

## FACT SHEET ON THE APPLICATION OF AN AQUATIC WEEVIL FOR BIOLOGICAL CONTROL OF EURASIAN WATER MILFOIL

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**M**any lakes in the United States are congested by an aquatic plant called Eurasian water-milfoil (*Myriophyllum spicatum*). The first documented occurrence of this plant was from the Washington D.C. area in 1942. By 1950 it was found in Arizona, California and Ohio. First observed in Minnesota in 1987, by 1993 it had spread to 65 water bodies. Presently it infests thousands of lakes in more than 42 states. The Army Corps of Engineers considers Eurasian watermilfoil to be the most pervasive aquatic nuisance plant in the United States.

Probably initially introduced by the aquarium trade, this weed has spread both purposefully by fishermen who introduced it to make beds for fish reproduction, and accidentally when caught in propellers or boat trailers and carried to a new body of water. Eurasian watermilfoil resembles an elongated bottle brush with long stems and feather-like leaves arranged in whorls. Its flowering spike protrudes from the water in late summer and when the flowers are pollinated, they set seed. More commonly, however, this plant propagates by fragmentation. Even pieces which have dried out or are quite small can begin new colonies. It is capable of growing in water from 2 to 24 feet in depth, and tolerates a wide range of pH and turbidity.

Eurasian watermilfoil forms dense mats in which it is difficult to boat, swim or fish. In addition, these uniform, tightly congested rafts of stems are not used by native aquatic fishes or invertebrates and inhibit the growth of other aquatic plants. Literally millions of dollars are spent each year trying to control it.

**What can be done to control this invasive water weed?** Since its rapid spread throughout the U.S. and southern Canada, a new business of Eurasian watermilfoil eradication has emerged. The most common methods are mechanical harvesting, chemical application, or the introduction of grass carp (*Ctenopharyngodon idella* Val.). The use of the weed harvester and chemicals are expensive, they do not discriminate between native plants and Eurasian watermilfoil, and have to be used repeatedly. Harvesters can't cut near docks and other structures. Many lake owners object to the use of chemicals in recreational water. Grass carp are not selective in food preference and eat all aquatic plants (Eurasian watermilfoil is their last choice), cause the lake to be turbid, and their fecal material promotes algal blooms. In addition, grass carp are illegal in some states.

EnviroScience, Inc. is proposing another method, one that uses a biological organism or biological control. This method is called **MiddFoil™** and it was developed after nearly nine years of intensive research by Dr. Sallie Sheldon. The organism is the milfoil weevil (*Euhrychiopsis lecontei*) (Coleoptera: Curculionidae). This biological control method, which uses a



native North American weevil, is by far the least expensive and most environmentally sensitive way of controlling Eurasian watermilfoil. Using weevils is no more expensive than treating a lake with chemicals over time.

**What is a biological control?** Basically, it's the use of one organism (the control) to manage another (the pest). Under most circumstances the "pest" is an exotic plant or animal introduced into a new area where it lacks any native control boundaries. Freed from the ecological context in which it evolved, it tends to take over the community where it is found. To counteract this, another exotic organism is introduced to control the first pest. In this particular case Eurasian watermilfoil is the exotic, introduced species and the milfoil weevil is a *native* control. Because this beetle is already widespread in the United States we are confident that augmentation of these existing populations won't create a new ecological problem.

The long-term goal of a biological control is not eradication of the pest, but rather the persistence at low density of both the weed and the control agent.

Insect biological controls have been used to control other aquatic pest species including waterfern (*Salvinia* sp.- controlled by weevils and moths) and alligator weed (*Alternanthera philoxeroides*- controlled with a set of insects).

**Where did this weevil come from and on what does it feed?** The milfoil weevil, *E. lecontei*, is native to the U.S. and Canada and has been collected from lakes in Connecticut, Illinois, Indiana, Iowa, Massachusetts, New York, Ohio, Washington, Wisconsin, and Vermont. The adult weevil is small, only about 2-3 millimeters or slightly smaller than a grain of rice. The adult lays eggs on the growing tips of milfoil. These eggs hatch within a week and the larvae begin to feed upon the plant. Eventually the larvae form puparia in the lower stem of the plant. Adults hatch out, swim to the top of the plants and begin the life cycle again. In the Midwest, the weevil goes through about 3 generations a summer. In autumn, the adult weevils move to plant litter at the lake margin where they over-winter. The following spring, the adults fly back to the plants in the lake.

