**Ohio Invasive Plant Assessment Protocol**

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<tr>
<th>Botanical Name: Lythrum salicaria L.</th>
<th>Step I Outcome: Invasive</th>
<th>Score</th>
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<td>Common Name: Purple Loosestrife</td>
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**Step I**

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<tr>
<th>Directions: Place an &quot;X&quot; in the Score column next to the selected answer to each of the four questions.</th>
<th>1. Is this plant known to occur in the state and listed as &quot;noxious&quot; on any federal or Ohio Department of Agriculture plant list?</th>
<th>Yes. Place on invasive plant list, no further investigation needed. STOP</th>
<th>X</th>
<th>Considered a noxious weed in 33 states, including IN, MI, PA, &amp; VA, on multiple state invasive plant lists (see question #3 below)</th>
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<td></td>
<td>No. Continue on to question 2.</td>
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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? Yes. Place on invasive plant list, no further investigation needed. STOP |
| No. Continue on to question 3. | | |
| | | |
| | Yes | X | |
| | No | | |
| | Unknown | | |

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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? Yes | X |
| No | | |
| Unknown | | |

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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? Yes | X |
| No | | |
| Unknown | | |

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.

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**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.

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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 |

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2. State Distribution
   - 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 |

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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 |

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4. Vegetative Reproduction
   - no vegetative reproduction (0 pts.)
   - reproduces readily within the original site (1 pt.)
   | | | | 14: Clonal dissemination occurs by stem cuttings or division. 15: Cloning of diaspore containing fruit. |
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#### 1. Flowering Period
- Has runners or spreading rhizomes (3 pts.)
- Fragments easily and can be easily dispersed (4 pts.)
- Has runners or spreading rhizomes that root easily AND fragments easily and can be easily dispersed (5 pts.)
- Information unknown (U)

#### 2. Seed/Propagule Potential
- High potential for long-distance seed/propagule dispersal (>1 km) (5 pts.)
- Medium potential for long-distance seed/propagule dispersal (3 pts.)
- Low potential for long-distance seed/propagule dispersal (1 pt.)

#### 3. Information
- Flowering period: Information unknown (U)

#### 4. Vegetative Growth
- Has runners or spreading rhizomes that root easily (3 pts.)
- Can send out new shoots and roots when segments were floated on a pond surface (5 pts.)
- Can spread vegetatively by formation of adventitious shoots and roots from clipped, trampled, or buried stems.

#### 5. Sexual Reproduction
- No sexual reproduction (0 pts.)
- Frequent sexual reproduction, but high variation among years in seed production (3 pts.)
- Information unknown (U)

#### 6. Number of Viable Seeds or Propagules per Plant
- Few (0-10) (1 pt.)
- Moderate (11-1,000) (3 pts.)
- Prolific (>1,000) (5 pts.)
- Information unknown (U)

#### 7. Flowering Period
- One month or less per year (0 pts.)
- Three to five months (2 pts.)
- Longer than five months (3 pts.)
- Information unknown (U)

#### References
- 12, 14, 15, 23, 26, 27, 46, 64, 65
- 13, 26, 28, 30, 33, 55, 56

### Score
- 5

### Notes
- 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 by formation of adventitious shoots and roots from clipped, trampled, or buried stems.

### References
- 14, 15, 23, 26, 27, 46, 64, 65
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#### Step I: Ecological Importance

- **Moderate effects on ecosystem-level processes (e.g., changes in nutrient cycling) (3 pts.)**
- **No known effect on ecosystem-level processes (0 pts.)**
- **Information unknown (U)**

#### Step II: Establishment

- **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)**

#### Step III: Impact on Ecosystem Processes

- **No known effect on ecosystem-level processes (0 pts.)**
- **Moderate effects on ecosystem-level processes (e.g., changes in nutrient cycling) (3 pts.)**

#### Score

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<td>I</td>
<td>5</td>
<td>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.</td>
<td>14,15,47,64</td>
</tr>
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<td>I</td>
<td>3</td>
<td>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.</td>
<td>28</td>
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<tr>
<td>II</td>
<td>6</td>
<td>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 from 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 &quot;large amounts of standing genetic variation for individual traits&quot;. 40: L. salicaria is not a good invader of established sites but once established, it is &quot;fairly resistant to invasion&quot;; 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 Lythrum salicaria 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.</td>
<td>17,22,24,25,29,40,42,43,44,51,53,55,57,62,63,64</td>
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<td>III</td>
<td>12</td>
<td>Species can clog streams and channels, slowing water flow; leaves decompose quickly in the fall, causing a nutrient flush in wetland communities (which are adapted to nutrient-poor conditions).</td>
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#### Step I

**Step I Outcome:** Invasive

**Step II Outcome:** Invasive

#### Directions:
- Place an “X” in the Score column next to the selected answer to each of the four questions.

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<td>6</td>
<td>Now, 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.</td>
<td>12,18,47</td>
</tr>
<tr>
<td>3</td>
<td>Impacts several state listed mudflat species at Sheldon March SNP (beetle used to control it there).</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>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 (Bufo americanus) 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 silkworm were detrimentally affected by L. salicaria (lower pupal mass and lower survivorship to pupation related to feeding on Salix). 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 Bufo americanus; 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.</td>
<td>12,15,18,20,38,39,47,49,50,61</td>
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#### Step I

**Step II Score:**

**Step I Outcome:**

- Causes long-term, substantial alterations in the ecosystem (e.g., changing fire regime of an area, changing hydrology of wetlands) (6 pts.)
- Caused a large change in the community diversity. (5 pts.)
- Decreased plant diversity. (3 pts.)
- Reduced plant biomass. (3 pts.)
- Decreased plant density. (2 pts.)
- Lowered survivorship to pupation related to feeding on Salix. (2 pts.)
- Increased algal communities. (2 pts.)
- Increased tannin concentrations from loosestrife. (2 pts.)
- Increased populations of marsh wrens and common grackles. (2 pts.)
- Increased positive influence on quality for some species. (2 pts.)

