

## Ohio Invasive Plant Assessment Protocol

Botanical Name: *Lythrum salicaria* L.  
 Common Name: Purple Loosestrife  
 Family Name: Lythraceae  
 Posted Date: 7/20/16

Step I Outcome: **Invasive**  
 Step II Score: **77**  
 Step II Outcome: **Invasive**

**Score**

**Notes**

**References**

Initial assessment conducted by: Allison Mastalerz, Theresa Culley

*Directions: Place an "X" in the Score column next to the selected answer to each of the four questions.*

**Step I**

- |  |   |          |   |          |
|--|---|----------|---|----------|
| <p><b>1. Is this plant known to occur in the state and listed as "noxious" on any federal or Ohio Department of Agriculture plant list?</b></p>  | <p>Yes. <i>Place on invasive plant list, no further investigation needed. STOP</i></p> <p>No. <i>Continue on to question 2.</i></p> | <p>X</p> | <p>Considered a noxious weed in 33 states, including IN, MI, PA, &amp; VA; on multiple state invasive plant lists (see question #3 below)</p> | <p>1</p> |
| <p><b>2. Has this plant demonstrated widespread dispersion and establishment (i.e. high numbers of individuals forming dense stands) in natural areas across two or more regions in Ohio?<sup>a</sup></b></p>        | <p>Yes. <i>Place on invasive plant list, no further investigation needed. STOP</i></p> <p>No. <i>Continue on to question 3.</i></p> | <p>X</p> |   |          |
| <p><b>3. Does this plant form self-replicating populations outside of cultivation in Ohio and is it documented to alter the composition, structure, or normal processes or functions of a natural ecosystem?</b></p> | <p>Yes</p> <p>No</p> <p>Unknown</p>   | <p>X</p> |   |          |
| <p><b>4. Is the plant listed as invasive in an adjoining state or a nearby state east of the Mississippi within the USDA Plant Hardiness zones 5-6?<sup>b,c</sup></b></p>  | <p>Yes</p> <p>No</p> <p>Unknown</p>   | <p>X</p> |   |          |

*If the answer was yes for both questions 3 and 4, the plant is placed on the invasive plant list and no further research is needed. Stop here. If the answer is no for both questions 3 and 4, the plant is not considered invasive and no further investigation is warranted. Otherwise, proceed to Step II.*

### Step II: Invasion Status

*Directions: Place the appropriate numerical score (or "U") in the Score column next to the selected answer to each of these 18 questions.*

**1. Current Invasion in Ohio**

- plant is not found in natural areas (0 pts.)
- plant is found in natural areas but only because it persist from previous planting in that location (e.g. old home sites) (0 pts.)
- plant is only expanding from sites of previous planting (1 pt.)
- plant occurs in natural areas away from site of planting (3 pts.)
- Information unknown (U)

3

Determined to be noxious in all areas of OH

2

**2. State Distribution<sup>a</sup>**

- plant is not naturalized in any region of Ohio (0 pts.)
- plant is naturalized in only one region in Ohio (1 pt.)
- plant is naturalized in two regions in Ohio (2 pts.)
- plant is naturalized in three regions in Ohio (3 pts.)
- plant is naturalized in four regions in Ohio (4 pts.)
- plant is naturalized in five regions in Ohio (5 pts.)
- Information unknown (U)

5

2: All OH Regions. 15: First record of species in OH comes from the Little Mountain area in Lake County in 1902. 15,16: Used remote sensing to document existence of species in Locas, Ottawa, Sandusky and Erie Counties.

2,15,16

**3. Regional/US Distribution**

- plant is not considered to be a problem in any other state (0 pts.)
- plant has been reported as a widespread problem in another non-neighboring state within the USDA Plant Hardiness Zones 5-6 (1 pt.)
- plant has been reported to be a widespread problem in 1-2 adjoining states (3 pts.)
- plant has been reported to be a widespread problem in 3 or more adjoining states (5 pts.)
- plant has been reported to be a widespread problem in similar habitat outside the US (1 pt.)
- Information unknown (U)

5

IN,WI,MN,MI,PA,NY,MA,Conn,WV

3,4,5,6,7,8,9,10,11,18,66

### Step II: Biological Characters

**4. Vegetative Reproduction**

- no vegetative reproduction (0 pts.)
- reproduces readily within the original site (1 pt.)

