Environmental Research and Education Technology for Conservation

News from..

Fall, 1989

Hudsonia

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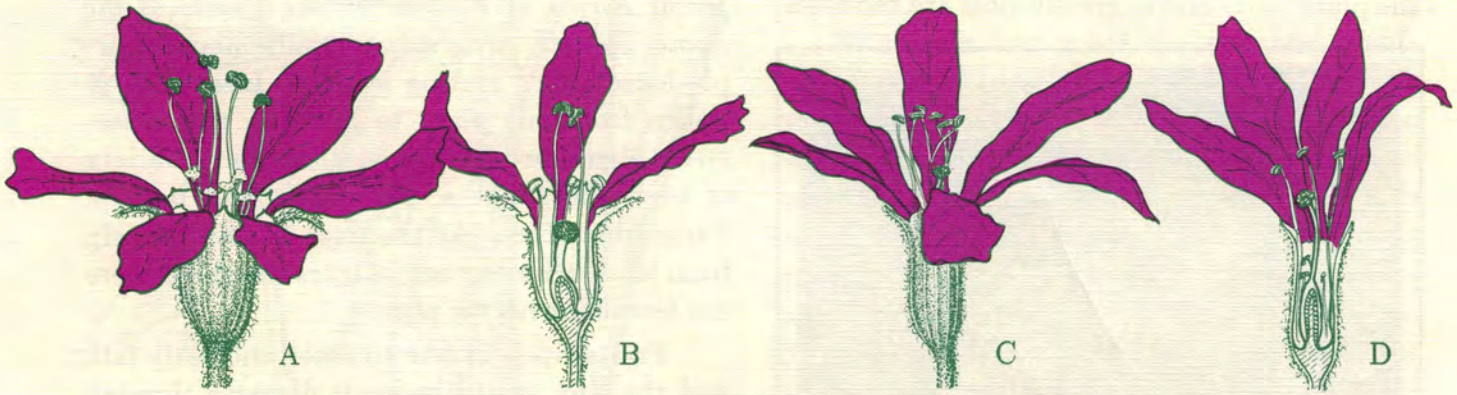
PURPLE LOOSESTRIFE'S TANGLED LOCKS

"The pageant of the river bank had marched steadily along... Purple loosestrife arrived early, shading luxuriant tangled locks along the edge of the mirror whence its own face laughed back at it."

In *The Wind in the Willows*, Kenneth Grahame beautifully describes the purple loosestrife of his native England. In North America, purple loosestrife is an introduced species, and Grahame's image of its "luxuriant tangled" growth suggests the many complex relationships it now has with our native biota.

There are several plants called loosestrife (see Table). In the Hudson Valley, the most likely to be confused with purple loosestrife is swamp loosestrife, which grows on soggy organic soil, has a low arching form and axillary purple flowers. Purple loosestrife has herbaceous, densely tufted stalks from an eventually massive, woody root crown. It is 1-2 m (3-6 ft) tall, with opposite or whorled leaves and numerous red-purple flowers in dense terminal spikes.

Red-purple flowers — Loosestrife family	Yellow flowers — Primrose family
Swamp loosestrife (*Decodon*)	Fringed loosestrife
Purple loosestrife (*Lythrum salicaria*)	swamp candles
other *Lythrum* species	other *Lysimachia* species



Purple loosestrife flowers have several combinations of short-, mid- and long-length male and female parts (stamens and styles). A. and B. short-styled flower; C. and D. mid-styled flower.

Purple loosestrife arrived in the Hudson Valley about 1800, evidently one of the first locales in North America where the species became established. The tiny seeds could have been transported accidentally in ship ballast or other materials. In the mid- to late-1800s, the purple loosestrife population began to explode in response to agricultural practices, other landscape disturbances, and a lack of ecological controls such as strong competitors, grazers, and diseases. Loosestrife is now widespread in the US, especially in glaciated areas, and in southernmost Canada. There are records from most states but the Northeast has the largest populations.

