

# INDIANA

## NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE  
Form version date: March 3, 2009

Scientific name: Saponaria officinalis L. USDA Plants Code: SAOF4  
 Common names: Bouncing-bet, bouncing betty, soapwort  
 Native distribution: Eurasia  
 Date assessed: 8/13/2012  
 Assessors: Ellen Jacquart  
 Reviewers: John Drake and Stuart Orr  
 Date Approved: September 21, 2012

**Indiana Invasiveness Rank:** Moderate (Relative Maximum Score 50.00-69.99)

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 ( <u>20</u> )	6
2	Biological characteristic and dispersal ability	25 ( <u>25</u> )	13
3	Ecological amplitude and distribution	25 ( <u>25</u> )	19
4	Difficulty of control	10 ( <u>10</u> )	7
	Outcome score	100 ( <u>80</u> ) <sup>b</sup>	45 <sup>a</sup>
	Relative maximum score <sup>†</sup>		56.25
	Indiana Invasiveness Rank <sup>§</sup>	Moderate (Relative Maximum Score 50.00-69.99)	

\* For questions answered “unknown” do not include point value in “Total Answered Points Possible.” If “Total Answered Points Possible” is less than 70.00 points, then the overall invasive rank should be listed as “Unknown.”  
<sup>†</sup>Calculated as 100(a/b) to two decimal places.  
<sup>§</sup>Very High >80.00; High 70.00–80.00; Moderate 50.00–69.99; Low 40.00–49.99; Insignificant <40.00

### A. DISTRIBUTION (KNOWN/POTENTIAL):

<p>A1.1. Has this species been documented to persist without cultivation in IN? (reliable source; voucher not required)</p> <p><input checked="" type="checkbox"/> Yes – continue to A2.2</p> <p><input type="checkbox"/> No – continue to A2.1</p>	<div style="border: 1px solid black; padding: 5px;"> <p><b>Legend</b></p> <p> PLANTS</p> <p> EDDM apps</p> <p> NO RECORD</p> <p>Date: 8/13/2012</p> </div>
<p>A2.1. What is the likelihood that this species will occur and persist outside of cultivation given the climate in Indiana? (obtain from occurrence data in other states with similar climates)</p> <p><input type="checkbox"/> Likely – continue to A2.2</p> <p><input type="checkbox"/> Not likely</p>	

**INDIANA**  
**NON-NATIVE PLANT INVASIVENESS RANKING FORM**

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE  
Form version date: March 3, 2009

**Documentation:**

Sources of information: Range maps compiled from PLANTS database, <http://plants.usda.gov/java/>; Indiana CAPS database, <http://extension.entm.purdue.edu/CAPS/index.html>; Indiana IPSAWG reports (unpublished); and EDDMapS reports, <http://eddmaps.org/>.

*If the species does not occur and is not likely to occur in Indiana, then stop here as there is no need to assess the species.*

A2.2. Describe the potential or known suitable habitats within Indiana (underlined). Natural habitats include all habitats not under active human management. Managed habitats are indicated with an asterisk.

<b>Aquatic Habitats</b>	<b>Wetland Habitats</b>	<b>Upland Habitats</b>
Rivers/streams	<u>Marshes</u>	Forest
Natural lakes and ponds	Fens	<u>Savannas</u>
Reservoirs/impoundments*	Bogs	Barrens
	Shrub swamps	<u>Prairies</u>
	Forested wetlands/riparian	<u>Cultivated*</u>
	<u>Beaches/dunes</u>	<u>Old Fields*</u>
	Ditches*	<u>Roadsides*</u>

Other potential or known suitable habitats within Indiana:

Ballast grounds, waste areas, railroads, wood edges, riparian sand flats; streamsides.

**Documentation:**

Sources of information:

Chrysler, 1930; McVaugh, 1957; Dowhan & Rozsa, 1989; Lu, 2004; Flora of North America Editorial Committee, 2005; Leck & Leck, 2005; Brooklyn Botanic Garden, 2009.