14: clonal dissemination occurs by stem cuttings or

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<ul style="list-style-type: none"> <li>- has runners or spreading rhizomes that root easily (3 pts.)</li> <li>- fragments easily and fragments can be easily dispersed (4 pts.)</li> <li>- has runners or spreading rhizomes that root easily AND fragments easily and fragments can be easily dispersed (5 pts.)</li> <li>- Information unknown (U)</li> </ul>	5	rhizomes. 15: Cut sections of rhizomes containing a single node can send out new shoots and roots when segments were floated on a pond surface. 56: Can spread vegetatively fby formation of adventitious shoots and roots from clipped, trampled, or buried stems.	14,15,56
<p><b>5. Sexual Reproduction</b></p> <ul style="list-style-type: none"> <li>- no sexual reproduction (0 pts.)</li> <li>- infrequent sexual reproduction (1 pt.)</li> <li>- frequent sexual reproduction, but high variation among years in seed production (3 pts.)</li> <li>- frequent sexual reproduction (one or more events per year) (5 pts.)</li> <li>- Information unknown (U)</li> </ul>	5	12: A single plant can produce more than 2 million viable seeds per season. 14: Species is tristylous with three morphs. 15: Flowers are visited by many insect generalist pollinators.23: Invasive plants exhibit an extended period of vegetative growth before flowering to increase height and allocation to clonal reproduction, compared to non-native (European) populations. 27: This species can be self-compatible in some areas of the US range. 46: North American population of <i>L. salicaria</i> are all tetraploids while native populations are triploid and mainly hexaploids.	12,14,15,23,26,27,46,64,65
<p><b>6. Number of Viable Seeds or Propagules per Plant</b></p> <ul style="list-style-type: none"> <li>- few (0-10) (1 pt.)</li> <li>- moderate (11-1,000) (3 pts.)</li> <li>- prolific (&gt;1,000) (5 pts.)</li> <li>- Information unknown (U)</li> </ul>	5	12: A single plant can produce more than 2 million viable seeds per season. 14: Seed production per capsule ranged from zero to 152, averaging 54 seeds; self-pollination is possible; cultivars grown in gardens can serve as pollen or seed sources for wild populations; seed germination ranged from 30-100% germination. 15: Seed production in monospecific stands was 149 kg/ha. 56: prolific seed production with up to 2.7 million seeds per plant per year.	12,14,15,18,56,64
<p><b>7. Flowering Period</b></p> <ul style="list-style-type: none"> <li>- one month or less per year (0 pts.)</li> <li>- two months (1 pt.)</li> <li>- three to five months (2 pts.)</li> <li>- longer than five months (3 pts.)</li> <li>- Information unknown (U)</li> </ul>	2	13: June to September in OH. 28: There is a relationship between size at flower and time to first flower. 30: earlier flowering is evolving at the northern limit of this invasive species' range where it increases fitness and competitive ability. 33: In Canada, plants flowered early July to most flowering by end of August in 1997 but in the El Nino following year, flowering occurred mid June to mid August. 55: In Sweden, plants grown from seed in a common garden started to flower when they were 2-4 years old. 56: In Philadelphia, PA, flower time is July to September or October.	13,26,28,30,33,55,56
<p><b>8. Dispersal Ability</b></p> <ul style="list-style-type: none"> <li>- low potential for long-distance seed/propagule dispersal (&gt;1km) (0 pts.)</li> <li>- medium potential for long-distance seed/propagule dispersal (3 pts.)</li> <li>- high potential for long-distance seed/propagule dispersal (5 pts.)</li> </ul>		14: Seeds can disperse by means of "air currents, flotation, fur of mink and muskrat, turtle shells, and dried mud on the feet of waterfowl; vegetative propagules occur by	