Loosestrife thrives in moist to wet soil and can grow in dry soil in the absence of competition. Growth is inhibited by deep water, shade, and very low or very high pH. I have seen dwarfed plants only 30 cm (1ft) high, with sparse, axillary flowers, in alkaline meadows. There is very little loosestrife in the Adirondacks, presumably due to acidic soils and cold climate.

In Hamlet, Ophelia floats to her death, carrying a bouquet of "long purples" and other stream bank flowers. Common loosestrife habitats in the Hudson Valley are banks of streams, ditches and ponds, wet old fields, and marshes. Loosestrife is common in the Hudson River tidal wetlands as far down as Piermont Marsh where salinity reaches a third or more of seawater strength. Loosestrife as yet dominates few Hudson marshes, and in the more saline areas the plant's size and aggressiveness are reduced.

Anita Barbour

For years, gardeners have planted loosestrife varieties, some probably hybrids of purple loosestrife and other Old World species such as *Lythrum virgatum*. Honeybees like loosestrife's copious, sweet nectar and beekeepers have encouraged loosestrife's spread in Iowa. But it is through mechanical disturbances to wet soils, land use change, water level manipulation, and probably water and soil pollution, that native plant communities have been stressed and habitats inadvertently prepared for the invasion of loosestrife. In refuges where artificial marsh pools are temporarily drained to increase fertility and promote the establishment of waterfowl food plants, the seeds of purple loosestrife germinate abundantly on mudflats. The ecological versatility of loosestrife is noteworthy; roadside ditches provide avenues of dispersal into adjoining wetlands, and in deeply flooded swamps, seedlings establish in insect burrows in rotting logs.

Flowering begins at the end of June, when cattail spikes begin to turn brown. A few loosestrife flowers are still open at first frost, usually early October. There are three types of flowers, different in the combinations of short- mid- and long-length male and female parts (stamens and style). Because pollen from stamens of one length mainly fertilizes flowers with styles of the same length, and same-length stamens and styles do not occur on the same individual plants, loosestrife has complicated cross-pollination which promotes genetic variation. Charles Darwin's 1893 book, *The Different Forms of Flowers on the Plants of the Same Species*, was substantially about purple loosestrife's mating system. Insects carry pollen from one plant to another, and loosestrife plants are feeding stations for a variety of bees, flies, moths, butterflies, and beetles. Large butterflies, like the tiger swallowtail, sip from loosestrife way out in marshes where there are few other nectar plants.

Fruits ripen in late summer and early fall, and the tiny, dust-like seeds disperse through the fall and winter. Seeds are distributed by riding storm winds, floating on water, and clinging to vehicles, animals, or people. I have

shaken loosestrife seeds out of my binoculars and pockets after walking through wet meadows, and I can only imagine how many seeds travel in tire treads and the mud under car fenders.

Besides seeding copiously, loosestrife has several means of vegetative reproduction. The stalks of shoreline plants, bent to the water in storms, root near the tips. Stalks broken off or cut by animals, such as beaver or muskrat, fall into the water and root. Supposedly dead stalks from the previous year, if they have spent the winter in water or in a soggy muskrat lodge, can sprout from the base in spring. Whole clumps (root crowns) loosened by erosion can tumble from a bank and be carried or rolled by water or ice to a new location. But purple loosestrife does not spread by creeping, horizontal stems in the soil as do cattail, common reed, many sedges and other competitors.

Invading loosestrife replaces many native marsh and meadow species in the Hudson Valley, most importantly cattails, tussock sedge, and other sedges. The tall, bushy canopy of foliage and the woody pedestal formed by loosestrife's roots and dead stalk bases are among the keys to its success: ecologically, it is nearly a shrub rather than an herb. European botanists do not mention the massive pedestal, and this may be a genetic enhancement in North America.

Often, large stands of graminoid (grass-like) plants give way to brushy, broad-leaved loosestrife, a habitat physically and chemically very different for animal food and shelter. Cattails and bulrushes are the staple foods for the muskrat, whereas loosestrife is eaten but little and its tannins and other natural products are probably toxic. Muskrats build winter lodges of loosestrife but it might not insulate as well as cattail.

