

# Conceptual Project Outline: Biological Control of Eurasian Watermilfoil with the Milfoil Weevil, *Euhrychiopsis lecontei* in Bays of Lake Huron

Prepared for the Les Cheneaux Watershed Council

by EnviroScience, Inc.  
(ES # 978-4145)

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## Introduction

A number of bays along the Lake Huron shore have been impacted by the invasive aquatic weed Eurasian watermilfoil (hereafter referred to as EWM) over the past decade. EWM was first introduced in North America in the 1930s and has since spread to virtually every state in the U.S. and half of Canada. This aggressive invader interferes with all forms of recreation in the lake and chokes out desirable native vegetation, often resulting in a dense monoculture.

The milfoil weevil was first identified as a likely biocontrol agent for EWM in the late 1980s. Over the next decade extensive university research confirmed that this native insect is highly specific to watermilfoils, and strongly prefers EWM over native milfoils, including its native host, *Myriophyllum sibiricum* (Northern watermilfoil) (see Sheldon and Creed, 1995). This specificity, coupled with the fact that the weevil is native to much of North America, makes the weevil nearly an ideal biocontrol agent. Based on this research, EnviroScience, Inc. in cooperation with Middlebury College (VT) began making the weevil commercially available in 1998. Since that time, more than 200 lakes in 14 U.S. states and two Canadian Provinces have successfully used the Milfoil Solution<sup>®</sup> program, with milfoil weevils, to obtain long-term, lake-wide control.

A project in Cedarville Bay, 2007-2008, initiated by the Les Cheneaux Watershed Council, demonstrated the first successful implementation of Milfoil Solution<sup>®</sup> in one of the Great Lakes, Lake Huron. Two weevil stocking sites, S1 and S2, were established on opposite ends of one long bed of EWM on the west side of the bay. Monitoring site, M1, was established along the north shore, east of the Cedarville marina. In June 2007, 13,550 weevils were planted in S1 and 2,000 in S2. The follow-up survey that year showed a decrease in EWM density by 14% in S1 and 45% in S2 and increase of 74% in M1. By the August 2008 final survey, EWM density had reduced dramatically from June 2007 in both stocking sites by 96% in S1 and 87% in S2. A decrease was also noted in M1 along with an increase in the weevil density. As the percent EWM decreased, all sites experienced an increase in native plants, as well as the presence of bare substrate where EWM once grew. These dramatic changes in one year demonstrate that faster results can be achieved when a large number of weevils are targeted to a discrete bed of EWM in the first year of a program.

Because the Cedarville Bay project is similar in scope to the bays being addressed and within the same watershed for this proposal, a monitoring survey of the Cedarville Bay sites is recommended to determine the conditions four years post weevil introduction. This information will add to the database for the use of biocontrol in the Great Lakes.

Biological control organisms serve to suppress their host plants. The milfoil weevil damages milfoil directly at the growing tip (meristem) and to the supporting stem. Weevils lay their eggs on the healthy red/green tips of the milfoil and hatchling weevil larvae immediately feed on the young leaves and damage the tip. This damage reduces the plant's ability to grow higher in the water column where it can access more light to photosynthesize into energy. The larval stage moves in and out of the stem down the plant as it feeds, destroying the plant tissue and creating holes in the stem walls. This internal damage disrupts the flow of nutrients to the roots, where energy is stored for subsequent growth. In addition, holes in the stem allow air to escape and cause the plant to lose buoyancy. As the stem begins to fall over it weighs down nearby stems, pulling them further from the lake surface (Creed et.al. 1992).

All of these effects serve to reduce milfoil growth, density, and expansion and allow native plants to fill in as milfoil drops out of the water column. The role of native plants in the success of the biological control process cannot be overstated. Their expansion is considered a positive sign as they facilitate the demise of the milfoil through increased competition for light from above and nutrients in the lake sediment.

### **Project Objective**

Demonstrate the potential for milfoil weevils to provide sustainable and low-maintenance control of EWM in three bays of Lake Huron. This objective will be accomplished by stocking a total of 65,000 milfoil weevils in approximately 16 locations over a two-year period beginning in July of 2011. In 2013, a follow-up monitoring survey of all program sites will be completed to document the extent to which the weevils have controlled the EWM in the project areas. It is expected that Eurasian watermilfoil will transition from a dominant species to a relatively small part of the overall plant community.

### **Technical Considerations**

There are many technical considerations that must be taken into account for this project. Several of the most important of these are described below.

