Lake Notes

The Milfoil Weevil

The milfoil weevil (*Euhrychiopsis lecontei*), a small aquatic beetle native to North America, has attracted the attention of lake managers in recent years. It appears to have the potential to control the invasive, exotic plant Eurasian water milfoil (*Myriophyllum spicatum*) in North American lakes. This weevil, which as an adult reaches only about 2 to 3 mm in length (about this size: -) and has black and yellow stripes on its back, spends its entire life feeding and reproducing on water milfoil plants.

An adult milfoil weevil

Courtesy: Sallie P. Sheldon, Middlebury College

Before the introduction of Eurasian water milfoil (EWM) to North America in the early 1940s, milfoil weevils fed on northern water milfoil (*Myriophyllum sibericum*), a native North American plant that is a relative of EWM, and possibly on other native water milfoils as well (such as *Myriophyllum verticillatum*). Since the milfoil weevil is a native species, it is particularly attractive as a means of controlling EWM.

Weevil Lifecycle and Impact on Eurasian Water Milfoil

The milfoil weevil has the potential to cause damage to milfoil plants at every stage of the weevil's lifecycle; however, the larval stage is believed to be the most destructive. Adult female weevils lay approximately 2 to 3 eggs per day on the leaves of the growing tips of milfoil plants. When the eggs hatch after 3 to 6 days, the larvae eat the growing tips of the plants for several days, then burrow into the stems where they feed on the tissue within the stems.

This destruction of stem tissue interferes with the plants' ability to transport food and nutrients, impacting the milfoils' ability to grow in the summer and survive the winter. The burrowing larvae also reduce the buoyancy of the stems, causing the plants to fall down into the water column and thus lose their ability to compete with other plants for sunlight. Weevil-damaged milfoil also may be more susceptible to disease from fungus and bacteria.

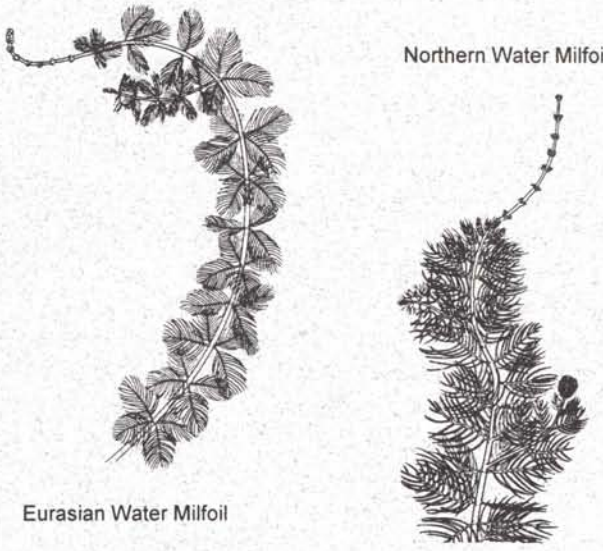
A milfoil weevil larva on EWM

Courtesy: R. Newman Lab, Univ. of Minnesota

After about 5 to 10 days of burrowing and feeding on the stem tissue, the larvae pupate within the stems, emerging as adults after about 7 to 12 days in the pupal stage. The adult weevils (which have lived as long as 162 days in captivity) then feed on the upper leaves of milfoil plants while reproducing. A weevil population may produce 3 to 4 generations in a given summer. The last generation develops wing muscles and migrates to shore where it overwinters in dry soil and leaf litter. This overwintering generation returns to the lake again the following spring.

While the weevil will readily use both EWM and northern water milfoil as a host, in cases where weevils are raised on EWM, they appear to have a preference for it, while weevils raised on northern water milfoil show equal preference for northern water milfoil and EWM. Interestingly, the milfoil weevil appears to

cause more damage to EWM than it does to northern water milfoil. This may be because northern water milfoil has evolved biochemical defenses against the weevil, or because the robust stem of the northern water milfoil is not as easily damaged by the burrowing larvae as is the more delicate EWM stem.