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Step II				
	- Information unknown (U)	5	stem cuttings or rhizomes carried by herbivores or humans; it was once an ornamental plant sold in the nursery trade. 15: accidentally transported by humans (trucks, boats, clothing, wild seed packets, etc.); seeds are also wind-dispersed and the cotyledon stage seedlings are buoyant, enhancing water dispersal. 47: species originally sold as seed and also likely introduced by ships dumping ballast (sand), or by raw wool or sheep imported from Europe.	14,15,47,64
	<b>9. Generation Time</b> - long juvenile period (>5 or more years for trees, 3 or more years for other growth forms) (0 pts.) - short juvenile period (<5 years for trees, <3 years for other forms) (3 pts.) - Information unknown (U)	3	28: Experimental project involved collecting seeds, planting them in the field and greenhouse, and monitoring them for two additional years for date of first flowering.	28
	<b>10. Establishment</b> - unable to invade natural areas (0 pts.) - can only colonize certain habitat stages (e.g. early successional habitats) (1 pt.) - aggressively colonizes and establishes in edge habitats (3 pts.) - aggressively colonizes and establishes in intact and healthy natural areas (6 pts.) - Information unknown (U)	6	17: invasive plants exhibited higher growth rate and branching than native plants. 22: Invasive plants exhibited greater amounts of phenotypic plasticity for aboveground biomass than did natives in response to changing nutrient levels in standing water. 24: Genetic research shows that multiple introductions may have created a genetic mixture fro diverse source populations and increased genetic diversity. 25: Invasive populations produced a greater size of largest leaf than natives and displayed a greater vegetative expansion. 29: population divergence during invasive spread has been constrained by strong genetic correlation among life-history traits, despite "large amounts of standing genetic variation for individual traits". 40: L. salicaria is not a good invader of established sites but once established, it is "fairly resistant to invasion"; disturbance of established vegetation facilitates invasion of L. salicaria. 42: L. salicaria is detrimental especially to rare plants and prevents other plants from colonizing loosestrife infested areas (compared to native Typha latifolia stands). 43: evolutionarily increased competitive ability occurs in invasive populations of L. salicaria. 44: Compared to populations in its native range, invasive populations of <i>Lythrum salicaria</i> exhibit greater plant vigor and response to herbivores. 51: vegetative and reproductive traits of loosestrife were phenotypically plastic in different soil moisture treatments. 55: In Sweden, species has evolved along latitudinal gradients. 57: Exposure to herbivory by two beetles influenced pollination visitation rates but not female reproductive success. 62: Occurrence of the species depends not only on availability of suitable habitat but also human actions and dispersal limitation.	17,22,24,25,29,40,42,43,44,51,53,55,57,62,63,64
	<b>Step II: Ecological Importance</b>			
	<b>11. Impact on Ecosystem Processes</b> - no known effect on ecosystem-level processes (0 pts.) - moderate effects on ecosystem-level processes (e.g., changes in nutrient cycling)(3 pts.)	12	12: Species can clog streams and channels, slowing water	

