PURPLE LOOSESTRIFE

An Invasive Plant Found in Manitoba: *Lythrum salicaria* L.

Purple loosestrife (*Lythrum spp*.) is a Eurasian perennial plant that was accidentally introduced into North America in the early 1800's. Purple loosestrife has been described as an invasive alien, an exotic alien, a noxious weed, a wetland invader, a beautiful killer, as well as a beautiful perennial garden flower.

It is estimated that purple loosestrife is now responsible for the loss of more natural habitat across North America than current human development pressure (Mal et al. 1992).

BIOLOGY

Purple loosestrife is an aggressive perennial, with mature plants having as many as 50 stems per root system and producing as many as 2.7 million seeds annually. Purple loosestrife is a member of the Lythraceae (the Loosestrife family). Main leaves are 3 to 10 cm long and can be arranged opposite or alternate along the squared stem and are either glabrous or pubescent. The flowers are on a terminal spike and in clusters of pinkish-purple petals (10 to 15 mm in length). Flowers are tri-morphic with short, medium, and long petals and stamens.

Plants can grow in a variety of habitats including wetlands, ditches, lakes, rivers, railway lines, rock crevasses, on gravel, sand, clay and organic soils. Plants develop a large, laterally branching rootstocks with starch as the main form of nutrient storage. Mature plants can develop rootstocks of heavier than 1 kg and can produce more than 30 annual shoots reaching a maximum height of more than 2 m.

Many ornamental varieties or cultivars of purple loosestrife have been developed such as ‘Morden Pink’. These garden varieties were believed to be sterile and not contributing to new populations. However, Manitoba research found that cultivated varieties are capable of crossing with naturalized purple loosestrife producing fertile seed within four months (Lindgren and Clay 1993, Ottenbreit 1991).

ECOLOGICAL DAMAGE

The impact of purple loosestrife on native vegetation has been disastrous, with more than 50% of the biomass of some wetland communities displaced. Monospecific blocks of this weed have maintained themselves for at least 20 years (Thompson et al. 1987).

Purple loosestrife degrades natural habitats such as wetlands and riparian areas reducing biological diversity by out-competing native vegetation. White et al. (1993) reported purple loosestrife as an alien species that presents a serious threat to native plant communities of natural habitats. The aggressive nature of purple loosestrife has been documented by Mal et al. (1997) who demonstrated its ability to replace the native perennial wetland species *Typha angustifolia* and by Johansson and Keddy (1991) who placed purple loosestrife at the top of a competitive plant hierarchy. Mal et al. (1992) noted that in areas where purple loosestrife has invaded wildlife species are in decline and further demonstrated that *Lythrum salicaria* is capable of replacing the native wetland species *Typha angustifolia* within four years.

Wildlife that depends upon native vegetation for food, shelter and breeding areas are forced to leave habitats invaded by purple loosestrife. There is no fish, insect, bird or mammal solely depends upon purple loosestrife for survival. In fact, purple loosestrife threatens the survival of our wildlife. For example, waterfowl do not feed on purple loosestrife. Waterfowl populations may decline with purple loosestrife infestations for loosestrife disturbs the emergent and submergent vegetation changing the biodiversity of aquatic systems, eliminating breeding areas, reducing aquatic fauna, eliminating available native plants once utilized for food. Dense purple loosestrife stands can also eliminate shallow water areas needed by fish species such as Northern Pike for spawning and foraging. Purple loosestrife quickly changes the ecological balance of all areas it invades and all flora and fauna associated with the invaded area.

Invasive species further threaten species at risk as identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This is the case with swamp rose mallow, *Hibiscus moscheutos*, a species designated as vulnerable by COSEWIC. Purple loosestrife also threatens the critical breeding habitat of species such as the threatened least bittern (*Ixobrychus exilis)* and the yellow rail (*Coturnicops noveboracensis)*. Alien invasive species have been implicated in the decline of 24% of species at risk in Canada (Stronen 2002) and 42% of threatened or endangered species in the United States (Stein and Flack 1997, Wilcove 1998).

ECONOMIC DAMAGE

Pimentel et al. (2005) estimated the costs of control, losses and damages associated with purple loosestrife is $45 million US dollars annually.

GEOGRAPHICAL DISTRIBUTION

Purple loosestrife (*Lythrum salicaria*) is an European plant that has naturalized in North America (Scoggan 1957). It is believed that purple loosestrife was accidentally introduced into North America in the early 1800's in the ballast of ships arriving on the east coast of North America from European destinations (Thompson et al. 1987) as well as by intentional introductions by beekeepers, immigrants as a medicinal herb, and through seeds attached to wool on sheep imported from Europe (Mal et al. 1992).

One of the earliest reports of purple loosestrife replacing native plant communities in Canada was from the St. Lawrence floodplain near Montreal (Fernald 1940). Mal et al. (1992) provided a historical review of the introduction of purple loosestrife into Canada noting that the first herbarium specimen was collected between 1850 and 1874 at Lotbiniere, Quebec and spread through habitat altered by agricultural settlement, military activities, and the construction of canal, highways and railway networks.

The first documented report of purple loosestrife in Manitoba was in 1896 from the Neepawa area. Large infestations of purple loosestrife were subsequently discovered along the Red and Assiniboine Rivers in the 1950's. Purple loosestrife has continued to spread yearly and can be found throughout much of southern Manitoba degrading wildlife habitat, riparian habitats, and agricultural lands.

