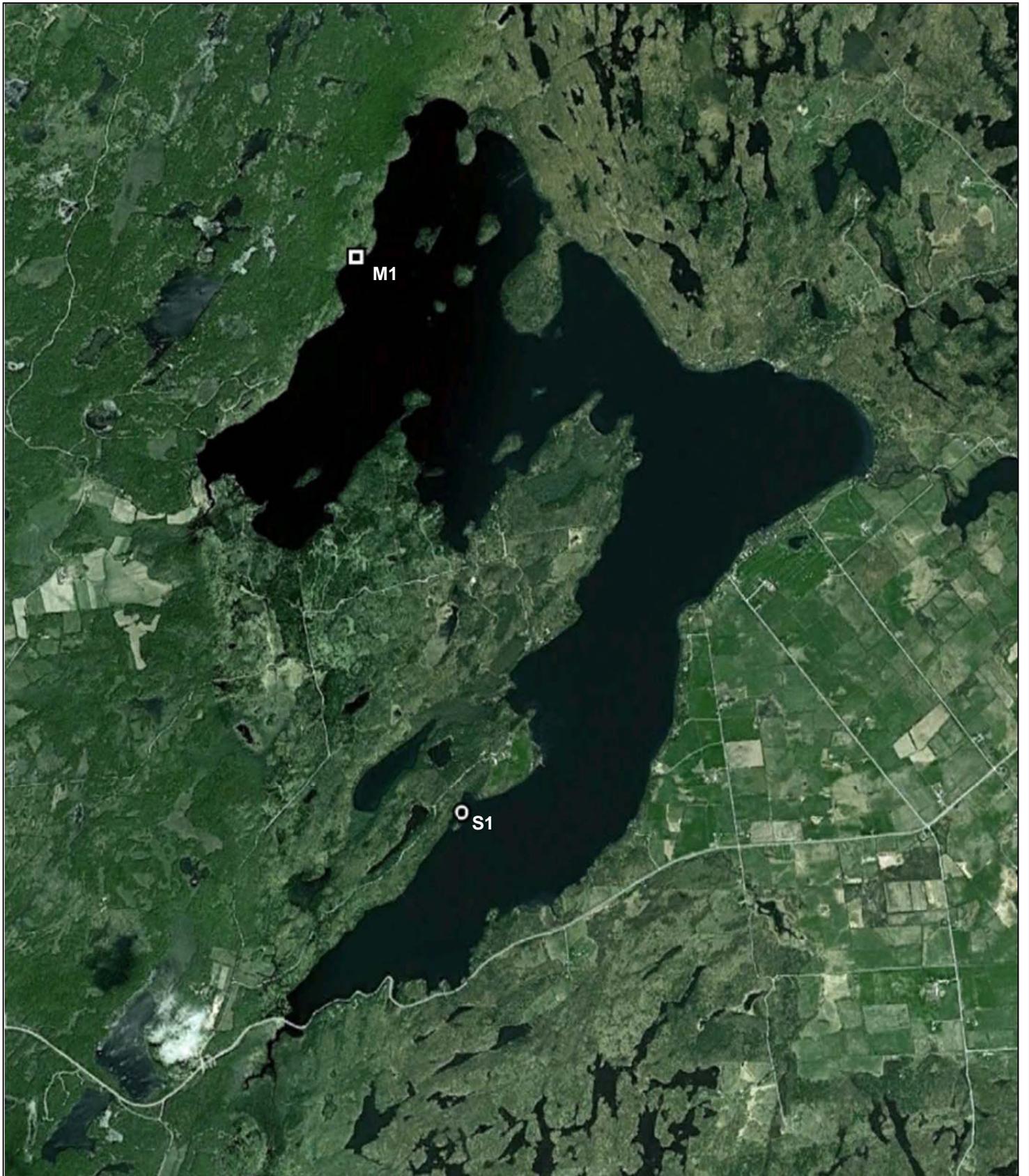
Lake Management Division
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Table 1. Weevil population analysis (weevils/stem) in Wolfe Lake, 2012.

Site #	Parameter Measured	July 24, 2012	August 31, 2012
S1	Total weevils	32.00	16.00
	Total stems	30.00	30.00
	Avg. weevils/stem	1.07	0.53
M1	Total weevils	12.00	12.00
	Total stems	30.00	30.00
	Avg. weevils/stem	0.40	0.40

Table 2. EWM density (stems/m²) in Wolfe Lake, 2012.

Site #	July 24, 2012	August 30, 2012
S1	157.41	164.77
M1	110.96	151.14



Wolfe Lake
Wesport,
Ontario

- ⊙ Weevil Stocking Site
- ▣ Monitoring Site