**B. INVASIVENESS RANKING**

Questions apply to areas similar in climate and habitats to Indiana unless specified otherwise.

*1. ECOLOGICAL IMPACT*

1.1. Impact on Natural Ecosystem Processes and System-Wide Parameters (e.g. fire regime, geomorphological changes (erosion, sedimentation rates), hydrologic regime, nutrient and mineral dynamics, light availability, salinity, pH)

- A. No perceivable impact on ecosystem processes based on research studies, or the absence of impact information if a species is widespread (>10 occurrences in minimally managed areas), has been well-studied (>10 reports/publications), and has been present in the northeast for >100 years. 0
- B. Influences ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability) 3
- C. Significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, reduces open water that are important to waterfowl) 7
- D. Major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology and/or hydrology, affects fire frequency, alters soil pH, or fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species) 10
- U. Unknown

Score

**Documentation:**

Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the

**INDIANA**  
**NON-NATIVE PLANT INVASIVENESS RANKING FORM**

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE  
Form version date: March 3, 2009

absence of impact information)  
No studies on the impact on natural ecosystem processes located.  
Sources of information:  
Lu, 2004; authors' pers. obs.

**1.2. Impact on Natural Community Structure**

- A. No perceived impact; establishes in an existing layer without influencing its structure 0
- B. Influences structure in one layer (e.g., changes the density of one layer) 3
- C. Significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer) 7
- D. Major alteration of structure (e.g., covers canopy, eradicating most or all layers below) 10
- U. Unknown

Score

**Documentation:**  
Identify type of impact or alteration:  
Large, dense stands, which increase the density of the herb layer, are occasionally encountered. No evidence of significant impact to or major alteration of structure.  
Sources of information:  
Authors' pers. obs.

**1.3. Impact on Natural Community Composition**

- A. No perceived impact; causes no apparent change in native populations 0
- B. Influences community composition (e.g., reduces the number of individuals in one or more native species in the community) 3
- C. Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community) 7
- D. Causes major alteration in community composition (e.g., results in the extirpation of one or several native species, reducing biodiversity or change the community composition towards species exotic to the natural community) 10
- U. Unknown

Score

**Documentation:**  
Identify type of impact or alteration:  
Dense stands can reduce the number of individuals of native species found in the community.  
Sources of information:  
Authors' pers. obs.

**1.4. Impact on other species or species groups (cumulative impact of this species on the animals, fungi, microbes, and other organisms in the community it invades. Examples include reduction in nesting/foraging sites; reduction in habitat connectivity; injurious components such as spines, thorns, burrs, toxins; suppresses soil/sediment microflora; interferes with native pollinators and/or pollination of a native species; hybridizes with a native species; hosts a non-native disease which impacts a native species)**

- A. Negligible perceived impact 0
- B. Minor impact 3
- C. Moderate impact 7
- D. Severe impact on other species or species groups 10
- U. Unknown

Score

**Documentation:**

**INDIANA**  
**NON-NATIVE PLANT INVASIVENESS RANKING FORM**

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE  
Form version date: March 3, 2009

Identify type of impact or alteration:  
No studies on the impact of other species located.  
Sources of information:  
Lu, 2004

Total Possible	20
Section One Total	6

**2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY**

- 2.1. Mode and rate of reproduction** (provisional thresholds, more investigation needed)
- A. No reproduction by seeds or vegetative propagules (i.e. plant sterile with no sexual or asexual reproduction). 0
  - B. Limited reproduction (fewer than 10 viable seeds per plant AND no vegetative reproduction; if viability is not known, then maximum seed production is less than 100 seeds per plant and no vegetative reproduction) 1
  - C. Moderate reproduction (fewer than 100 viable seeds per plant - if viability is not known, then maximum seed production is less than 1000 seeds per plant - OR limited successful vegetative spread documented) 2
  - D. Abundant reproduction with vegetative asexual spread documented as one of the plants prime reproductive means OR more than 100 viable seeds per plant (if viability is not known, then maximum seed production reported to be greater than 1000 seeds per plant.) 4
  - U. Unknown
- Score 2

