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Panel Discussion[1]

Management of Eurasian Watermilfoil in the United States Using Native Insects: State Regulatory and Management Issues

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ABSTRACT

While researchers have evaluated the potential of native insect herbivores to manage nonindigenous aquatic plant species such as Eurasian watermilfoil (*Myriophyllum spicatum* L.), the practical matters of regulatory compliance and implementation have been neglected. A panel of aquatic nuisance species program managers from three state natural resource management agencies (Minnesota, Vermont and Washington) discussed their regulatory and policy concerns. In addition, one ecological consultant attempting to market one of the native insects to manage Eurasian watermilfoil added his perspective on the special challenges of distributing a native biological control agent for management of Eurasian watermilfoil.

Key words: Myriophyllum spicatum, *Euhrychiopsis lecontei*, biological control, policy, permit, regulation.

INTRODUCTION

Research on the potential use of native insect herbivores to manage Eurasian watermilfoil (*Myriophyllum spicatum* L.) and other nonindigenous aquatic plant species has been ongoing for over a decade (Batra 1977, Buckingham and Ross 1981, Creed et al. 1992, Kangasniemi and Oliver 1983, Painter and McCabe 1988). Substantial progress has been made towards understanding the impacts of native insects on Eurasian watermilfoil, and their use as biological control agents has been advanced. However, little progress has been made in addressing either the regulatory considerations regarding the use of these herbivores as biocontrol agents, or the practical considerations regarding the large-scale use of these insects in an operational setting.

While some concerns that accompany the introduction of foreign insects to manage a plant species are alleviated by the use of native or naturalized insects, other regulatory concerns involving interstate transport of native or naturalized insects may surface. Representatives from three states will discuss these regulatory concerns as well as reasons their states have supported research into the use of native and naturalized insects for managing Eurasian watermilfoil.

Another issue regarding the use of native or naturalized insects is distribution. With classical biological control, where an agent from the native range of the target species is introduced to the new host region, it is assumed that once a sufficient founder population is established, it will increase in size and the control agent will disperse to new host populations. The theory is that the population will spread to suppress the target plant over a period of years. Therefore, federal and state government agencies have used tax dollars to establish these small initial populations for the benefit of an entire region, rather than an individual state or lake. However, with the use of a native or naturalized insect, there is no theoretical reason to assume that a few small initial populations will be sufficient to manage the target plant species across a very large geographical area, or this population dynamic would have occurred long ago. Therefore, a larger program for establishment would be required.

One solution to the problem of managing plant populations with native insect biological control agents is to use private companies that would handle distribution to lakes where this management technique is desired, much the same has chemical or mechanical control technologies. One such company, EnviroScience, Inc., has begun marketing the milfoil weevil (*Euhrychiopsis lecontei* (Dietz)) to private and governmental organizations that wish to manage Eurasian watermilfoil on a lake by lake basis. Mr. Martin Hilovsky, President of EnviroScience, will provide his company's view of the future for native insect biocontrol of Eurasian watermilfoil.

Lastly, the conference attendees will have the opportunity to ask questions and have them answered by both the panel members and other presenters within this session.

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PANEL MEMBER STATEMENTS

Kathy Hamel, Washington State Department of Ecology

Eurasian watermilfoil has been managed in Washington since the mid 1970's and is considered the number one submersed aquatic problem species statewide. While success has been achieved in eliminating Eurasian watermilfoil from aquatic systems of less than 350 acres, many of the larger lakes and rivers, such as the Columbia and Pend Oreille Rivers, are still heavily infested.

In some of the lakes with older established populations, Eurasian watermilfoil has declined and is no longer the dominant species in the lake. This is in contrast to newly infested lakes, where the Eurasian watermilfoil population is rapidly spreading throughout the littoral zone, suppressing native species. Evidence suggests that herbivory by weevils and other native insects has contributed to many of these Eurasian watermilfoil population declines. As a result, use of native insects has been advocated as a management tool for the rivers and larger lakes to suppress Eurasian watermilfoil.

