

THE PURPLE LOOSESTRIFE PROJECT AT MICHIGAN STATE UNIVERSITY

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Introduction/Background

Purple loosestrife (*Lythrum salicaria*) is a European plant species that has invaded North American wetlands, lakes and rivers. Once established, purple loosestrife can become the dominant vegetation, forming dense stands that may significantly reduce biodiversity and habitat quality. Of primary concern is that purple loosestrife may displace native plants eliminating food and shelter for wildlife and other species. While strikingly beautiful, dense stands of loosestrife also impair recreational use of wetlands and rivers, impede water flow in drainage ditches and invade right-of-ways, requiring costly management efforts. Purple loosestrife is a widespread and serious problem, affecting coastal and inland wetlands, lakes and waterways throughout the Great Lakes region. In Michigan, purple loosestrife is present throughout the Lower Peninsula and is expanding its range in the Upper Peninsula. Few viable solutions for managing this invasive weed had emerged prior to the early-1990s. Control by conventional means (water level management, burning, herbicides, direct digging, cutting) has proven to be extremely difficult and is impractical on a large scale. An alternative is the biological control of purple loosestrife by introduction of natural enemies from its native range.

Three species of plant feeding beetles, *Galerucella californiensis*, *G. pusilla* and *Hylobius transversovittatus* show promise as biological controls for purple loosestrife. Native to Europe, these insects have undergone extensive testing to determine their safety and effectiveness, receiving USDA approval in 1992. Since then, these insects have been released in 27 states and all the Canadian provinces. The *Galerucella* leaf beetles feed on bud, leaf and stem tissue causing defoliation and prevent flowering and seed production. Continued defoliation leads to plant death. *Hylobius* is a weevil whose larvae mine in root tissue weakening and ultimately killing the plant. Results indicate that the *Galerucella* beetles can have a dramatic impact on purple loosestrife infestations in as little as three years.

Beginning in 1994, the Michigan Department of Natural Resources, Wildlife Division, petitioned the Michigan Department of Agriculture for approval to release these insects on several infested state game areas in Michigan. The MDNR's releases of ca 5,000 *Galerucella* in 1994 have established and are showing significant impacts. The results of *Hylobius* releases in 1996 are still uncertain. While these natural enemies cannot eliminate purple loosestrife, experts believe that in combination they are capable of reducing the density of purple loosestrife by 90% over most its current range. Reducing purple loosestrife density will allow re-establishment of more desirable wetland vegetation.

The Purple Loosestrife Project at Michigan State University was initiated in 1997 to help establish viable populations of these natural enemies in Michigan watersheds where purple loosestrife occurs. Our goal is to train and support a network of teachers and other volunteers to rear the natural enemies and in turn have them educate and support their communities in managing this invasive species. The overall project has four components: 1) rearing and release of approved natural enemies, 2) evaluation of natural enemy impact, 3) public education and outreach, 4) research to develop improved management systems.

Rearing, Release, and Impacts of Natural Enemies

We have conducted a greenhouse-rearing program to produce *Galerucella* beetles for release and to supply beetles to our project participants. At selected sites, researchers released insects in the spring (timed to natural beetle emergence). These sites will serve as nursery sites to provide beetles for future years. Remaining beetles are used to initiate colonies in outdoor rearing programs at our so-called Cooperative Biological Control (CBC) network sites and at the USDA APHIS-PPQ Niles Biological Control Laboratory. Participating leaders from each CBC site were provided with a detailed guide on *Galerucella* rearing and trained in these procedures during workshops in March 1998 and March 1999. Each CBC rears second-generation beetles for release in a location chosen and managed by them.

Standardized evaluation criteria developed at Cornell University are used to evaluate the establishment of the leaf beetles on selected release sites. Intensive monitoring was conducted on 1997-98 release sites managed by the project to help elucidate site suitability criteria, rate of spread of beetles,

impact on individual purple loosestrife plants and recovery of native plant community. Personnel from CBC sites were trained in evaluation criteria and encouraged to use them on the sites they manage. A commitment to evaluate at least the establishment of the natural enemies is a requirement for CBC site participation.

Preliminary estimates indicate that the 1999 rearing program will exceed its goal for rearing and re-distributing *Galerucella* beetles. To date, MSU project personnel have made 13 releases in high-quality sites and two supplemental releases for a total of ca. 119,000 insects.

In 1999, the project also provided a *Galerucella* starter colony to the USDA APHIS PPQ, Niles Biological Control Laboratory. From these, the Niles lab reared over 400,000 beetles supplying Michigan teachers, CBC sites and also providing insects to 27 cooperators in 18 states.