While the adults and larvae both feed on milfoil leaves, the larvae do the most destruction by eating the conductive tissue inside the stem. Eventually, damaged plants lose buoyancy and the stems fall to the bottom of the water body and slowly decay. Prior to the introduction of Eurasian watermilfoil, this weevil grazed on native milfoils.

**What about other milfoil species?** There are nine native species of milfoil found in the U.S. By far the most common and abundant in any lake is Eurasian watermilfoil, *M. spicatum*. Weevils had an impact on some native watermilfoils in controlled laboratory experiments at extremely high concentrations. However, beetles feeding on native milfoils had greatly reduced reproduction compared to weevils on Eurasian watermilfoil. When given a



choice between a native species or the introduced variety, weevils prefer the exotic Eurasian watermilfoil. In natural conditions, the milfoil weevil can't maintain a high enough density to have a significant impact on native watermilfoils.

Eurasian watermilfoil appears to lack a defensive compound that evolved in native species to deter insect grazing. It is unique that this native insect prefers an introduced host. Biologists at EnviroScience will be able to survey lakes to be certain that the milfoil to be treated is indeed the introduced Eurasian watermilfoil.

**What about other water plants in the lake?** Research has been done in Vermont on the effects of the milfoil weevil on other aquatic plants. The weevils had no effect on other submerged aquatic plants such as coontail (*Ceratophyllum demersum*), stonewort (*Chara* sp.), elodea (*Elodea canadensis*), water stargrass (*Heteranthera dubia*), water marigold (*Megalodonta beckii*), naiad (*Najas flexilis*), wild celery or eelgrass (*Vallisneria americana*) and large-leaved pondweed (*Potamogeton amplifolius*).

One of the benefits of using the milfoil weevil over chemicals, a harvester, or grass carp is that weevils attack the problem species exclusively, while allowing the other submerged aquatic plants to re-establish and form a natural plant community.

**Will the adult milfoil weevils leave the plant and attack a swimmer?** No! The milfoil weevils seek out the delicate plant leaves of Eurasian watermilfoil and are actually hard to remove from the plant, even when it is fiercely shaken. The weevil cannot bite nor sting, and are so small that they are difficult to see.

**How will EnviroScience introduce milfoil weevils into a lake?** EnviroScience will provide milfoil weevils mostly in the form of eggs and larvae attached to plants grown in the laboratory. These weevils will be concentrated on milfoil stems that will be added to an existing milfoil bed. Consultation with lake owners will determine the exact treatment to be used.

**Will the lake look different after the insects are introduced?** Not immediately. The weevils are so small and difficult to see that it would be hard for even a trained expert to notice the introduction. Under most circumstances, dramatic effects on Eurasian watermilfoil won't be seen for several years.

**What do the milfoil weevils do to water quality?** The lake will become clearer due to the removal of the Eurasian watermilfoil rafts, which often serves as host to algae that grow as threadlike masses on the stems, making the water more murky. In addition, native aquatic plants will either move back into the area or expand from existing populations and form a more natural plant community that will vary in height and leaf shape.



**Is this a permanent treatment?** Given a little time, the milfoil weevil will significantly impact populations of Eurasian watermilfoil. Because there will always be re-introductions of milfoil into lakes (remember that it arrived there accidentally in the first place) from boat propellers, migrating waterfowl, and fish releases, it would not be desirable to completely eradicate it. As long as there are small populations of Eurasian milfoil, there will be a population of milfoil weevils to control it.

**What other lakes have been treated?** To date, weevils have been stocked in Illinois, Michigan, Massachusetts, Michigan, New York, New Jersey, Ohio, Vermont and Wisconsin lakes. Much of the original research was done in Vermont lakes. MiddFoil™ is also being studied as a control agent in a number of other states and Canada.

**How long will it take?** That depends on when and how many beetles are applied. A pinhead-sized weevil is an underwhelming control agent for a lake filled with Eurasian watermilfoil. Under most circumstances, it will take several seasons to have its maximum effect. Under some circumstances, EnviroScience can provide integrated pest management, which combines the use of the biological control with another treatment, such as harvesting or chemicals. Different parts of the lake could be simultaneously managed differently. The rate of decline is directly related to the number of and the time of year that the milfoil weevils are introduced.

**What controls the control?** Basically, the milfoil weevil will be controlled by the amount of Eurasian watermilfoil in the lake. As the plants become less abundant, so will the beetles.

**What next?** Contact EnviroScience at (800)940-4025 and ask for information about MiddFoil™. Or visit our website: [www.enviroscienceinc.com](http://www.enviroscienceinc.com)

### References

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