The availability of native insects as a viable management tool has advantages and disadvantages from both a regulatory and management point of view. The advantages are: 1) other states have already completed much of the ground work; 2) native insects as a biological control agent are more acceptable to the public than the introduction of exotic biocontrol agents; and 3) state permitting is easier for indigenous native insects. The disadvantages are 1) Washington State does not have the resources available to be involved in weevil production; 2) insect cultures imported from other states have to be guaranteed free from exotic pests such as zebra mussels, parasites, and pathogens; and 3) scientists, resource managers, and citizens have expressed concerns about different weevil or Eurasian watermilfoil genotypes being introduced into Washington State.

Before weevils and other native insect herbivores are accepted by the public in Washington State as an effective management tool, control needs to be demonstrated within a 3 to 4 year time frame and be proven as cost-effective as the other management methods. In addition, further research needs to be conducted on other native insects as potential biocontrol agents, augmentation rates using native insects, flowing water problems and weevil population densities in Washington State.

Currently, the State of Washington's Department of Agriculture has not approved a permit to import and release weevils into Washington waters, and any permit issued will be for experimental use only.

Holly A. Crosson, Vermont Department of Environmental Conservation

Eurasian watermilfoil has been a problem in Vermont since the early 1980's, although the first recorded infestation occurred in Lake Champlain in 1962. Various control methods have been employed such as mechanical harvesting, hand pulling, diver-operated suction harvesting and bottom barriers. The importation of grass carp is illegal under current Vermont Fish and Wildlife Department regulation. While aquatic herbicide permits have been issued, treatments for Eurasian watermilfoil have not occurred due to lack of funding or permit appeal by local citizens.

The Vermont Department of Environmental Conservation (VTDEC) has been working with the watermilfoil weevil, *Euhrychiopsis lecontei* (hereafter called weevil) since 1989, allocating more than $800,000 of state and federal funds toward research and control efforts. The weevil is currently found in 33 of the state's 45 Eurasian watermilfoil-infested lakes, and natural milfoil declines have occurred in ten lakes. Weevil introductions and augmentations have occurred in nine lakes since 1993, with over 100,000 weevil adults, eggs and larvae being introduced. Weevil-induced plant damage is evident at many sites; however, significant declines attributable to weevils have not occurred.

Four laws in Vermont regulate weevil importation, introduction and collection. Importation permits are required from both the Vermont Department of Agriculture, Food and Markets and the Vermont Department of Fish and Wildlife before weevils from out-of-state can be brought into Vermont. To date, imported weevils have been authorized for use in contained facilities only. Primary concerns with weevil importation and subsequent introduction to state waters (any surface water, whether public or private) are: 1) potential introduction of new exotic species through transfer of water and plant material; 2) potential exposure of Vermont weevils to new parasites or pathogens; 3) potential negative effects on the genetic integrity of the Vermont weevil population; and 4) potential introduction of a new genotype of Eurasian watermilfoil.

Introduction of weevils into Vermont state waters requires a biological control permit is required from the VTDEC's Aquatic Nuisance Control Permit Program (ANCP). The applicant must demonstrate and the state must find that the proposed weevil introduction or augmentation poses: 1) an acceptable risk to the non-target environment; 2) a negligible risk to public health; and 3) a benefit to, or no undue adverse effect upon the public good. At this time, without additional information that addresses the concerns mentioned above, the ANCP requires that all weevils released in Vermont must come from genetic stock originating in Vermont.

The removal of weevils from Vermont state waters for educational, research, commercial or other purposes is illegal without a collection permit from the Vermont Department of Fish and Wildlife under their non-game wildlife management rule. Currently, the VTDEC is the only group that has requested (and received) authorization for this activity.

The VTDEC administers a grant program which provides financial assistance to municipalities to conduct Eurasian watermilfoil control programs. At this time, the VTDEC considers the use of the weevil to be experimental and has not awarded grants for *operational* biological control using this insect. One of the evaluation criteria the grant program uses for prioritizing projects is the "likelihood of success." The VTDEC does not believe there is currently enough data to show that the weevil can be used reliably or predictably, which would result in a low priority being given such projects based on "likelihood of success." The use of state grant funds for operational biological control of Eurasian watermilfoil will be considered once field research has demonstrated that

weevils can be used successfully, and under what conditions that success is likely to be achieved.

