

October 16, 2008

Robert Smith
Les Cheneaux Islands Watershed Council
1751 Lakeside Rd.
Cedarville, MI 49719

Dear Bob,

This report outlines the MiddFoil[®] program, which the Les Cheneaux Islands Watershed Council began in the summer of 2007. As noted in the original proposal, Option I included detailed qualitative and quantitative surveys before and after weevil stocking in 2007 and a final follow-up survey in 2008. Visual observations of weevils, overall health of the Eurasian watermilfoil (EWM) and native plant identification were also recorded. The table below outlines the program's schedule, site establishment, and number of weevils stocked.

Year/Option	Survey Dates	Sites Established	Number of weevils
2007/Option I	Initial: 6/21 Follow-up: 8/7	S1; S2; Mon1	15,500
2008/Option I	Follow-up: 8/6	no new sites	0

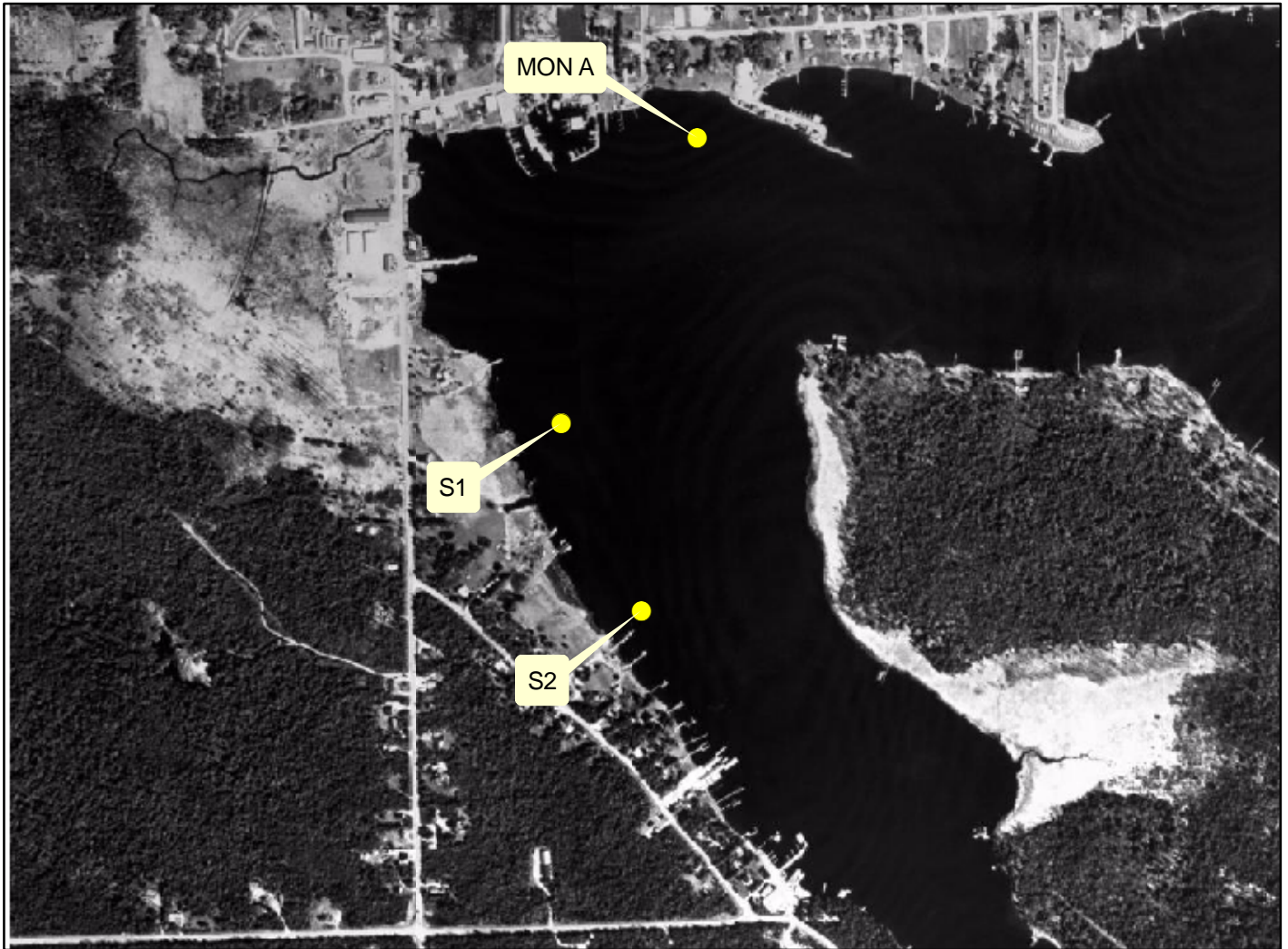
2007 Results

Two stocking locations were established, S1 and S2, into which weevils were implanted (Figure 1). A monitoring site (M1) was set up as a control site, therefore not stocked with weevils, to monitor movement of the weevils throughout the bay. S1 and S2 are located along the western edge of the bay south of the Cedarville Marina in one continuous milfoil bed. Location S1 was stocked with approximately 13,500 weevils while the remaining 2,000 was stocked at S2 near the Shoberg residence. M1 was established east of the Cedarville Marina in the northern portion of the bay. A small number of milfoil weevils and their damage were found in all three sites during the initial survey. This indicated the presence of an indigenous population of weevils in the bay along with healthy growth of EWM. In addition, five species of native plants and one species of algae were found, representing a diverse aquatic plant community. These species include largeleaf pondweed (*Potamogetan amplifolious*), eel grass (*Vallisneria americana*), elodea (*Elodea canadensis*), chara (*Chara spp.*), northern watermilfoil (*Myriophyllum sibiricum*) and coontail (*Ceratophyllum demersum*).

