

***Lythrum salicaria* invasiveness, impacts and regulation implications to Alaska**

Gino Graziano

Invasiveness in Alaska

Lythrum has long been used as a horticultural and herbal addition to gardens. Due to its presence in Europe near navigation terminals in the 17th and 18th centuries and quick spread to American navigation terminals, the invasions of *Lythrum* are most often attributed to ballast water. Garden varieties are also a contributing factor to escapement in North America, and are the most likely source of the infestation found on Chester Creek in Anchorage. In Europe *Lythrum* is often not associated with mono-specific stands because of predation by native insects (Batra et al. 1986). Mono-specific stands of *Lythrum* in North America may also be attributed to hybridization amongst European and North American varieties resulting in a more adaptive and vigorous North American Hybrid (Thompson et al. 1987).

Regardless of the difference between North America and European forms of *Lythrum* ample evidence exists for its potential invasiveness in Alaskan ecosystems. Hulten 1958 studied circumpolar relationships of boreal plants and suggest that species evolved in Eurasia or North America are adapted to environments within its circumpolar range (Thompson et al. 1987). The circumpolar range of *Lythrum* within Europe is near the 65th parallel and is present in Iceland and other northern areas (Thompson et al. 1987). In addition to its far north ranging habitats in Eurasia, *Lythrum* has two principle associates, *Typha latifolia* and *Phalaris arundinacea*, that are considered indicators of a habitats vulnerability to invasion by lythrum (Thompson et al. 1987). *T. latifolia* is described by Hulten 1968 as common along the Tanana River and east to Big Delta as well as present in the Mat-Su Valley. *P. arundinacea* was also described by Hulten 1968 as being present in similar northern areas as *T. latifolia*. The presence of these associates is evidence of *Lythrum*'s potential to invade areas near the proposed northern limits of European *Lythrum* varieties.

The temperatures of interior Alaska may have an impact on the reproduction of *Lythrum*. Bailey 1976 showed that *Lythrum* has been a vigorous colonizer in areas where temperatures range in the -29 to -23°C, and shows some decrease in vigor at the -34.5 to -29°C zone. As the temperatures increase and growing seasons lengthen in Alaska these exact temperatures are less of a barrier to the reproductive success of *Lythrum*. Since the Bailey 1976 study is over 30 years old ample time has been given for *Lythrum* varieties to adapt to colder climates. Some gardeners argue that *Lythrum* varieties in interior Alaska behave as annuals due to the cold temperatures. Annual and biennials are also known to be invasive often due to copious seed production and early growth of seedlings both of which are characteristics of *Lythrum*. The average mature *Lythrum* plant produces about 2,700,000 seeds annually (Thompson et al. 1987). First year plants with single stems are capable of producing 108,000 seeds per plant (Shamsi and Whitehead 1974a). Flowering begins 8-10 weeks after germination with seed production occurring after pollination providing ample time for reproduction in interior Alaska. Produced seeds can retain 80% viability after 2-3 years of submergence (Malecki 1990) allowing them to dominate seed banks (Welling and Becker 1990). The copious seed production of first year plants and

rapid early growth of seedlings show that *Lythrum* retains the characteristics of an invasive plant even if it behaves as an annual.

Regulations and sterile hybrids

Many states have listed *Lythrum* as a noxious weed that cannot be grown, sold or transported in their state. A few of these states also include the sterile hybrids in this category because they are difficult to differentiate from non-sterile hybrids, and can reproduce with non-sterile hybrids. Sterile varieties of *Lythrum* were developed in the mid 1900s to use as ornamentals. Experiments under greenhouse conditions have shown that crosses between sterile varieties and several cultivars of *Lythrum* as well as wild loosestrife and the Midwest native *L. alatum* result in highly fertile hybrids (Ottenbreit 1991, Ottenbreit & Staniforth 1994). Experiments performed under field conditions produced similar results (Lindgren & Clay 1993). While *L. alatum* is not present in Alaska, wild reproducing *Lythrum* populations exist in Anchorage and cultivated reproducing varieties are present in gardens of some Alaskans. Because of the presence of reproducing varieties, allowing sterile varieties of *Lythrum* to be sold and cultivated in Alaska could result in hybridization of sterile varieties and further the invasions of reproducing *Lythrum* varieties.

Effects to Native Ecosystems and Agriculture

Lythrum has proven to have ecosystem effects on several bird species including black tern, least bittern, pie-billed grebe, virginai rail, sora and long billed marsh wren (Hickey 1997, Hickey and Malecki 1997, Lor 2000, Rawinski and Malecki 1984, Whitt et al. 1999). The bird species *Lythrum* is known to have effects on occupy similar habitats to Alaskan birds. *Lythrum* invasions also make waterfowl nesting difficult since its tendency to clump can reduce access to open water and provide additional cover to predators (Mal et al. 1992). While *Lythrum* is used by some generalist wetland species it has ecological effects on the specialist species listed above and others that may loose preferred nesting habitats. Impacts to wildlife have economic/social impacts on the wildlife viewing, hunting and subsistence uses of the affected areas.

Lythrum also has documented effects to plant biodiversity in wetland ecosystems. It affects plant biodiversity through quick germination and domination of seed banks which reduce native plant species (Gabor et al. 1996, Welling and Becker 1990, Weiher et. al. 1996). In addition to affecting plants and animals directly, *lythrum* can affect the function of wetland ecosystems. Studies have shown that *lythrum* may drop its leaves earlier in the fall than native plants causing a decrease in available nutrients for detritovores in the spring (Emery and Perry 1996, Barlocher and Biddiscombe 1996, Grout et al. 1997). Salmon and trout populations that rely on healthy populations of detritovores in the spring may be impacted by *Lythrum* invasions.