Charles H. Welling, Minnesota Department of Natural Resources

The Eurasian Watermilfoil Program for Minnesota Department of Natural Resources (MDNR) is concerned both with controlling Eurasian watermilfoil which creates problems in many Minnesota lakes, as well as preventing the spread of the exotic to lakes that currently do not contain Eurasian watermilfoil populations. The attraction of biological control for lake managers is selective control, lake-wide control, and permanent control. Benefits from the agency's perspective are the reduction in funds and staff time for management of Eurasian watermilfoil and the decrease in herbicide usage in Minnesota lakes. Eurasian watermilfoil is considered one of Minnesota's most problematic aquatic plants, and since 1992 more than $700,000 has been allotted for research to evaluate the potential for biological control of milfoil. This research has demonstrated that the milfoil weevil can severely damage Eurasian watermilfoil under controlled conditions. Declines have been documented in the Minnesota lakes with weevil populations, although other factors may have contributed to these declines. The current research focus is attempting to reproduce in the field similar results to those produced under controlled conditions. Present funding for biological control in Minnesota is $75,000 annually for Eurasian watermilfoil, in addition to $75,000 for purple loosestrife. The entire budget for exotic species control and management for the state of Minnesota is 1.1 to 1.2 million dollars annually, with over half of this amount allocated toward the prevention of spread of all exotics. Research dollars are limited, and half of the funding for biological control is reviewed by the state legislature. It will become increasingly more difficult to continue funding for basic research beyond the year 2001, if a practical approach for biological control of Eurasian watermilfoil is not developed.

Martin A. Hilovsky, EnviroScience, Inc.

The overview of the MiddFoil™ process stresses the science rather than just the releasing of the insects. Baseline and follow-up monitoring are integral parts of each project. Experimental concerns that remain are: 1) the number of insects per acre of Eurasian watermilfoil needed to achieve control; 2) given a particular stocking rate, the length of time before control; 3) the mechanism of weevil spread; 4) characterizing the conditions in which weevils are successful or unsuccessful; for example, determining if high water temperatures in southern locations preclude the use of weevils; 5) characterization of the specific overwintering sites of weevils; and 6) evaluation of weevils in flowing water systems. We believe there is sufficient evidence available to support our contention that once an effective population size of weevils has been obtained, they will provide control of Eurasian watermilfoil in any water body.

Baseline data are obtained by surveying water bodies to determine stem density of Eurasian watermilfoil, the existence of native weevil populations, and mapping the Eurasian watermilfoil beds to obtain initial data using differential global positioning systems (GPS). Other baseline components to the Middfoil™ process involve addressing the expectations and budgeting of the lake association, determining stocking locations and monitoring. After the initial stocking, a follow-up survey of the complete lake is performed to determine the establishment and spread of the weevils.

The insects are sold as units of 1,000 individuals, with not less than one unit going to any single location. It is beneficial to stock as early in the season as possible to increase the number of generations. A general guideline is to stock 3,000 insects per acre for effective control within two seasons. Both state and federal permits are generally required. State requirements address concerns about genetic diversity of the weevils and accidental introductions of unwanted species.

SUMMARY

A consensus is developing that the use of native insects for managing Eurasian watermilfoil has both positive and negative attributes. Positive attributes include a recognition that the use of native insects to control Eurasian watermilfoil is: 1) more popular with the general public than the use of exotic insects (e.g., classical biological control) or herbicides; 2) generally involve fewer regulatory steps than classical biocontrol agents, 3) desirable if a selective and cost effective biological control can be found; 4) feasible if a cost effective method of propagation and distribution can be found; and 5) holds the promise for a long-term control of Eurasian watermilfoil populations. Clearly, the declines of Eurasian watermilfoil that have been observed in numerous lakes in the presence of native or naturalized insects make this an attractive and promising possibility.

The current drawbacks to implementation of biological control programs using native insect agents prevent the widespread use of this technique. Some of these drawbacks include: 1) no state is prepared to embark on large-scale rearing of weevils for widespread distribution; 2) states are concerned about the introduction of new exotic pest species, or insect parasites or pathogens, brought in with the weevil from outside of the state; and 3) states are concerned about the introduction of more aggressive genotypes of Eurasian watermilfoil or other genotypes of weevils that may have less desirable attributes (e.g., lower fecundity or feeding rates). However, numerous lake associations and other governmental groups are very interested in establishing populations of this weevil, and other potential Eurasian watermilfoil herbivores, in their lakes.