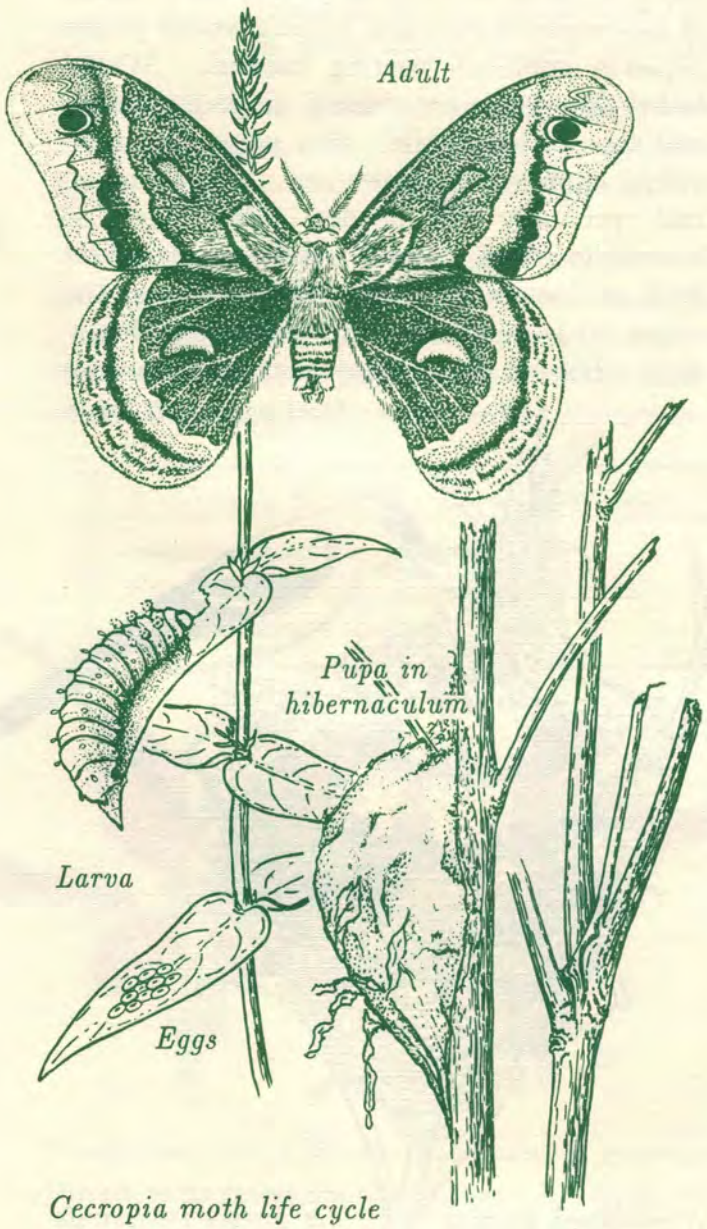
In the Northeast, extensive cattail stands are critical nesting habitat for several marsh birds, the least bittern, king rail, common moorhen, and marsh wren, and important but not sole nesting habitat for American bittern, northern harrier, Virginia rail, and sora. Some of these birds nest in mixed cattail-loosestrife stands, but rarely or never in pure loosestrife. The endangered bog turtle requires openings in the vegetation canopy where it can sun itself close to the ground, and loosestrife creates dense shade that can interfere with bog turtle basking. Loosestrife thickets can also shade out rare, native marsh and meadow plants (these habitats are among the most important for rare plants in the Northeast).

On the other hand, the red-winged blackbird prefers to nest in loosestrife rather than cattail; this has been well documented by Nature Conservancy botanist Tom Rawinski in New York's Montezuma Marshes. The American goldfinch frequently nests in loosestrife but rarely in other herbaceous plants; the presence of loosestrife in wetlands lacking woody plants expands goldfinch nesting habitat. White-tailed deer graze extensively on young shoots and tops of loosestrife, often preventing individual clumps from flowering. A small mammal, probably the meadow vole, gnaws on loosestrife roots. And a multitude of insects feeds on loosestrife nectar, flowers, leaves, and stems. It is not known to what extent the insects attracted to purple loosestrife are used for food by marsh birds.