**Documentation:**  
Describe key reproductive characteristics (including seeds per plant):  
Examination of fresh and dried herbarium material suggests that plants produce a moderate amount of seed (ie., lover 100 but ess than 1000 with viability not known).  
Sources of information:

- 2.2. Innate potential for long-distance dispersal** (e.g. bird dispersal, sticks to animal hair, buoyant fruits, pappus for wind-dispersal)
- A. Does not occur (no long-distance dispersal mechanisms) 0
  - B. Infrequent or inefficient long-distance dispersal (occurs occasionally despite lack of adaptations) 1
  - C. Moderate opportunities for long-distance dispersal (adaptations exist for long-distance dispersal, but studies report that 95% of seeds land within 100 meters of the parent plant) 2
  - D. Numerous opportunities for long-distance dispersal (adaptations exist for long-distance dispersal and evidence that many seeds disperse greater than 100 meters from the parent plant) 4
  - U. Unknown
- Score 1

**Documentation:**  
Identify dispersal mechanisms:  
No studies located on dispersal of seed. seeds appear to lack adpatations but are small and long distance transport would seem to occasionally occur via animals (epizoochory) or water.  
Sources of information:

- 2.3. Potential to be spread by human activities** (both directly and indirectly – possible mechanisms include: commercial sales, use as forage/revegetation, spread along highways, transport on boats, contaminated compost, land and vegetation management equipment such as mowers and excavators, etc.)
- A. Does not occur 0

**INDIANA**  
**NON-NATIVE PLANT INVASIVENESS RANKING FORM**

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE  
Form version date: March 3, 2009

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- B. Low (human dispersal to new areas occurs almost exclusively by direct means and is infrequent or inefficient) 1
- C. Moderate (human dispersal to new areas occurs by direct and indirect means to a moderate extent) 2
- D. High (opportunities for human dispersal to new areas by direct and indirect means are numerous, frequent, and successful) 3
- U. Unknown

Score

**Documentation:**  
Identify dispersal mechanisms:  
Cultivated as an ornamental, seed sold in the United States since the early 1800's (Mack, 1991) and continued to be sold on the internet (author's personal observations). Historically used in medicine and as a soap (Mitich, 1990). Seeds could also be readily transported by humans, especially through mowing equipment.  
Sources of information:  
Mitich, 1990; Mack, 1991; author's pers. obs.

**2.4. Characteristics that increase competitive advantage, such as shade tolerance, ability to grow on infertile soils, perennial habit, fast growth, nitrogen fixation, allelopathy, etc.**

- A. Possesses no characteristics that increase competitive advantage 0
- B. Possesses one characteristic that increases competitive advantage 3
- C. Possesses two or more characteristics that increase competitive advantage 6
- U. Unknown

Score

**Documentation:**  
Evidence of competitive ability:  
Perennial, able to grow on poor soil.  
Sources of information:  
Mitich, 1990; Baker et al., 2004; Lu, 2004; authors' pers. obs.

**2.5. Growth vigor**

- A. Does not form thickets or have a climbing or smothering growth habit 0
- B. Has climbing or smothering growth habit, forms a dense layer above shorter vegetation, forms dense thickets, or forms a dense floating mat in aquatic systems where it smothers other vegetation or organisms 2
- U. Unknown

Score

**Documentation:**  
Describe growth form:  
Neither observed forming thickets or having a smothering growth habit in the Northeast region, nor any literature locating suggesting this.  
Sources of information:  
Lu, 2004; authors' personal observations

**2.6. Germination/Regeneration**

- A. Requires open soil or water and disturbance for seed germination, or regeneration from vegetative propagules. 0
- B. Can germinate/regenerate in vegetated areas but in a narrow range or in special conditions 2
- C. Can germinate/regenerate in existing vegetation in a wide range of conditions 3
- U. Unknown (No studies have been completed)

Score

**INDIANA**  
**NON-NATIVE PLANT INVASIVENESS RANKING FORM**

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE  
 Form version date: March 3, 2009

**Documentation:**

Describe germination requirements:

Light, adequate moisture, and prechilling regimens may be required for germination; germination rates reported as high as 99% under optimum conditions.