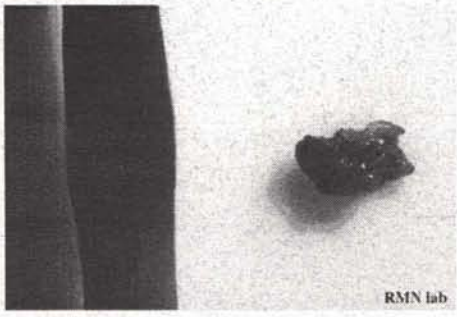


Eurasian Water Milfoil

Northern Water Milfoil

Evidence of Weevil Damage to Eurasian Water Milfoil

Signs of weevil damage to EWM plants include broken plant tips or very fragile tips that break readily when handled. Other signs of damage include stems that have lost their buoyancy due to the burrowing of weevil larvae and have fallen down within the water column. Such stems often appear to be arched over instead of standing up straight in the water. If you look closely, dark areas that extend around the entire circumference of the stem can be seen where weevil larvae have hollowed the stem. These darkened areas usually occur in the top 1 to 2 feet of the plant. Small holes in the stem where pupation has occurred also may be visible. These are generally found 2 to 3 feet down the stem and several inches below the lowest area darkened by burrowing. Weevil-damaged EWM also may take on a "sickly" yellowish-brown color as opposed to the usual healthy green.



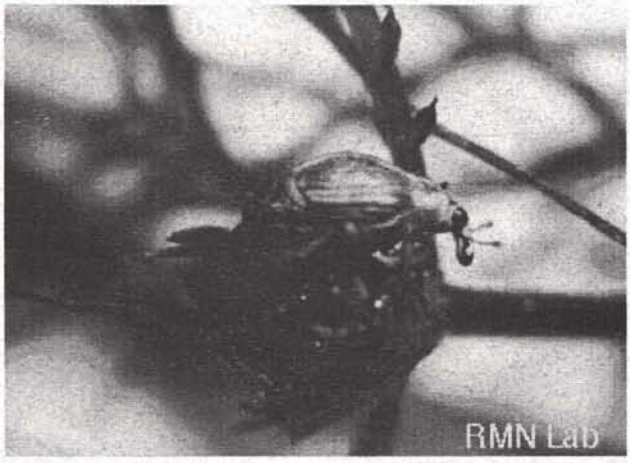
Left: Milfoil stem with a hole revealing where a weevil emerged from its pupal chamber
Right: A milfoil weevil pupa

Courtesy: R. Newman Lab, Univ. of Minnesota

You can search for adult weevils, eggs, larvae, pupae and damage characteristic of weevil activity on milfoil plants in your lake. Plants can be examined by wading, snorkeling, or from a small boat. The eggs of milfoil weevils are tiny yellow spheres (about 0.5 mm by 0.5 mm in size) that can be found on the tiny leaves of the growing stem tips (called "apical meristems" by botanists), and adults may be spotted near the tops of milfoil plants.