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<ul style="list-style-type: none"> <li>- causes long-term, substantial alterations in the ecosystem (e.g., changing fire regime of an area, changing hydrology of wetlands) (6 pts.)</li> </ul>	6	Flow; leaves decompose quickly in the fall, causing a nutrient flush in wetland communities (which are adapted to this happening in the spring). 18: Species reduces wetland function in many different ways. 47: a review of the species.	12,18,47
<p><b>12. Impact on Rare Organisms</b></p> <ul style="list-style-type: none"> <li>- no known negative impact on Ohio State-listed or federal-listed plants or animals (0 pts.)</li> <li>- negatively impacts listed species, such as through displacement or interbreeding (3 pts.)</li> </ul>	3	Impacts several state listed mudflat species at Sheldon March SNP (beetle used to control it there).	
<p><b>13. Impact on Native Animals</b></p> <ul style="list-style-type: none"> <li>- no known negative impact on animals (0 pts.)</li> <li>- documented direct or indirect negative effects on animal taxa (3 pts.)</li> </ul>	3	12: Displaces native vegetation used by animals for food. 15: Tests of bird guts showed that wetland birds did not frequently consume loosestrife seeds. 18: Several birds avoid purple loosestrife for foraging and nesting. 20: Purple loosestrife negatively impact tadpoles of the American toad ( <i>Bufo americanus</i> ) through their effect on algal communities. 38: Monotypic stands of purple loosestrife do not lack aquatic invertebrates (but stands were relatively recent and results may differ in older-aged stands). 39: in WI: population of a native silkmoth were detrimentally affected by <i>L. salicaria</i> (lower pupal mass and lower survivorship to pupation related to feeding on <i>Salix</i> ). 47: a review of the literature. 49: Some bird species appear to avoid nesting in loosestrife; wetlands dominated by loosestrife are now adequate breeding habitats for marsh wrens and common grackles. 50: High tannin concentrations from loosestrife have the potential to create an environment directly toxic to tadpoles of <i>Bufo americanus</i> ; American Toad). 61: Loosestrife cover or density does not categorically decrease habitat quality for all wetland bird species and it may have a positive influence on quality for some species.	12,15,18,20,38,39,47,49,50,61
<p><b>14. Impact on Native Plants</b></p> <ul style="list-style-type: none"> <li>- no known negative effects on native plants (0 pts.)</li> <li>- negatively impacts some native plants (increasing their mortality and/or recruitment of certain taxa) (3 pts.)</li> </ul>		12: Loosestrife displaces native vegetation. 15: Species	

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<ul style="list-style-type: none"> <li>- impacts native plants to such an extent that community structure is greatly altered (6 pts.)</li> </ul>	6	<p>outcompeted <i>Echinochloa walteri</i>, <i>Polygonum</i> spp. and <i>Cyperus</i> spp. 18: Species can outcompete other native plant species; purple loosestrife reduces seed set of related <i>L. alatum</i>. 19: <i>L. salicaria</i> significantly reduced pollinator visitation and seed set in <i>L. alatum</i>. 21: <i>L. salicaria</i> competes with <i>L. alatum</i> for pollinators (and wins). 31: <i>L. salicaria</i> appears to facilitate the reproductive success of native <i>Decodon verticillatus</i> in a wetland in southern Ontario. 32: Mixed pollen involving <i>L. salicaria</i> reduced seed set of <i>Decodon verticillatus</i> by 33.3% compared to pure pollen application. 34: In the Pacific Northwest, <i>L. salicaria</i> did not detrimentally affect native rare <i>Sidalcea hendersonii</i>. 35: Whether <i>L. salicaria</i> impacts native species or not depends in some part on metrics used to measure competition; <i>L. salicaria</i> in some cases does not impact species richness but its biomass can impact biomass of natives. 36: Presence of <i>L. salicaria</i> is associated with reduction of conspecific pollen deposition and number of seeds per fruit in <i>Mimulus ringens</i>. 37: Presence of <i>L. salicaria</i> lowered mean seed number in <i>Mimulus ringens</i> fruits. 42: <i>L. salicaria</i> is detrimental especially to rare plants and prevents other plants from colonizing loosestrife infested areas (compared to native <i>Typha latifolia</i> stands). 45: <i>L. salicaria</i> exhibited a negative effect on the native <i>Decodon verticillatus</i> (swamp loosestrife) when grown together when bumblebee visitation was observed (but not for all other pollinators considered together). 58: Loosestrife can reduce plant community diversity.</p>	12,15,18,19,21,31,32,24,35,36,37,42,45,52,58
<p><b>15. Hybridization</b></p> <ul style="list-style-type: none"> <li>- no known instances of hybridization with other plant species (0 pts.)</li> <li>- can hybridize with native Ohio plants or commercially-available species, but seeds are inviable (1 pt.)</li> <li>- can hybridize with native Ohio plants or commercially-available species, producing viable seed (3 pts.)</li> </ul>	3	<p>41: <i>L. salicaria</i> can hybridize with <i>L. alatum</i>., with genetic and morphological data supporting hybrids in the field. 48: <i>L. virgatum</i> hybridizes with <i>L. salicaria</i> in the field. 54: In Ohio, the 'Morden Pink' cultivar can cross-fertilize wild <i>L. salicaria</i>. 59,60: Cultivars of <i>L. virgatum</i> are not distinguishable from <i>L. salicaria</i> using isozymes.</p>	41,48,54,59,60
<p><b>16. Population Density</b></p> <ul style="list-style-type: none"> <li>- occurs only as small, sporadic populations or individuals (1 pt.)</li> <li>- typically forms small, monospecific patches (3 pts.)</li> <li>- is a dominant plant in area where population occurs (absolute cover 15-50%) (4 pts.)</li> </ul>	5	<p>15: Sometimes forms large, monospecific stands in the US; populations in northern OH counties covered 0 to 454.4 ha. 16: In northern OH, 213 stands were identified that were 0.4-60.2 ha in size. 47: a review of the literature.</p>	15,16,47
<p><b>17. Role in Succession in Natural Areas</b></p> <ul style="list-style-type: none"> <li>- successional information is unknown (0 pts.)</li> <li>- is an early successional species that temporarily invades a disturbed site but does not persist as the site matures (0 pts.)</li> <li>- readily invades disturbed sites and persists, but does not interfere with succession (1 pt.)</li> </ul>		<p>40: <i>L. salicaria</i> is not a good invader of established sites but once established, it is "fairly resistant to invasion";</p>	