Sources of information:

Mitchell, 1926; Steinbauer & Grigsby, 1957; Comes et al., 1978.

2.7. Other species in the genus invasive in Indiana or elsewhere

- A. No 0
- B. Yes 3
- U. Unknown

Score 

0
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**Documentation:**

Species:

Saponaria ocymoides L. reported from NY and other northeastern states, but not regarded as invasive.

Flora of North America Editorial Committee, 2005; U.S.D.A., 2009; Weldy & Werier, 2009.

Total Possible 

25
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Section Two Total 

13
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**3. ECOLOGICAL AMPLITUDE AND DISTRIBUTION**

3.1. Density of stands in natural areas in the northeastern USA and eastern Canada (use same definition as Gleason & Cronquist which is: "The part of the United States covered extends from the Atlantic Ocean west to the western boundaries of Minnesota, Iowa, northern Missouri, and southern Illinois, south to the southern boundaries of Virginia, Kentucky, and Illinois, and south to the Missouri River in Missouri. In Canada the area covered includes Nova Scotia, Prince Edward Island, New Brunswick, and parts of Quebec and Ontario lying south of the 47th parallel of latitude")

- A. No large stands (no areas greater than 1/4 acre or 1000 square meters) 0
- B. Large dense stands present in areas with numerous invasive species already present or disturbed landscapes 2
- C. Large dense stands present in areas with few other invasive species present (i.e. ability to invade relatively pristine natural areas) 4
- U. Unknown

Score 

0
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**Documentation:**

Identify reason for selection, or evidence of weedy history:

No large stands observed in the Northeast region, nor any literature locating suggesting this.

Sources of information:

Lu, 2004; authors' personal observations

3.2. Number of habitats the species may invade

- A. Not known to invade any natural habitats given at A2.2 0
- B. Known to occur in two or more of the habitats given at A2.2, with at least one a natural habitat. 1
- C. Known to occur in three or more of the habitats given at A2.2, with at least two a natural habitat. 2
- D. Known to occur in four or more of the habitats given at A2.2, with at least three a natural 4

**INDIANA**  
**NON-NATIVE PLANT INVASIVENESS RANKING FORM**

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE  
Form version date: March 3, 2009

- habitat.
- E. Known to occur in more than four of the habitats given at A2.2, with at least four a natural habitat. 6
- U. Unknown

Score 6

**Documentation:**

Identify type of habitats where it occurs and degree/type of impacts:  
See A2.2.

Sources of information:

Chrysler, 1930; McVaugh, 1957; Dowhan & Rozsa, 1989; Lu, 2004; Flora of North America Editorial Committee, 2005; Leck & Leck, 2005; Brooklyn Botanic Garden, 2009.

**3.3. Role of disturbance in establishment**

- A. Requires anthropogenic disturbances to establish. 0
- B. May occasionally establish in undisturbed areas but can readily establish in areas with natural or anthropogenic disturbances. 2
- C. Can establish independent of any known natural or anthropogenic disturbances. 4
- U. Unknown

Score 2

**Documentation:**

Identify type of disturbance:

Observed colonizing disturbed habitats, generally absent from pristine habitats in the Northeast region.