A goldfinch nesting in purple loosestrife

Waterlily leaf beetle (*Pyrrhalta nymphaeae*) adults and larvae eat loosestrife leaves, as do a variety of caterpillars including those of the pearly wood-nymph moth (*Eudryas unio*). A small caterpillar of the genus *Mompha*, and adult waterlily leaf beetles, overwinter inside the stem. In winter, the purple loosestrife stalks that support dodder (*Cuscuta gronovii*), a parasitic plant, may also shelter the larvae of the dodder weevil (*Smicronyx*). Japanese beetles eat the flower pistils avidly.

Among the loosestrife feeders, its size and appetite distinguish the caterpillar of the cecropia moth (*Hyalophora cecropia*), our largest North American moth. Hudsonia ecologist Spider Barbour has found dense populations of cecropia caterpillars developing on loosestrife in wet meadows in Ulster County, New York, although the native hosts of cecropia are woody plants such as cherries and shrubby dogwoods. The high tannin content of purple loosestrife, probably unusual in herbaceous plants, may make it an acceptable cecropia food while the dense growth habit protects caterpillars and cocoons from predators.



Cecropia moth life cycle

John Burroughs wrote, "... your eye ... will revel with delight in the masses of fresh bright color afforded by the purple loosestrife, which...shows here and there like purple bonfires." Flower enthusiasts, apiarists, moth and butterfly lovers, and goldfinch fans may hail the conquest of the New World by purple loosestrife. Managers of wetland reserves for diminishing populations of muskrats, ducks, marsh birds, and bog turtles feel different.

Native animals benefitted by loosestrife are species with broad niches that can live in a variety of plant communities and/or eat a variety of plants. The animals that lose their habitat to loosestrife invasion are species with narrow niches that depend on the increasingly scarce plant communities that are replaced by loosestrife. Most animals that require graminoid wetlands are already rare or threatened by pollution and loss of high quality wetlands. If normal populations of marsh birds and muskrat are to be conserved, many extensive cattail marshes and sedge meadows must be protected from large-scale loosestrife invasion.

Wisconsin has made the sale and planting of purple loosestrife illegal, and through public education landowners are encouraged to remove loosestrife plants while they are still scarce. Although a low density of loosestrife increases biological diversity, loosestrife makes more loosestrife. Herbicides have been used successfully for loosestrife control. But the Hudson Valley has too much loosestrife for hand-pulling, and herbicides can kill non-target plants that are rare or valuable for other reasons (*e.g.*, waterfowl food plants), as well as poisoning animals and microorganisms. Ide-

ally, we want to reduce loosestrife to conserve or restore graminoid communities in selected wetlands that are valuable to rare plants, waterfowl, marsh birds, muskrats, and bog turtles, while we allow loosestrife to take its own course in less-valuable wetlands where it may be a harmless component of diversity. The U.S. Department of Agriculture has begun research on the biological control of purple loosestrife using specially-selected European insects. In 10 years or so, we hope to see beneficial organisms employed in selected areas for reduction of loosestrife populations, without negative impact to native species.

History has shown that we cannot safely and effectively manage populations without understanding their ecology. Purple loosestrife spread, reproduction, growth, biomass production, decomposition, environmental tolerances, pathology, chemistry, and relationships with native and introduced species must be understood before loosestrife can be managed without harm to the rest of the marsh and meadow environment. Good studies of the natural history and ecology of loosestrife are badly needed.

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For more information, readers may refer to: "Spread, impact, and control of purple loosestrife (*Lythrum salicaria*) in North American wetlands" by Daniel Q. Thompson, *et al.*, U.S. Fish and Wildlife Service Research Publication 2 (available from USFWS, Washington DC 20240).

This issue of News from Hudsonia was written by Erik Kiviat, edited by Karin M. and Allen B. Altman, illustrated and designed by Kathleen A. Schmidt, typeset in TEX by Allen Altman, and produced by Kathy Anne Schmidt.

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