Weevil Damage to EWM in Illinois

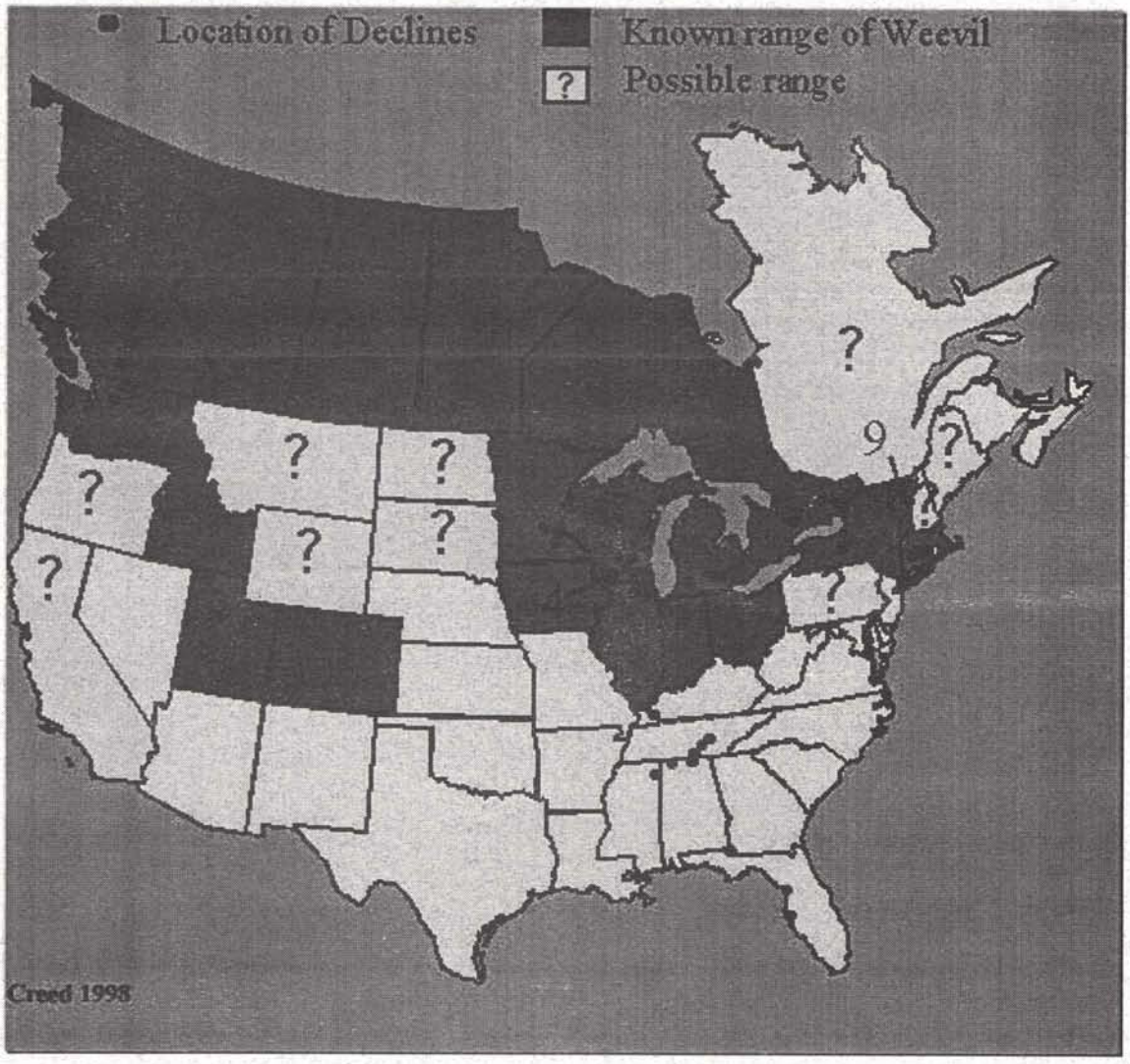
The first lake in Illinois discovered to have a significant EWM decline in the presence of the milfoil weevil was McCullom Lake in McHenry County in northeastern Illinois. The weevil was found on a few remaining strands of EWM in June 1995. This discovery followed a then-mysterious, nearly total disappearance of the EWM that had covered nearly 70% of the lake's 244 acres the previous summer. The weevil continues to be present in McCullom Lake and appears to be keeping the EWM population in check.



An adult milfoil weevil on the tiny leaves of a growing EWM stem tip

Courtesy: R. Newman Lab, Univ. of Minnesota

Since this discovery at McCullom Lake, several other lakes in northeastern Illinois (including several in Lake County) also have been found to have milfoil weevil populations. In some, significant damage to, and decline of, EWM has been documented. In others, damage appears to be minimal. In some lakes where the milfoil weevil initially caused EWM declines, the EWM has recovered to again dominate the lake. This may reflect a cyclic pattern of predator-prey relationships. Predation by the weevil results in a decline in the EWM. This may be followed by a decline in the weevil population due to a shortage of EWM on which to feed and reproduce. The decline in the weevil population allows the EWM population to again expand, and then the cycle begins again.



The known and possible range of the milfoil weevil in the United States and Canada

Courtesy: Robert Creed, Appalachian State University; Ray Newman, University of Minnesota; and the Journal of Aquatic Plant Management, a publication of the Aquatic Plant Management Society, Inc.