Sources of information:

Lu, 2004; authors' personal observations

**3.4. Climate in native range**

- A. Native range does not include climates similar to Indiana 0
- B. Native range possibly includes climates similar to at least part of Indiana 1
- C. Native range includes climates similar to those in Indiana 3
- U. Unknown

Score 3

**Documentation:**

Describe what part of the native range is similar in climate to Indiana:  
Eurasia, as far north as Sweden.

Sources of information:

Stenberg, 1994; Flora of North America Editorial Committee, 2005.

**3.5. Current introduced distribution in the northeastern USA and eastern Canada (see question 3.1 for definition of geographic scope )**

- A. Not known from the northeastern US and adjacent Canada 0
- B. Present as a non-native in one northeastern USA state and/or eastern Canadian province. 1
- C. Present as a non-native in 2 or 3 northeastern USA states and/or eastern Canadian provinces. 2
- D. Present as a non-native in 4–8 northeastern USA states and/or eastern Canadian provinces, and/or categorized as a problem weed (e.g., “Noxious” or “Invasive”) in 1 northeastern state or eastern Canadian province. 3
- E. Present as a non-native in >8 northeastern USA states and/or eastern Canadian provinces, and/or categorized as a problem weed (e.g., “Noxious” or “Invasive”) in 2 northeastern states or eastern Canadian provinces. 4

**INDIANA**  
**NON-NATIVE PLANT INVASIVENESS RANKING FORM**

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE  
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U. Unknown

Score

**Documentation:**

Identify states and provinces invaded:

Documented from all northeastern states and provinces.

Sources of information: See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.

Flora of North America Editorial Committee, 2005; U.S.D.A., 2009.

**3.6. Current introduced distribution of the species in natural areas in Indiana**

- |    |                                                                          |   |
|----|--------------------------------------------------------------------------|---|
| A. | Present in no Indiana counties                                           | 0 |
| B. | Present in 1-10 Indiana counties                                         | 1 |
| C. | Present in 11-20 Indiana counties                                        | 2 |
| D. | Present in 21-50 Indiana counties                                        | 3 |
| E. | Present in more than 50 Indiana counties or on Federal noxious weed list | 4 |
| U. | Unknown                                                                  |   |

Score

**Documentation:**

Describe distribution:

See A1.1.

Sources of information:

Brooklyn Botanic Garden, 2009; Weldy & Werier, 2009.

Total Possible	25
Section Three Total	19

**4. DIFFICULTY OF CONTROL**

**4.1. Seed banks**

- |    |                                                                                                                                      |   |
|----|--------------------------------------------------------------------------------------------------------------------------------------|---|
| A. | Seeds (or vegetative propagules) remain viable in soil for less than 1 year, or does not make viable seeds or persistent propagules. | 0 |
| B. | Seeds (or vegetative propagules) remain viable in soil for at least 1 to 10 years                                                    | 2 |
| C. | Seeds (or vegetative propagules) remain viable in soil for more than 10 years                                                        | 3 |
| U. | Unknown                                                                                                                              |   |

Score

**Documentation:**

Identify longevity of seed bank:

One germination study found seeds viable for at least 2-3 years.

Sources of information:

Steinbauer & Grigsby, 1957.

**4.2. Vegetative regeneration**

- |    |                                                     |   |
|----|-----------------------------------------------------|---|
| A. | No regrowth following removal of aboveground growth | 0 |
| B. | Regrowth from ground-level meristems                | 1 |
| C. | Regrowth from extensive underground system          | 2 |
| D. | Any plant part is a viable propagule                | 3 |
| U. | Unknown                                             |   |

Score



**INDIANA**  
**NON-NATIVE PLANT INVASIVENESS RANKING FORM**

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE  
Form version date: March 3, 2009

**Documentation:**

Describe vegetative response:

Can reproduce by suckering, root runners, or pieces of root. Baker et al. characterized the plant as rhizomatous.

Sources of information:

Baker et al., 2004; Lu, 2004.