Lythrum is not typically considered an agricultural pest, but Thompson et al. 1987 reports that it has some unwanted effects to agricultural lands. Wetland pastures in the Northeastern US and Canada, and riparian hay meadows in the West are susceptible to invasion by *Lythrum*. Low palatability to livestock reduces the quality of forage in areas

affected by *Lythrum*. Additionally *Lythrum* has caused problems for irrigation ditches and irrigated areas in the west.

Literature Cited

- Bailey, L. H., and E. Z. bailey. 1976. Hortus third. Macmillan Publishig Co., Inc., New York. xiv + 1290 pp.
- Barlocher, F. and Biddiscombe, N.R. 1996. *Geratology and decomposition of Typha Latifolia and Lythrum salicaria in a freshwater marsh*. Archiv fuer hydrobiology 136: 309-325.
- Batra, S. W. T., D. Schroeder, P. E. Boldt, and W. Mendl. 1986. *Insects associated with purple loosestrife (Lythrum salicaria L.) in Europe*. Proc. Entomol. Soc. Wash. 88: 748-759.
- Emery, S.L. and Perry, J.A. 1996. *Decomposition rates and phosphorous concentrations of purple loosestrife (Lythrum salicari) and cattail (Typha spp.) in fourteen Minnesota wetlands*. Hydrobiologia 323: 129-138.
- Gabor T.S., Haagsma T and Murkin H.R. 1996. *Wetland plant responses to varying degrees of purple loosestrife removal in southeastern Ontario, Canada*. Wetlands 16: 95-98.
- Grout, J.A. Levis, C.D. and Richardson J.S. 1997. *Decomposition rates of purple loosestrife (Lythrum salicaria) and Lyngbei's sedge (Carex lyngbyei in the Fraser River Estuary*. Estuaries 20: 96-102.
- Hickey, J.M. 1997. *Breeding biology and population dynamics of the black tern in western New York*. MS thesis, Department of Natural Resources, Cornell University, Ithaca New York, 160pp.
- Hickey J.M. and Malecki R.A. 1997. *Nest site selection of the black tern in Western New York*. Colonial Waterbirds 20: 582-595.
- Hulten, E. 1968. *Flora of Alaska and Neighboring Territories*. Stanford, CA: Stanford University Press.
- Lidgren, C.J. & R.T. Clay 1993. *Fertility of 'Morden Pink' Lythrum vigatum L. transplanted into wild stands of L. salicaria l. in Manitoba*. HortScience 28(9):954.
- Lor, S.K. 2000. *Population status and breeding biology of marsh birds in Western New York*. MS Thesis, Departnemn of Natural Resources, Cornell University, Ithaca New York, 135 pp.

- Mal, T.K., J. Lovett-Doust, L. Lovett-Doust & G.A. Mulligan 1992. *The biology of Canadian weeds. 100 Lythrum salicaria*. Can. J. Plant Sci. Rev. Can. Phytotech. 72(4):1305-1330.
- Malecki, R. 1990. *Research update-Biological control of purple loosestrife*. Report of New York Cooperative Fish and Wildlife Research Unit, Cornell University, Ithaca, New York. 4pp + 2 figs.
- Ottenbreit, K. A. 1991. *The distribution, reproductive biology and morphology of Lythrum species, hybrids and cultivars in Manitoba*. M.Sc. thesis, Department of Botany, University of Manitoba, Winnipeg, Manitoba, Canada.
- Ottenbreit, K.A. & R. J. Staniforth 1994. *Crossability of naturalized and cultivated Lythrum taxa*. Canadian Journal of Botany 72(3):337-341.
- Rawinski, T.J. and Malecki, R.A. 1984. *Ecological relationships among purple loosestrife, cattail and wildlife at the Montezuma National Wildlife Refuge*. New York Fish and Game Journal 31: 81-87.
- Shamsi, S. R. A., and F. H. Whitehead. 1974a. *Comparative eco-physiology of Epilobium hirsutum L and Lythrum salicaria L. I. General biology, distribution and germination*. J. Ecol. 62:279-290.
- Thompson, Daniel Q., Ronald L. Stuckey, Edith B. Thompson. 1987. *Spread, Impact, and Control of Purple Loosestrife (Lythrum salicaria) in North American Wetlands*. U.S. Fish and Wildlife Service. 55 pages. Jamestown, ND: Northern Prairie Wildlife Research Center Online.
<http://www.npwrc.usgs.gov/resource/plants/loosstrf/index.htm>
(Version 04JUN1999).
- Weher E., Wisheu IC, Keddy PA and Moore D.R.J. 1996. *Establishment, Persistence, and management implications of experimental wetland plant communities*. Wetlands 16L 208-218.
- Welling, C. H. & R. L. Becker 1990. *Seed bank dynamics of Lythrum salicaria L.: implication for control of this species in North America*. Aquatic Botany 38:303-309.
- Whitt MB, Prince HH and Cox Jr. RR 1999. *Avian use of purple loosestrife dominated habitat relative to other vegetation types in a Lake Huron wetland complex*. Wilson Bulletin 111: 105-114.