- 1. Host Specificity-** *E. lecontei* has been well documented as being extremely specific to watermilfoils (Solarz and Newman, 1996). In fact, work by Sheldon and Creed (1995) has demonstrated that the weevil can survive on only two of the many species of milfoil found in North America. These are EWM (*M. spicatum*) and Northern watermilfoil (*M. sibiricum*). In more than one hundred project lakes, EnviroScience has confirmed this host specificity and documented that the population of weevils declines as the quantity of milfoil is reduced. In other words, the weevil is incapable of shifting to alternate aquatic or terrestrial food sources.
- 2. Number of Sites and Weevils-** EnviroScience is proposing to implement an aggressive treatment program in 2011. The number of sites and the total number of weevils to be stocked varies depending on the relative size and the degree of infestation. Within each bay, one or more sites will be stocked with no less than 5,000 milfoil weevil eggs and larvae per site. Locations will be determined shortly

before stocking in mid-summer when the milfoil is high in the water column. (Table 1.) provides details on the proposed sites and numbers of weevils per bay.

### 3. Monitoring, Stocking, and Reporting

A critical component of this project is a monitoring program, which will measure the impact of the weevils. This is accomplished through a pre-stocking survey and post-stocking survey, conducted six to eight weeks later. In addition to the stocking sites, if enough milfoil beds are available within a bay, one or two untreated monitoring locations can be established to provide data that can be used for comparative purposes. These monitoring (control) sites, not stocked with weevils, will also help track the movement of weevils throughout the bay.

**Table 1. Les Cheneaux Watershed Proposed Schedule for Milfoil Weevil Stocking**

Location		2011	2012	2013	Total Weevils
Sheppard Bay	No. of Sites	3-4	2	Monitoring	30,000
	No. of Weevils	20,000	10,000	0	
Mismer Bay	No. of Sites	3-4	2	Monitoring	30,000
	No. of Weevils	20,000	10,000	0	
Wilderness Bay Area	No. of Sites	2-3	2	Monitoring	25,000
	No. of Weevils	15,000	10,000	0	
<b>Total No. Weevils</b>		55,000	30,000	0	85,000

Before milfoil weevil application, each proposed weevil stocking site will be circumnavigated to determine and map the location and size of watermilfoil beds with differential GPS. During mapping, the milfoil species, size of the population, and presence of native species will be noted. For each site, three transects will be located within the stocked milfoil beds. The top 50 cm of EWM stems will be collected along the transects as follows: 3 transects/bed x 5 sampling points/transect x 2 stems/sampling point = 30 stems/site with transects approximately equidistant from one another: one through the center of the bed, and one on each side of the bed. In addition, milfoil weevil effects within each project site will be measured by determining the percent damage to three sets of ten randomly selected stems. The transect plant material will be observed under a microscope for the identification of weevil life stages (eggs, larvae, pupae, adults and distinctive larval damage). Counts will be used to estimate abundance of weevils on watermilfoil stems. The initial survey will reveal if an indigenous milfoil weevil population is present and at what density. Changes in the aquatic plant community will be monitored by visual inspections. The increase in native

plant density and species is a positive indicator that the EWM is being outcompeted for space and resources.

After the initial survey is completed, EnviroScience biologists will apply weevils to the sites established. The company is currently the only entity engaged in the commercial production and release of the milfoil weevil. The first follow-up monitoring event will be conducted six to eight weeks after weevil application.

As a biological control agent, the milfoil weevil should return to the watermilfoil beds every year, thereby creating a long-term control option for the treated bays.

Both stocking and untreated monitoring sites will at a minimum be analyzed twice each summer for a period of two years. This includes an event immediately prior to stocking and, one in late summer (late August or early September).

Data from these surveys will be compiled and an annual report will be produced along with maps of the project areas based on GIS technology.

### **Costing**

The following table indicates the total costs by year for the combined project sites. Expenses include two annual surveys at each site, stocking, reporting, as well as travel, per diem, and equipment costs by year.

<b>Year</b>	<b>Total Weevils</b>	<b>Cost for Weevils</b>	<b>Expenses</b>	<b>Total by Year</b>
2011	55,000	\$48,000.00	\$12,000.00	\$60,000.00
2012	30,000	\$30,000.00	\$15,000.00	\$45,000.00
2013	0	\$0.00	\$7,000.00	\$7,000.00
<b>Totals</b>		<b>\$78,000.00</b>	<b>\$34,000.00</b>	<b>\$112,000.00</b>

## Terms and Agreement

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EnviroScience, Inc. will provide services and organisms for application of **Milfoil Solution**® for the Les Cheneaux Watershed Council as outlined in the attached proposal.

Should the project be cancelled, delayed or otherwise postponed after May 1<sup>st</sup> of any year due to factors outside of the control of EnviroScience, Inc., 20% of the annual project cost for the year in question will be kept as a cancellation fee to defray costs associated with start up of the laboratory cultures. Any additional balance will be retained and applied to the project costs for the following year. Factors beyond EnviroScience's control may include, but are not limited to adverse weather, high water level, and actions of outside contractors hired by the client.

Please note: Stocking priority is determined by the date we receive a signed contract and deposit. The price in this proposal is valid for 60 days from the date of issuance.

Respectfully submitted by:



Rebecca McMenamin  
Sales Representative  
|EnviroScience, Inc.

**Accepted and Authorized to Proceed:**

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**Signature**

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**Date**