History of Purple Loosestrife (*Lythrum salicaria* L.) Biological Control Efforts[1]

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ABSTRACT: After a relatively slow beginning on the northeastern maritime coast, purple loosestrife (*Lythrum salicaria* L.) has spread across temperate North America to the Pacific Coast. It has displaced native wetland vegetation in pastures, marshes, and riparian meadows. Thus far, all methods of cultural, mechanical, and chemical controls have proven unsatisfactory for widespread use in natural areas. An attempt to establish a biological control program in the late 1960s failed because there was not enough information to justify the cost of the program, and because regional interest was low in this weed, which was so well-established as to seem part of the natural setting. Subsequent research on purple loosestrife continued part-time and consisted of field surveys and literature searches to establish the background of the weed and its potential impact on native biota. In 1968, a questionnaire on purple loosestrife spread and impact was mailed to wetland managers throughout the Northeast and Midwest. The response formed the beginnings of a purple loosestrife monitoring network that eventually succeeded in obtaining congressional support for the biological control of purple loosestrife.

INTRODUCTION

Purple loosestrife (*Lythrum salicaria* L.) is a tall (1.5–2.0 m) herbaceous perennial that is native to Eurasia. It probably arrived on our Atlantic maritime coast in the early 1800s on sailing ships from northern Europe. It was so well-established by the 1830s as to be considered a native by early American botanists (Torrey and Gray 1840). Since then, its alien origin has become obvious with its spread into wetlands across the northern United States and southern Canada (Stuckey 1980). The present limits of the plant's distribution in North America are from New Brunswick to South Carolina in the East and from British Columbia to California in the West. Its mean rate of spread since 1940 has been about 645 km^2 per year. The annual cost of these infestations, in terms of the effect on wildlife and agriculture, has been estimated to be $45 million (Thompson et al. 1987).

PURPLE LOOSESTRIFE ENCOUNTER IN NEW YORK

In 1964, I was in charge of a research committee that was planning a long-term study of the effects of seasonal flooding on the productivity of a muck hardwood forest on the Montezuma National Wildlife Refuge in upstate New York. The study proposed to flood the forest floor of two experimental units with 30–38 cm of spring runoff and to maintain these levels into early summer to encourage waterfowl nesting. The goal of this work was to enhance waterfowl habitat without sacrificing the integrity of the forest community. The attraction of waterfowl to these new nesting opportunities was immediate and quite beyond our expectations (Thompson et al. 1968).

From a report on the control of *L. salicaria* in upstate New York (Smith 1959), we were aware of the potential threat that purple loosestrife posed to our study area, but we concluded that the isolated location of the experimental units and the relatively undisturbed condition of these sites would protect them from invasion by weeds. Nevertheless, by 1966 the first blooms of purple loosestrife appeared along the margin of a dike that controlled water levels on one of the experimental impoundments. Our apprehensions were fulfilled in the next few years: purple loosestrife overwhelmed the floating and emergent aquatic communities that were critical escape and foraging cover for waterfowl broods emerging from the adjacent flooded timber. In a few more years, the plants moved up onto the dry slopes of the dikes and displaced grass cover that had provided brood forage for a small population of Canada geese (*Branta*

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canadensis) that had become established with the creation of the experimental impoundments.

The failure of previous efforts (Smith 1964) to control purple loosestrife with various herbicides (including 2,4D) strongly suggested that our best response to the colorful intruder would be to keep it under surveillance and explore new methods of control. Moreover, since our management goal in the woodland impoundments was to encourage waterfowl nesting without disturbing biotic diversity, we were wary of using herbicides in the forest floor community. Our observations soon bore fruit: we noted that *L. salicaria* seedlings were not able to survive in the dense shade of the forest floor; our study units were safe, even though brood escape routes were threatened. Meanwhile, my contacts with biological control studies in upstate New York suggested that this approach might be effective with purple loosestrife. In 1968, a research project on the ecology and control of purple loosestrife was established at the Cooperative Wildlife Research Unit at Cornell University. A questionnaire on purple loosestrife was mailed to wetland managers in the northern United States and southern Canada. The responses to the questionnaire were the beginnings of a purple loosestrife monitoring network that eventually grew into an informal but effective support group for the control of this weed.

BIOLOGICAL CONTROL INITIATIVES

My early attempts to establish a national biological control program were frustrated by several problems. First, I did not have enough information about the spread and impact of purple loosestrife to justify the cost of a national program. Second, purple loosestrife's long-established presence in the wetlands of eastern maritime North America had created a sense of resignation among wetland managers and administrators. Despite the surge of conservation action that was rising in the late 1960s, few observers in New England were likely to become excited about the presence of a long-established exotic weed that many had mistaken for a native marsh plant. Third, the scope, complexity, and cost of a biological control program demanded support from the U.S. Department of Agriculture (USDA). I received polite responses from USDA to my preliminary inquiries, but it was obvious that without substantial funding, the costs of initiating a national biological control program were beyond reach.

As the decade (1960s) that saw the rise of environmental awareness drew to a close, my efforts to establish a biological control program for purple loosestrife came to a standstill. Nevertheless, the seeds of further work had been sown. I had five years of observation and measurement of purple loosestrife infestations in upstate New York, and my wife and I had a roadside log of the location and abundance of purple loosestrife throughout the northeast maritimes, south to Washington, D.C. and west to Illinois and Wisconsin. As for many roadside purple loosestrife watchers to follow, our own roadside observations and photographs had sensitized us to the dynamic character of purple loosestrife's spread into the Midwest.