**4.3. Level of effort required**

- |    |                                                                                                                                                                                                                                                                                                                                 |   |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| A. | Management is not required: e.g., species does not persist without repeated anthropogenic disturbance.                                                                                                                                                                                                                          | 0 |
| B. | Management is relatively easy and inexpensive: e.g. 10 or fewer person-hours of manual effort (pulling, cutting and/or digging) can eradicate a 1 acre infestation in 1 year (infestation averages 50% cover or 1 plant/100 ft <sup>2</sup> ).                                                                                  | 2 |
| C. | Management requires a major short-term investment: e.g. 100 or fewer person-hours/year of manual effort, or up to 10 person-hours/year using mechanical equipment (chain saws, mowers, etc.) for 2-5 years to suppress a 1 acre infestation. Eradication is difficult, but possible (infestation as above).                     | 3 |
| D. | Management requires a major investment: e.g. more than 100 person-hours/year of manual effort, or more than 10 person hours/year using mechanical equipment, or the use of herbicide, grazing animals, fire, etc. for more than 5 years to suppress a 1 acre infestation. Eradication may be impossible (infestation as above). | 4 |
| U. | Unknown                                                                                                                                                                                                                                                                                                                         |   |

Score 

3
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**Documentation:**

Identify types of control methods and time-term required:

While there are not many infestations that need control in Indiana, those that are managed require multiple follow-up treatments and monitoring of seed bank

Sources of information:

Baker et al., 2004; Orr's personal observation.

Total Possible	10
Section Four Total	7

<b>Total for 4 sections Possible</b>	<b>80</b>
<b>Total for 4 sections</b>	<b>44</b>

**References for species assessment:**

Baker, D. V., T. L. Steinke, S. K. McDonald. 2004. Bouncinbet. *Saponaria officinalis* L. Cooperative Extension. Colorado State University. 3 pp. <cepep.colostate.edu/profiles/bouncingbet.pdf>. [Accessed 24 June 2009.]

Brooklyn Botanic Garden. 2009. AILANTHUS database. [Accessed on 2 June 2009].

Chrysler, M. A. 1930. The origin and development of the vegetation of Sandy Hook. Bull. Torrey Bot. Club. 57(3):163-176.

Comes, R. D., V. F. Bruns & A. D. Kelley. 1978. Longevity of certain weed and crop seeds in fresh water. Weed Sci. 26(4):336-344.

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**INDIANA**  
**NON-NATIVE PLANT INVASIVENESS RANKING FORM**

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE  
Form version date: March 3, 2009

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Leck, M. A. & C. F. Leck. 2005. Vascular plants of a Delaware River tidal freshwater wetland and adjacent terrestrial areas: seed bank and vegetation comparisons of reference and constructed marshes and annotated species list. *J. Torrey Bot. Soc.* 132(2):323-354.

Lu, S. 2004. *Saponaria officinalis*. U.S. Invasive Species Impact Rank (I-Rank). NatureServe Explorer. <[www.natureserve.org](http://www.natureserve.org)>. [Accessed on 2 June 2009].

Mack, R. N. 1991. The commercial seed trade: an early disperser of weeds in the United States. *economic Botany*. 45(2):257-273.

McVaugh, R. 1957. Establishment of vegetation on sand-flats along the Hudson River, New York--II. The period 1945-1955. *Ecology*. 38(1):23-29.

Mitchell, E. 1926. Germination of seeds of plants native to Dutchess County, New York. *Botanical Gazette*. 81(1):108-112 .

Mitich, L. W. 1990. Bouncingbet: The soap weed. *Weed Tech.* 4(1):221-223.

Steinbauer, G. P. & B. Grigsby. 1957. Interaction of temperature, light, and moistening agent in the germination of weed seeds. *Weeds*. 5(3):175-182.

Stenberg, L. 1994. Observations of the flora in the Pitea area in the southern part of Norrbotten. *Svensk Botanisk Tidskrift*. 88(1):49-56.