As of the fall of 2001, there were 492 known purple loosestrife infestations in Manitoba with an estimated 5,575.2-ha of purple loosestrife (Lindgren 2003). These data indicated a 13-fold increase in the number of purple loosestrife infestations in Manitoba in between 1991 and 2001 (10-yr period). In 1991 there was 38 known populations of purple loosestrife in Manitoba with most in the watersheds of the Red and Assiniboine Rivers (Ottenbreit 1991). The Netley-Libau Marsh accounts for the majority of purple loosestrife in Manitoba (see above figure of Netley-Libau Marsh/Lake Winnipeg shoreline).

DISPERSAL MECHANISMS

The horticultural industry has been a major vector in the spread of purple loosestrife with the introductions of various *Lythrum* cultivars. *Lythrum* cultivars, developed in Manitoba as early as 1937, were promoted as ideal perennials for the home garden as they tolerated

dry soils and were winter-hardy. Manitoba research (Lindgren and Clay 1993) indicated that *Lythrum* cultivars were not sterile and contributed to the spread of purple loosestrife.

Thompson et al. (1987) described the following dispersal pathways. Seed dispersal is largely by drift in moving water; long distance spread is possible by seeds imbedded in mud on water birds, trucks or off-road vehicles, or in the cooling systems of outboard motors. Erratic spread can also occur by purposeful introduction as a honey bee forage plant or by accidental escape from horticultural plantings. Seed samples from commercial suppliers of wildlife cover and prairie restoration plants have contained purple loosestrife seeds as an impurity.

MANAGEMENT

Purple loosestrife management has involved four general control approaches: cultural, mechanical, chemical, and biological. Control of purple loosestrife by mowing, cutting, burning, flooding, or discing have met with little success. Cultural and mechanical control methods have been largely unsuccessful (Thompson et al. 1987). Mowing or cutting mature purple loosestrife plants has been shown to decrease plant vigor and retard seed production, but does not destroy the perennial rootstock. Cutting can reduce stem densities, but many repeated cuts are necessary and purple loosestrife may never be eliminated from a site using this technique. Malecki et al. (1993) noted that these control methods are costly, localized, and short-term.

While herbicides have been used extensively in the United States, there are no herbicides registered in Canada for the control of purple loosestrife over or near water. In many cases, herbicides have resulted in increasing population densities. Hence, management initiatives in Manitoba are focused on a classical biological control program using European phytophagous insects (Lindgren et al. 2002).

BIOLOGICAL CONTROL

The Manitoba Purple Loosestrife Project was one of three conservation groups instrumental in the introduction of biological control agents into Canada in 1992 against purple loosestrife. Biological control is currently viewed as a potential long-term management strategy in the control of purple loosestrife in many regions of Canada.

Biological control of weeds is an attempt to reunite an introduced plant such as purple loosestrife with its natural enemies. In Europe over 120 species of phytophagous insects were found to be associated with purple loosestrife. Of these 120 species, 14 were found to be host specific, and five were considered for release in North America. Current purple loosestrife management efforts are focused on the introduction and establishment of several biological control agents (Hight et al. 1995, Malecki et al. 1993). *Galerucella calmariensis* L. (Coleoptera: Chrysomelidae) and *G. pusilla* Duftschmid are leaf-eating beetles that have been approved for introduction and release by the Canadian and United

States governments in 1992 (Blossey et al. 1994, Hight et al. 1995). *Hylobius transversovittatus* Goeze (Coleoptera: Curculionidae) is a root-mining weevil that attacks the main storage tissues of purple loosestrife. The flower-feeding weevil *Nanophyes marmoratus* Goeze, capable of reducing seed production (Blossey and Schroeder 1995, Hight et al. 1995, Malecki et al. 1993) has also been released in North America against purple loosestrife.

Most regions have focused on the release of the leaf-defoliating beetle *G. calmariensis* which has been successfully established at a number of sites across North America (Hight et al. 1995, Lindgren et al. 2002; McAvoy et al. 1997). Performance monitoring studies have indicated that the biological control agent *G. calmariensis* is capable of providing successful control of target weed purple loosestrife within a period as short as 3 years (Lindgren 2003b). The effectiveness of an integrated vegetation management strategy for the management of purple loosestrife integrating herbicides and biological control agents has been investigated (Henne and Lindgren 2005).

SPECIES INFORMATION LINKS

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Global Invasive Species Database – Purple Loosestrife
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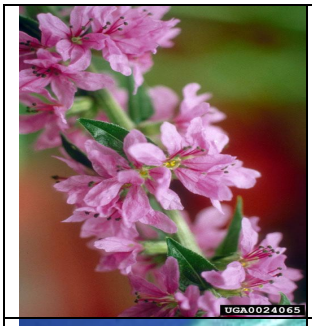
The Bugworld Network – Purple Loosestrife
http://www.invasiveplants.net/invasiveplants/biologicalcontrol/11PurpleLoosestrife.html

USGS - Spread, Impact, and Control of Purple Loosestrife (*Lythrum salicaria*) in North American Wetlands (Thompson et al. 1987)
http://www.npwrc.usgs.gov/resource/1999/loosstrf/loosstrf.htm

PICTURE GALLERIES

	**Organization: Invasive Plants of the Eastern US.** **Link: http://www.invasive.org/eastern/species/3047.html**
	**Organization: Manitoba Purple Loosestrife Project** **Link: http://www.ducks.ca/purple/photo/index.html**