Milfoil Weevils in Other States and Canadian Provinces

Other U.S. states and Canadian provinces where the presence of milfoil weevils has been documented include Vermont, Connecticut, Massachusetts, and New York in the northeastern United States; Michigan, Minnesota, Wisconsin, Ohio, Indiana, and Iowa in the midwestern United States; Idaho, Colorado, Utah, and Washington in the western United States; and Alberta, British Columbia, Saskatchewan, Manitoba, and Ontario in Canada. In several of these states and provinces, EWM declines also have been documented. The range of milfoil weevils has not been completely studied, and the weevils probably occur in other states and provinces within the range of the native northern water milfoil.

Factors Affecting the Success of EWM Control by Weevils

Research suggests that milfoil weevil populations may be more successful, and thus more likely to control infestations of EWM, in some lakes than in others. For example, of lakes stocked with milfoil weevils and studied in Wisconsin, those with more natural shoreline areas achieved higher weevil densities than did lakes primarily bordered by sea walls, rip-rap, mown grass, or sand. It appears that lakes with natural shorelines may provide better habitat for over-wintering weevils. Wisconsin studies also indicate that weevils are more likely to cause EWM declines in lakes where the milfoil grows in shallower water, as well as in lakes where the milfoil has already reached its maximum distribution and is no longer expanding its territory. Research done at the University of

Minnesota suggests that in some lakes, sunfish preying on weevils may be a factor in keeping weevil populations low. Other research suggests that lakes with high nutrient levels may foster populations of EWM that are too vigorous for the the weevils to control. However, at this point lake managers and scientists still cannot accurately predict under what circumstances weevils will be effective in controlling EWM in a particular lake.

Although weevil stocking alone does not appear to be enough to control EWM infestations in most lakes, it may be a valuable component of an integrated control approach. Weevil stocking can be used in conjunction with aquatic herbicides and mechanical plant harvesting—as long as the herbicides or harvesting are not used in the same area of the lake where weevils are stocked! This is critical because the weevils require the growing tips of milfoil for food and reproduction, and these growing tips are removed by harvesting and herbicides.

Introduction and Augmentation of Milfoil Weevils in Lakes

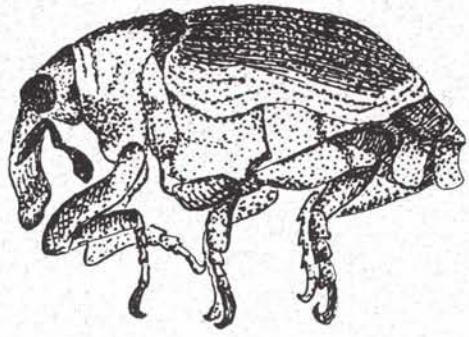
Milfoil weevils are available commercially; they also have been introduced into lakes by researchers. It is important to keep in mind, however, that some experts believe there is good reason to avoid moving weevils from one state to another, between different regions within a state, and even from lake to lake within the same region. This is, in part, because different weevil strains may occupy different lakes. Introduction of a weevil strain with lower feeding and reproductive rates than the strain currently inhabiting a lake could result in the formation of a weevil population with less desirable attributes in terms of its potential to control EWM. Also, other organisms may be accidently moved along with the weevils including pest species, more aggressive strains of EWM, or insect parasites and pathogens that could be harmful. Experts from the University of Minnesota suggest that the best course of action is to determine if weevils are present within your lake and then, if they are present, to work to promote and conserve their population.

For Further Information

To learn more about the milfoil weevil, check out the webpage "Biocontrol of Eurasian Water Milfoil" by Dr. Ray Newman at the University of Minnesota, Department of Fisheries and Wildlife:

http://www.fw.umn.edu/research/milfoil/milfoilbc/weevil.html

To learn more about Eurasian water milfoil, see the *Lake Notes* publication "Aquatic Exotics."



Courtesy: Susan Warren, Vermont Department of Environmental Conservation

Lake Notes . . . is a series of publications produced by the Illinois Environmental Protection Agency about issues confronting Illinois' lake resources. The objective of these publications is to provide lake and watershed residents with a greater understanding of environmental cause-and-effect relationships, and actions we all can take to protect our lakes.

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For more information about other publications in this series and to request copies, please contact: Illinois Environmental Protection Agency, DWPC-Lake and Watershed Unit, P.O. Box 19276, Springfield, Illinois, 62794-9276; 217/782-3362.

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