United States Department of Agriculture, National Resources Conservation Service. 2009. The PLANTS Database. National Plant Data Center, Baton Rouge, Louisiana [Accessed on 2 June 2009].

Weldy, T. & D. Werier. 2009. *New York Flora Atlas*. [S. M. Landry and K. N. Campbell (original application development), Florida Center for Community Design and Research. University of South Florida]. New York Flora Association, Albany, New York. [Accessed on 2 June 2009].

**Citation:** This IN ranking form may be cited as: Jacquart, E.M. 2012. Invasiveness ranking system for non-native plants of Indiana. Unpublished. Invasive Plant Advisory Committee (IPAC) to the Indiana Invasive Species Council, Indianapolis, IN.

**Acknowledgments:** The IN form incorporates components and approaches used in several other systems, cited in the references below. The Invasive Plant Advisory Committee was created by the Indiana Invasive Species Council in October 2010, and is made up of the original members of the Indiana Invasive Plant Assessment Working Group (IPSAWG). Original members of IPSAWG included representatives of the The Nature Conservancy; Indiana Native Plant and Wildflower Society; Indiana Nursery and Landscape Association; Indiana Chapter of the American Society of Landscape Architects; Indiana Forage Council; Indiana Wildlife Federation; Indiana State Beekeepers Association; Indiana Beekeeper's Association; Department of Natural Resources; Hoosier National Forest; Indiana Academy of Science; Natural Resources Conservation Service; Indiana Department of Environmental Management; Indiana Department of Transportation; Purdue Cooperative Extension Service; Seed Administrator, Office of the Indiana State Chemist.

**INDIANA**  
**NON-NATIVE PLANT INVASIVENESS RANKING FORM**

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE  
Form version date: March 3, 2009

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**References for ranking form:**

- Carlson, Matthew L., Irina V. Lapina, Michael Shephard, Jeffery S. Conn, Roseann Densmore, Page Spencer, Jeff Heys, Julie Riley, Jamie Nielsen. 2008. Invasiveness ranking system for non-native plants of Alaska. Technical Paper R10-TPXX, USDA Forest Service, Alaska Region, Anchorage, AK XX9. Alaska Weed Ranking Project may be viewed at: [http://akweeds.uaa.alaska.edu/akweeds\\_ranking\\_page.htm](http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm).
- Heffernan, K.E., P.P. Coulling, J.F. Townsend, and C.J. Hutto. 2001. Ranking Invasive Exotic Plant Species in Virginia. Natural Heritage Technical Report 01-13. Virginia Dept. of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. 27 pp. plus appendices (total 149 p.).
- Morse, L.E., J.M. Randall, N. Benton, R. Hiebert, and S. Lu. 2004. An Invasive Species Assessment Protocol: Evaluating Non-Native Plants for Their Impact on Biodiversity. Version 1. NatureServe, Arlington, Virginia. <http://www.natureserve.org/getData/plantData.jsp>
- Randall, J.M., L.E. Morse, N. Benton, R. Hiebert, S. Lu, and T. Killeffer. 2008. The Invasive Species Assessment Protocol: A Tool for Creating Regional and National Lists of Invasive Nonnative Plants that Negatively Impact Biodiversity. *Invasive Plant Science and Management* 1:36–49
- Warner, Peter J., Carla C. Bossard, Matthew L. Brooks, Joseph M. DiTomaso, John A. Hall, Ann M. Howald, Douglas W. Johnson, John M. Randall, Cynthia L. Roye, Maria M. Ryan, and Alison E. Stanton. 2003. Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands. Available online at [www.caleppc.org](http://www.caleppc.org) and [www.swvma.org](http://www.swvma.org). California Exotic Pest Plant Council and Southwest Vegetation Management Association. 24 pp.
- Williams, P. A., and M. Newfield. 2002. A weed risk assessment system for new conservation weeds in New Zealand. *Science for Conservation* 209. New Zealand Department of Conservation. 1-23 pp.