The average number of weevils per stem was similar between the initial and follow-up surveys for S1 and S2 with an increase found in M1 (Table 1). The EWM density decreased moderately at S1 and significantly at S2 between June 5 and August 7. In M1, the EWM density increased over the same period (Table 2).

Cedarville Bay, Lake Huron, MI

MiddFoil® Stocking and Monitoring Site Locations



Data projected to NAD83 UTM Zone 16N.

0 0.125 0.25 0.5 Miles

● 2007 Site Location



Figure 1. Cedarville Bay Stocking and Monitoring Locations

2008 Results

No weevil stocking took place at Cedarville Bay in 2008. As per the original proposal, the EnviroScience field team returned to Cedarville Bay to conduct a final follow-up survey on August 6, 2008. They used the same protocol as the surveys in 2007, taking transects of plant samples for analysis, plant density measurements, and visual recordings of the overall plant community and location.

Table 2 shows a dramatic decrease in density of EWM from measurements taken exactly one year after the follow-up survey of 2007. This shift in EWM quantity one year after the introduction of weevils is in keeping with the decline that can be expected using the MiddFoil[®] program.

In S1, the EWM was sparse toward shore with bare sediment exposed and grew denser toward the channel. The plants were below the surface of the bay. Larval damage and weevil eggs and adults were observed. Native plants made up forty percent of the plant community. The EWM in S2 was moderately sparse toward shore and denser toward the channel. It had fused leaflets, no actively growing meristems, and all were lying down below the surface of the bay. About 25 percent of the plant community was comprised of native plants. The monitoring site, M1, had open holes within the bed of EWM, but otherwise was the densest of the three sites, with ten percent native plants.

Table 1 presents the number of weevils counted on EWM stems analyzed at the EnviroScience lab. Weevil life stages were found on all sampling dates at the three sites with the exception of S2 on August 6, 2008, the final follow-up survey. This is an extremely positive indication that weevils successfully overwintered and returned to the bay.