#### Step II

**Step II Outcome:**

- No known negative effects on native plants (6 pts.)
- Negatively impacts some native plants (increasing their mortality and/or recruitment of certain taxa) (3 pts.)
- Negatively impacts listed species, such as through displacement or interbreeding (3 pts.)
- No known negative impact on animals (5 pts.)
- Documented direct or indirect negative effects on animal taxa (3 pts.)
- Displaces native vegetation used by animals for food. (5 pts.)
- Decreases plant diversity. (3 pts.)
- Decreases plant biomass. (3 pts.)
- Decreases plant density. (2 pts.)
- Decreases algal communities. (2 pts.)
- Decreases tannin concentrations from loosestrife. (2 pts.)
- Decreases populations of marsh wrens and common grackles. (2 pts.)
- Decreases positive influence on quality for some species. (2 pts.)

#### Notes

- 12: Loosestrife displaces native vegetation. 15: Species frequently consume loosestrife seeds. 18: Species avoid purple loosestrife for foraging and nesting. 20: Purple loosestrife negatively impact tadpoles of the American toad (Bufo americanus) 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 silkworm were detrimentally affected by L. salicaria (lower pupal mass and lower survivorship to pupation related to feeding on Salix). 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 Bufo americanus; 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 |
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### Step 1
- Impacts native plants to such an extent that community structure is greatly altered (6 pts.)
- Species can outcompete other native plant species; purple loosestrife reduces seed set of related L. alatum. 19: L. salicaria significantly reduced pollinator visitation and seed set in L. alatum. 21: L. salicaria competes with L. alatum for pollinators (and wins). 31: L. salicaria appears to facilitate the reproductive success of native Decodon verticillatus in a wetland in southern Ontario. 32: Mixed pollen involving L. salicaria reduced seed set of Decodon verticillatus by 33.3% compared to pure pollen application. 34: In the Pacific Northwest, L. salicaria did not detrimentally affect native rare Sidalcea hendersonii. 35: Whether L. salicaria impacts native species or not depends in some part on metrics used to measure competition; L. salicaria in some cases does not impact species richness but its biomass can impact biomass of natives. 36: Presence of L. salicaria is associated with reduction of conspecific pollen deposition and number of seeds per fruit in Mimulus ringens. 37: Presence of L. salicaria lowered mean seed number in Mimulus ringens fruits. 42: L. salicaria is detrimental especially to rare plants and prevents other plants from colonizing loosestrife infested areas (compared to native Typha latifolia stands). 45: L. salicaria exhibited a negative effect on the native Decodon verticillatus (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.

### Step 2
- Can hybridize with native Ohio plants or commercially-available species, but seeds are inviable (1 pt.)
- Can hybridize with native Ohio plants or commercially-available species, producing viable seed (3 pts.)

15. Hybridization
- No known instances of hybridization with other plant species (0 pts.)
- Can hybridize with native Ohio plants or commercially-available species, but seeds are inviable (1 pt.)
- Can hybridize with native Ohio plants or commercially-available species, producing viable seed (3 pts.)

16. Population Density
- Occurs only as small, sporadic populations or individuals (1 pt.)
- Typically forms small, monospecific patches (3 pts.)
- Is a dominant plant in area where population occurs (absolute cover 15-50%) (4 pts.)
- Forms an extensive, monospecific stand (absolute cover >50%) (5 pts.)

17. Role in Succession in Natural Areas
- Successional information is unknown (0 pts.)
- Is an early successional species that temporarily invades a disturbed site but does not persist as the site matures (0 pts.)
- Readily invades disturbed sites and persists, but does not interfere with succession (2 pts.)
- Readily invades disturbed sites and persists, but does not interfere with succession (2 pts.)

18. Species can outcompete other native plant species; purple loosestrife reduces seed set of related L. alatum. 19: L. salicaria significantly reduced pollinator visitation and seed set in L. alatum. 21: L. salicaria competes with L. alatum for pollinators (and wins). 31: L. salicaria appears to facilitate the reproductive success of native Decodon verticillatus in a wetland in southern Ontario. 32: Mixed pollen involving L. salicaria reduced seed set of Decodon verticillatus by 33.3% compared to pure pollen application. 34: In the Pacific Northwest, L. salicaria did not detrimentally affect native rare Sidalcea hendersonii. 35: Whether L. salicaria impacts native species or not depends in some part on metrics used to measure competition; L. salicaria in some cases does not impact species richness but its biomass can impact biomass of natives. 36: Presence of L. salicaria is associated with reduction of conspecific pollen deposition and number of seeds per fruit in Mimulus ringens. 37: Presence of L. salicaria lowered mean seed number in Mimulus ringens fruits. 42: L. salicaria is detrimental especially to rare plants and prevents other plants from colonizing loosestrife infested areas (compared to native Typha latifolia stands). 45: L. salicaria exhibited a negative effect on the native Decodon verticillatus (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.
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**Step I Outcome:** Invasive

**Step II Score:** 77

**Step II Outcome:** Invasive

**Posted Date:** 7/20/16

#### 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).

1. Readily invades disturbed sites, persists and interferes with succession of native plants (4 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.)

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

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

3. Readily invades disturbed sites, persists and interferes with succession of native plants (3 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.)

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

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

#### Total Score: 77

**Number of Unknowns:** 0

**Outcome:** Invasive