A career change in 1975 (unrelated to purple loosestrife) moved me to the Editorial Office of the U.S. Fish and Wildlife Service (USFWS) at Fort Collins, Colorado. Opportunities for loosestrife watching now shifted to the West and eventually extended to the Pacific Northwest and British Columbia. I was also now in frequent contact with FWS research centers and field stations. Nonetheless, plans for a purple loosestrife program remained stalled until December 1978, when a remarkable memo from a frustrated young USFWS refuge manager (George Gavutis, Parker River National Wildlife Refuge) appeared at the Beneficial Insect Laboratory of the USDA Agricultural Research Service (ARS) in Beltsville, Maryland.

On the surface of it, the memo seemed unlikely to do more than raise eyebrows in supervisory levels of the departments of interior and agriculture. Here was a field officer from the USFWS writing directly to a research laboratory of the ARS. But if the upper levels were ever aware of the memo, not a ripple of complaint was heard. Furthermore, George's memo from the field was so convincing of the need for a biological control program against purple loosestrife as to stir ever-widening circles of sympathetic waves within ARS and FWS that soon reached the FWS Editorial Office in Fort Collins and energized me to restart the purple loosestrife network.

This was probably the turning point in the purple loosestrife story and it hinged on administrative flexibility within ARS and USFWS. It also hinged on the energies and foresight of S.W.T. Batra, a USDA scientist who included purple loosestrife on a list of weed targets during her searches in Europe for candidate control insects. She also obtained the cooperation of the Commonwealth Institute for Biological Control (CIBC) in assembling preliminary findings from central Europe that were vital to the success of a growing biological control effort.

PURPLE LOOSESTRIFE NETWORK

Meanwhile, Tom Jackson (Western Weed Coordinator USFWS) asked me to contribute a segment on purple loosestrife for an interagency short course on weed control to be given at various times and places. "Purple Loosestrife Alert" was prepared as a class handout. Tom distributed hundreds of copies of "Alert" during the next few years. As interest in the loosestrife problem began to grow, there were increasing requests for "Alert" from the Midwest where several effective citizen activists began to carry their own programs for purple loosestrife awareness and action.

Of many private cooperators, three stand out for their dedicated and persistent effort: B. Popelka, D. Wade, and B. Harper. As a local officer of the National Audubon Society, Bernice B. Popelka became aware of purple loosestrife's threat to Wisconsin's Horicon Marsh. Her interest in the problem grew in proportion to loosestrife's abundance. She was one of the first cooperators to carry her organization's concerns to the state legislature with a request that purple loosestrife be declared a noxious weed. She was also a prime mover in what was to become the Purple Loosestrife Task Force — a highly effective citizen's organization

that published its own newsletter. Douglas E. Wade was a retired professor of conservation education in northern Illinois where he and his wife, Dorothy, ran a prairie nursery. He was also the leader of the Ogle County Prairie Preservation Society. Doug became deeply concerned about the spread of purple loosestrife and other alien weeds through the sale of wildflower seed mixes (Wade 1983, 1985). His contacts with seed suppliers and nurseries throughout the United States influenced these wholesale outlets to screen their stocks for alien weeds. In Minnesota, Bonnie L. Harper, a landscape architect and instructor at the University of Minnesota, learned of Doug Wade's work and transferred his ideas to the problem of purple loosestrife escapes from nursery plantings. She organized the Purple Loosestrife Coalition. This group was especially effective in working with the Minnesota Nurserymen's Association and the Minnesota legislature in curbing the sale of *L. salicaria* and declaring it a noxious weed. State conservation organizations in New York, Ohio, Illinois, Minnesota, and Wisconsin were also vigorous supporters of purple loosestrife programs. Minnesota now has a well-established purple loosestrife control project. The California Department of Agriculture was alert to the threat of purple loosestrife and took prompt action in declaring the plant a noxious weed in 1987.

NATIONAL EFFORTS

The first step toward a national biological control program was completed in January 1980 when an interagency group working on the biological control of weeds approved purple loosestrife as a candidate plant for study. The year 1980 also marked a sharp downturn in USFWS funding — leaving me with few options for seeking support for a modest grant to ARS for studies of purple loosestrife in Europe. Despite these setbacks, purple loosestrife continued to climb on USFWS's list of the top ten resource problems; however, every step ahead seemed doomed by successive cutbacks and reorganizations.

It became obvious that the only hope for funding was through a congressional add-on to FWS appropriations. Repeated requests to Congress from state and national conservation organizations eventually resulted in a supplemental appropriation, in 1987, to the Department of Interior for the control of alien weeds, with specific reference to purple loosestrife. The New York Cooperative Wildlife Research Unit at Cornell University is administering the funds. The USDA Beneficial Insects Laboratory at Beltsville is coordinating the search and screening for candidate control insects in Europe, and host specificity testing is taking place at a quarantine facility at Virginia Polytechnic Institute and State University. Field tests and a release program will be supervised by the Beneficial Insects Laboratory.

CONCLUSIONS

From our experience with purple loosestrife, we conclude that the ingredients needed to establish a national biological control program are:

A timely message

In dealing with the spread of a nationwide weed, it is important to concentrate efforts in areas where the invader is obvious but has not yet displaced native flora. We were too late to stir much interest in the Northeast, too early in most of the West, but right on time in the Midwest.

A vigorous network of cooperators

Citizen activists in Illinois, Minnesota, and Wisconsin were highly effective in urging support for state and national control programs.

A wide base of support

The threat to wetland and riparian habitats in all four waterfowl flyways was sufficient to draw support from a half-dozen national conservation organizations.

Persistence

It took more than five years of volunteer effort and about as many file drawers of correspondence, reports, manuscripts, and proposals to launch this national program. I am grateful to all of the concerned citizens and public servants who responded to this environmental challenge.

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