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- readily invades disturbed sites, persists and interferes with succession of native plants (4 pts.)

4

disturbance of established vegetation facilitates invasion of *L. salicaria*. 42: 42: *L. salicaria* prevents other plants from colonizing loosestrife infested areas (compared to native *Typha latifolia* stands); purple loosestrife suppresses other colonizers.

40,42

### 18. Number of Habitats Invaded

**Forestlands:** Floodplain forest, hemlock-hardwood forest, mixed mesophytic forest, beech-maple forest, oak-maple forest, oak-hickory forest.

**Grasslands:** Alvar\*, beach-dune community\*, bur oak savanna\*, slough-grass-bluejoint prairie\*, sand barren\*, big bluestem prairie, little bluestem prairie (xeric limestone prairie\*+), post oak opening\*+

**Wetlands:** Bog\*, fen\*, twigrush-wiregrass wet prairie\*, marsh, buttonbush swamp, mixed shrub swamp, hemlock-hardwood swamp\*, maple-ash-oak swamp, white pine-red maple swamp\*

\* Considered a rare plant community in Ohio by ODW's Biodiversity Database Program.

+ = xeric limestone prairies or cedar glades and post oak openings are unique to the Interior Low Plateau Region of Adams, Highland and Pike counties, and are not included in Schneider and Cochrane (1997).

- not found in any natural habitats in Ohio (0 pts.)
- only found in 1 broad category (1 pt.)
- found in 2 broad categories or 2 rare habitat types (3 pts.)
- found in 3 broad categories or 3 rare habitat types (4 pts.)
- found in 4 or more rare habitat types (5 pts.)

3

12: In Alaska, species is found in wetlands (cattail marshes, sedge meadows, open bogs) and along stream/river banks and lake shores, and in ditches and disturbed, wet areas. 13: In OH: wet ditches and shores, moist roadsides and other moist, open, disturbed sites. 55: In Sweden, species grows in wetland habitats, including lake- and seashores, riversides and fens. 62: In Minnesota: herbaceous wetlands, edges of open water sites and developed open spaces R. Gardner: known in OH from fens and twigrush wet prairies as well as other wetlands and grasslands.

12,13,55,62

**Total Score:** 77

**Number of Unknowns:** 0

**Outcome:** Invasive

Total Points	Assessment Decision
4 or more U	Insufficient Data
0-34	Not Known to be Invasive
35-44	Pending Further Review
45-80	Invasive