BIOLOGICAL CONTROL OF PURPLE LOOSESTRIFE

Wetlands Weed Meets the Beetles

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Purple loosestrife (*Lythrum salicaria*) is a noxious weed species that has become a common problem throughout North America. With increased sensitivity to the management of this invasive plant, the New Hampshire Department of Transportation's (NHDOT's) Bureau of Environment, in conjunction with the New Hampshire Department of Agriculture's (NHDA's) Market and Foods Division, has created a purple loosestrife biological control program that uses two host-specific plant-feeding insects.

Problem

For any project that may affect wetlands significantly, the preliminary designs include an evaluation of the mitigation options—that is, wetland enhancement, restoration, or creation. Each mitigation option typically deals with landscape alterations that have created large pockets of disturbed soils.

Mature loosestrife in flower.

At many project construction sites, despite preventive measures, loosestrife quickly becomes established. Loosestrife propagates primarily because of its ability to take root easily via seeds and cuttings—a single, mature, vigorous plant can produce 2.5 million viable seeds. In addition, stem and root cuttings can develop roots when exposed to moist soil and sunlight.

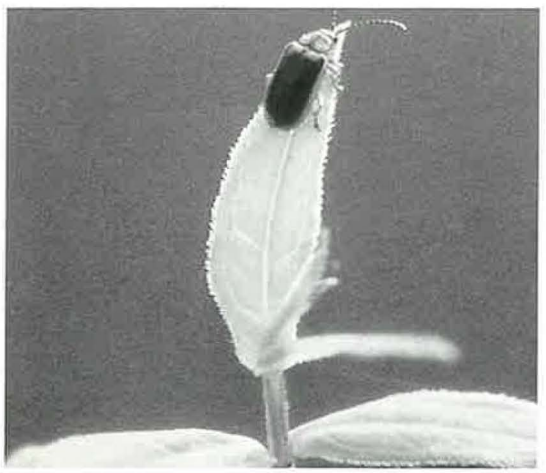
Because loosestrife grows vigorously and rapidly and adapts easily to many types of wetland habitats, the species tends to overtake native vegetation, creating monotypic stands. This elimination of plant diversity and of food and nesting habitat warrants purple loosestrife's classification as a noxious weed species by the U.S. Army Corps of Engineers (USACE) and other organizations. As a result, wetland permits issued by USACE and the New Hampshire Wetlands Bureau include a requirement to control loosestrife within mitigation areas.

Solution

Finding an Effective Method

In 1994 NHDOT's Bureau of Environment recognized the need to control loosestrife. The bureau reviewed previously tested control methods to determine which would be feasible and provide the best results. The literature review identified four types of control methods—mechanical, cultural, chemical, and biological.

NHDOT and NHDA developed a four-year pilot program to study the effects of biological control agents and to develop self-sustaining populations of beetles for managing the purple loosestrife. The results of U.S. Department of Agriculture biological studies from the mid-1980s led to the selection of *Galerucella calmariensis* and *G. pusilla*—two leaf-eating beetles—for investigation.



Galerucella spp.—a leaf-eating beetle.

Locating a Test Site

In 1993 NHDOT constructed nine acres of wetland in Nashua as mitigation for the widening and reconstruction of the F. E. Everett Turnpike. Soon after completion of the project, loosestrife began growing throughout the site. By 1997 loosestrife—already 6 to 7 feet tall—had become the dominant species, making the wetland an ideal field test site for the biological control program.

To monitor the effects of the program, researchers first established transects and 1-meter square data plots and conducted a vegetative analysis before the release of the beetles. Post-release monitoring of the data plots took place in late summer. The monitoring included counts of beetles and of egg depositions and a quantitative analysis of the percentages of leaf and plant damage to the loosestrife. NHDOT and NHDA used the results to determine if the beetles met the expectations for control or if additional beetles should be released.

From 1997 through 1999, researchers released approximately 16,500 beetles at the Nashua site. By early summer 2000, all of the loosestrife within and adjacent to the site was either dead or extremely stressed and dying as a result of the feeding damage to the leaf tissue—estimated at more than 80 percent of the overall leaf area. Leaf damage appeared to occur at different stages of plant development—most likely related to the life cycle of the beetles—with the greatest damage in the lower portions of the stem.

None of the remaining live plants appeared to develop any flowers when loosestrife was in full flower at nearby locations outside the study area. Although loosestrife was eradicated almost completely from the study site, self-sustaining populations of beetles still were found among the remaining loosestrife plants. As the loosestrife declined, indigenous vegetation filled the void and restored diversity. A diverse plant community and the continued presence of biological control agents should help sustain a balance of vegetation.

After studying the pilot test results, NHDOT and NHDA have released beetles at 12 additional sites throughout state and are continuing to monitor all 13 sites. The beetles feed exclusively on purple loosestrife and have shown no effect on any other plants.

Benefits

The research program at the Nashua site demonstrated that the biological control method is both cost and labor effective. Researchers estimate that manually removing the loosestrife, including roots, from the pilot site over the four-year period would have taken approximately 700 worker-hours. In comparison, the release of beetles over the same four-year period required less than 20 worker-hours and cost only an additional $200—the purchase price of the beetles. Use of biological vegetation control therefore saved $20,000 in labor costs at the study site alone. NHDOT expects similar savings at the other beetle release sites.

At all the release sites, the beetles currently are active, and effective biological control of loosestrife is anticipated. Additional beetle releases will occur as needed. Because the biological agent for the control of purple loosestrife has met the original goals and program objectives, NHDOT and NHDA are developing a new grant proposal to continue the effort at several new locations throughout New Hampshire.

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Suggestions for "Research Pays Off" topics are welcome. Contact G. P. Jayaprakash, Transportation Research Board, 2101 Constitution Avenue, NW, Washington, DC 20418 (telephone 202-334-2952; e-mail gjayapra@nas.edu).