Density oscillations observed between weevils and EWM are expected and are not surprising due to the fact that the milfoil has the potential to grow faster than the weevils can reproduce. It may take the population of weevils a season to "catch up" with the density of EWM before they can bring the milfoil levels back down. We have been witnessing this very event happening in many lakes in Michigan that utilize the MiddFoil[®] program.

Between the 2007 follow-up survey and 2008 final survey, a change in the composition of the plant community took place in S1 and S2. As the percent of EWM decreased, native plants increased. A healthy and established population of native vegetation will not only compete for essential light and nutrients but is expected to replace the EWM preventing future re-establishment of the milfoil.

Discussion

The focus of the MiddFoil® treatment program is to control the growth of EWM using the milfoil weevil. The post-treatment density, distribution, and condition of the EWM and that it remained below the surface in Cedarville Bay demonstrates successful results from using this program.

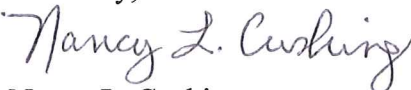
When working with a biocontrol such as the milfoil weevil, it is important to remember that the rate in which "control" is achieved can vary greatly among water bodies. Many factors play an important role including the size of the water body, shoreline habitat, amount and health of the EWM, amount of weevils stocked, and how much recreation occurs on the lake. Cedarville Bay maintains the necessary requirements to sustain a population of weevils throughout the summer, as well as having the critical required shoreline habitat for overwintering survival. As the EWM begins to decrease over time, so will the population of weevils until the two reach a state of equilibrium and sustain each other within the lake at low levels. Density oscillations observed between weevils and EWM are expected and are not surprising due to the fact that the milfoil has the potential to grow faster than the weevils can reproduce. It may take the population of weevils a season to "catch up" with the density of EWM before they can bring the milfoil levels back down. We have been witnessing this very event happening in many lakes from Michigan to Wisconsin that utilize the MiddFoil® program.

Positive results from the 2007 and 2008 surveys revealed not only the presence of weevil-induced damage, but also weevil life stages in the field and on collected EWM stems analyzed under the microscope. Furthermore, desirable native plant species increased in numbers and were filling in the open areas of the stocking locations where the EWM density started to decrease.

Future Recommendations

It is the recommendation of EnviroScience for the Les Cheneaux Watershed Council to continue to implement the MiddFoil® program, as multiple year management using milfoil weevils leads to long-term sustainable EWM control. Should you have any questions or comments, please do not hesitate to contact Cortney Marquette, the program manager at (800)940-4025 or email, cmarquette@enviroscienceinc.com.

Sincerely,



Nancy L. Cushing
Research Biologist

Table 1. Summary Data from Site Transect Analysis of EWM During 2007/2008 Initial and Follow-up Surveys of Cedarville Bay

Site #	Parameter Measured	Initial Survey (June 22, 2007)	Follow-up Survey (August 7, 2007)	Final Follow-up (August 6, 2008)
S1	Total weevils	8.00	11.00	9.00
	Total stems	30.00	30.00	30.00
	Average weevils/stem	0.27	0.37	.30
	Avg. meristems/stem	3.25	2.17	1.2
S2	Total weevils	16.00	7.00	0.00
	Total stems	30.00	30.00	28.00
	Average weevils/stem	0.53	0.23	0.00
	Avg. meristems/stem	2.00	1.97	.143
M1	Total weevils	2.00	9.00	1.00
	Total stems	30.00	30.00	28.00
	Average weevils/stem	0.07	0.30	.036
	Avg. meristems/stem	2.87	1.43	.75

Table 2. Average Density of Eurasian Watermilfoil Collected During 2007 Initial and Follow-up Surveys of Cedarville Bay

Site #	Species	Common Name	June 22, 2007 Density (stem /m ²)	Aug. 7, 2007 Density (stem/m ²)	Aug. 6, 2008 Density (stem/m ²)
S1	<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	244.44	211.11	11.11
S2	<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	300	166.67	40.00
M1	<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	155.55	270.00	133.30