Qualitative information from spring sampling indicates that establishment is generally good and most populations are increasing. Examples include reductions in purple loosestrife flowering at Pointe Mouille, Monroe Co. (1997 release) and Windmill Island, Holland MI (1998 release). The most dramatic success to date is from 1994 releases by the MDNR-Wildlife Division at Shiawassee, Nyanquing Point and Crow Island State Game Areas. At each of these sites the beetle populations have increased to the point where purple loosestrife is being completely consumed over large acreage's and beetles have spread from 1/3 to over 1 mile from the original release sites. At Shiawassee SGA, several 40-acre impoundments, formerly dominated by purple loosestrife, now have no plants exceeding a few inches in height.

Public Education and Outreach

Progress toward Purple Loosestrife Project education and outreach objectives has been steady. In addition to the spring training workshop mentioned below, university faculty and staff have provided hundreds of hours of direct support to K-12 educators, some including one-on-one work in schools, and to nature centers and community groups as well. Another accomplishment was completion of the PLP Cooperator's Handbook, an MSU Extension Bulletin, in January of 1999.

We hosted Purple Loosestrife Project workshops on campus during ANR week in 1998 and 1999. We provided an overview of the project in morning plenary sessions and we trained about 50 each year teacher participants in rearing, release and evaluation of natural enemy impacts in afternoon sessions.

We also provided teachers with root crowns, pots, cages and a small brood stock of twenty *Galerucella* beetles. Educators reviewed and suggested improvements to the project materials and exchanged valuable ideas and enthusiasm as did members of the Cooperative Biological Control (CBC) Network who also attended. Teachers we surveyed who attended the Spring 1998 workshop reported three important things: that they would not need further training to be successful, that they felt adequately prepared to participate in the project, and that the Handbook and website were sufficient sources of support. Similar results emerged from our 1999 survey of teacher participants. Nearly seventy percent of teacher respondents felt the Purple Loosestrife Project would "help students with MEAP or other standardized testing."

The Purple Pages website has become a reliable source of information for educators and the cooperating public and was recently improved with the addition of the complete text of the secondary K-12 activity set and elementary lesson abstracts. The percentage of surveyed teachers who used the website moved up slightly to almost 60% in 1999.

The Loosestrife Locator Postcard Survey was conducted in 1998, primarily to raise public awareness and recruit public assistance. In addition, the postcard has begun to yield very valuable information for understanding the scope of the infestation in Michigan. We are using the data to link public and private resources on a local level; and this maximizes efficiency of limited resources as we improve our knowledge of the largest infestations in the state.

Project outreach to teachers, citizen groups, nature centers, community officials and others is shifting to university support of the Project's Cooperative Biological Control (CBC) Network. To become a member of the CBC network, selected organizations must commit to complete training in rearing, release, and evaluation of beetles; they must demonstrate a willingness to help in the education of neighbors and others who visit the CBC; and they must have the capability of rearing enough beetles to share. Twenty CBC sites were fully capable of serving as "local contacts" in 1998, and our goal is to firmly

establish 25 to 30 members by Spring 2000. This system will allow a gradual shift of responsibility for loosestrife control from the university to community leaders.

Publication of the Cooperator's Handbook in 1999 gives community groups, individual landowners, and educators what they need to fully participate in the project. The Handbook contains ten secondary school activities, background materials, and three complete elementary lessons: all field-tested and refined by teacher-writing teams. The Handbook is a Michigan State University Extension Bulletin (MSUE 2690) and contains the following sections: Cooperator Essentials, Rearing and Release Natural Enemies to Control Purple Loosestrife, Secondary School Activity Set, Upper Elementary Lessons Teacher's Guide and Student Workbook.

Future Funds for Turfgrass Work?

We would like to locate funding to develop of the following educational materials: 1) Interpretive displays for use on golf courses to describe the problem of purple loosestrife and the biological control program to manage it. 2) A bulletin for distribution to golfers describing the wildlife conservation benefits the purple loosestrife biological control program. 3) Computerized slide presentation materials for use at association meetings to introduce the ideas behind control of purple loosestrife. 4) A feature article for submittal to GSCA and news releases for local association newsletters and magazines.

Purple loosestrife is a direct threat to the integrity of the aquatic and wetland habitats prevalently found on golf courses. Conventional means of control (herbicides, cutting etc.) are expensive, must be repeated yearly and are largely ineffective. In contrast, the biological controls are self-sustaining, inexpensive and very effective once established. Biological control could be used on thousands of golf course acres, improving their biodiversity and quality as wildlife habitat. In the process, the golf industry will be shown to be leaders in an environmental stewardship program of benefit not only to the lands they manage but also to the watersheds in which they exist.