Before native insects can be widely used for managing Eurasian watermilfoil, three issues need to be addressed: 1) large sources of these insects are needed; 2) a practical approach needs to be developed to utilize native insects that is both cost-effective and efficacious; and 3) consistent permitting or regulatory criteria need to be developed between states and at the federal level. The requirements for use of native insects should be consistent with those for agricultural and "classical" noncrop biocontrol agents.

Future trends for native insects include reduced funding for basic research, and increased pressure to implement these insects as an operational management tool. Mean-

while, basic research of interest to state natural resource agency personnel and EnviroScience that remain to be answered are: 1) the time frame and effective stocking densities required between introduction of the milfoil weevil and control of Eurasian watermilfoil; 2) cost-effectiveness of this technique; 3) identification of other insects or pathogens which might be used alone or in tandem for management of Eurasian watermilfoil; 4) the effectiveness of native insects in flowing water systems; and 5) environmental and ecological parameters that define the limits to the effectiveness of native insect herbivores.

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QUESTIONS AND ANSWERS

Q: (Lars Anderson, USDA, Davis, CA)—Is there any quality control of genetic consistency? Any research on this subject? Are some weevils more vigorous than other?

A: (Hilovsky)—There is not any ongoing research on selection of more vigorous weevils.

A: (Crosson)—We would like to see additional work done on this subject; more funding is needed.

A: (Sallie Sheldon, Middlebury College, Middlebury, VT)—There has been some fecundity work in Vermont and Wisconsin but no differences were found between populations.

A: (Ray Newman, University of Minnesota, St. Paul, MN)—We know there is differential performance among populations and there are differences in size (e.g., Newman et al. 1997, Solarz 1998). We do not know what the effect of size on fecundity is, and there has been very little research conducted on weevil genetics.

A: (Al Cofrancesco, US Army Engineer Research and Development Center, Vicksburg, MS)—There has been work funded to compare weevil populations from different regions on Eurasian watermilfoil populations at WES.

Q: (Anderson)—If you perform collections, then is it time to do the genetics?

A: (Welling)—Minnesota shares the concerns about transporting weevils and Eurasian watermilfoil. The USDA 526 permit was not accepted in Minnesota because we do not want to risk introduction of new genotypes of Eurasian watermilfoil from other states, in addition to the risk of exposing Minnesota weevils to new pathogens or genes from less vigorous weevils.

Q: (David Spencer-USDA-ARS, Davis, CA)—How much do a thousand weevils cost? And what about weevils in flowing water?

A: (Hilovsky)—About $1000 per 1000 insects.

A: (Robert Creed, Appalachian State University, Boone, NC)—I have found weevils on Eurasian watermilfoil along the margins of rivers in Washington. The stronger currents in the main channel may prevent weevils from becoming abundant there. For example, as the larvae damage the stem it could break and both it and the larvae would be swept downstream. There may be some threshold value for current velocity above which Eurasian watermilfoil can grow but the weevils cannot extensively damage the plants.

Q: (John Barko, US Army Engineer Research and Development Center, Vicksburg, MS)—How are populations of weevils influenced by predators and pathogens? If weevils have evolved to feed on native milfoil, why do we think that they will perform on Eurasian watermilfoil? Is augmentation suspect because there are different populations of weevils?

A: (Newman)—Weevils perform as well or better on Eurasian than on native watermilfoil (Newman et al. 1997). We have seen damage to native water milfoil, but damage is generally much greater on Eurasian watermilfoil. Native watermilfoil populations have not been critically studied because they are not considered nuisances. The natives might not be a nuisance because of control by native weevil populations.

A: (Sheldon)—Native weevils may have predators or pathogens, but we have not had a noticeable problem with them. Fecundity is 5 to 20 times higher on Eurasian watermilfoil than on the native watermilfoil species. An example is a site where Eurasian watermilfoil was damaged, *Myriophyllum alterniflorum* relocated into a site but was not impacted.