

INDIANA

NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE
Form version date: July 10, 2009

Plantsplants.dap

Scientific name: Ailanthus altissima (Miller) Swingle USDA Plants Code: AIAL
 Common names: Tree of heaven
 Native distribution: China
 Date assessed: July 15, 2012
 Assessors: Ellen Jacquart, Alison Clements
 Reviewers: David Gorden, Dave Stratman, Brenda Howard, Dong Lee at 8/9/2012 meeting
 Date Approved: September 27 Gomez-Aparicio, L. and C.D. Canham. 2008. Neighborhood models of the effects of invasive tree species on ecosystem processes. Ecological Monographs, Vol. 78, No. 1, pp. 69-86., 2012

Indiana Invasiveness Rank: High 70.00–80.00

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (<u>40</u>)	23
2	Biological characteristic and dispersal ability	25 (<u>25</u>)	22
3	Ecological amplitude and distribution	25 (<u>25</u>)	25
4	Difficulty of control	10 (<u>10</u>)	8
	Outcome score	100 (<u>100</u>) ^b	78 ^a
	Relative maximum score [†]		78.00
	Indiana Invasiveness Rank [§]	High 70.00–80.00	

* 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.”

[†]Calculated as 100(a/b) to two decimal places.

[§]Very High >80.00; High 70.00–80.00; Moderate 50.00–69.99; Low 40.00–49.99; Insignificant <40.00

Not Assessable: not persistent in IN, or not found outside of cultivation.

A. DISTRIBUTION (KNOWN/POTENTIAL):

A1.1. Has this species been documented to persist without cultivation in IN? (reliable source; voucher not required)

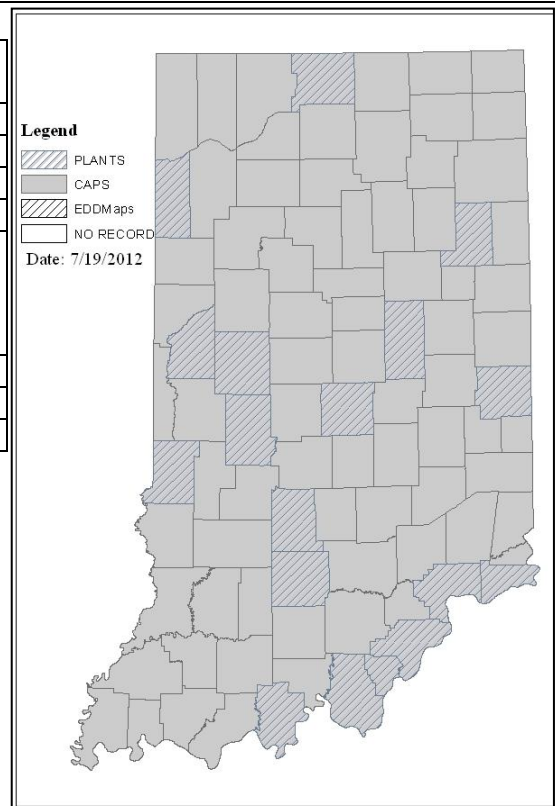
Yes – continue to A2.2

No – continue to A2.1

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)

Likely – continue to A2.2

Not likely



INDIANA
NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE
Form version date: July 10, 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.

Aquatic Habitats

Rivers/streams
Natural lakes and ponds
Reservoirs/impoundments*

Wetland Habitats

Marshes
Fens
Bog
Shrub swamps
Forested wetlands/riparian
Beaches/dunes
Ditches*

Upland Habitats

Forest
Savannas
Barrens
Prairies
Cultivated*
Old Fields*
Roadsides*

Other potential or known suitable habitats within Indiana:

Documentation:

Sources of information:
Jacquart personal observation

B. INVASIVENESS RANKING

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

10

Documentation:

Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)
"Our results showed that Norway maple and tree of heaven alter the functioning of temperate forest ecosystems even at relatively low densities by increasing cycling rates (i.e.,

INDIANA
NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE
 Form version date: July 10, 2009

net N mineralization, net nitrification, Ca mineralization) and nutrient availability (i.e., pH, Ca, Mg, K, N). At the neighborhood scale, the spatial extent of the impact of the two species varied strikingly among soil properties. Moreover, the neighborhood effects of the two invasive species were site dependent, with the magnitude of the impact increasing with soil fertility. At the community level, Norway maple and to a lesser extent tree of heaven had stronger effect on soils than any of the dominant native tree species considered. We conclude that the invasion of northeastern forests by Norway maple and tree of heaven is characterized by predictable, neighborhood-specific acceleration of nutrient cycling rates and localized increases in nutrient pools. These ecosystem alterations have enormous potential for the modification of competitive hierarchies in forest communities. In particular, Norway maple and tree of heaven may change relative abundances within the native community.”

Sources of information:

Gomez-Aparicio and C. Canham, 2008.

Commercially available since 1840s (Gilman and Watson 1993); >10 citations in this document and NatureServe's assessment.

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 7

Documentation:

Identify type of impact or alteration:

Occupies canopy layer, changing the density of the layer, creation of new layer in dunes and grasslands

Sources of information:

Burch, & Zedaker, 2003; Howard, 2004; Invasive Species Specialist Group 2005; Miller & Yawney, 1990; Shah, 1997; Swearingen & Pannill, 2006.

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 3

Documentation:

Identify type of impact or alteration:

Can predominate in the canopy layer at disturbed sites no doubt at the expense of some native species; unclear though that there are effects beyond this to other native species as the species so frequently grows in heavily disturbed areas where native species have already been compromised.

Sources of information:

Burch, & Zedaker, 2003; Howard, 2004; Invasive Species Specialist Group 2005; Miller & Yawney, 1990; Shah, 1997; Swearingen & Pannill, 2006.

1.4. Impact on other species or species groups (cumulative impact of this species on

INDIANA
NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE
Form version date: July 10, 2009

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 3

Documentation:

Identify type of impact or alteration:

Ailanthus produces compounds that are toxic to other plants and organisms. Need more data on impacts in natural systems.

Sources of information:

Burch, & Zedaker, 2003; Howard, 2004; Invasive Species Specialist Group 2005; Mergen, 1959; Miller & Yawney, 1990; Shah, 1997; Swearingen & Pannill, 2006.

Total Possible	40
Section One Total	23

2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

2.1. Mode and rate of reproduction

- | | | |
|----|---|---|
| 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 4

Documentation:

Describe key reproductive characteristics (including seeds per plant):

More than 300,000 seeds can be produced each year from a single tree.

Sources of information:

Burch, & Zedaker, 2003; Howard, 2004; Invasive Species Specialist Group 2005; Miller & Yawney, 1990; Shah, 1997; Swearingen & Pannill, 2006.

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 |

INDIANA
NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE
Form version date: July 10, 2009

- 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

Documentation:

Identify dispersal mechanisms:

Seeds wind dispersed long distances.

Sources of information:

Burch, & Zedaker, 2003; Howard, 2004; Invasive Species Specialist Group, 2005; Miller & Yawney, 1990; Shah, 1997; Swearingen & Pannill, 2006.

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
- 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:

Planted/cultivated, movement of seeds inadvertently by construction debris and mowing.

Sources of information:

Burch, & Zedaker, 2003; Howard, 2004; Invasive Species Specialist Group 2005; Miller & Yawney, 1990; Shah, 1997; Swearingen & Pannill, 2006.

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:

Can grow in extremely poor soil (out of the side of a building), perennial, allelopathy

Sources of information:

Jacquart observation

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
-

INDIANA
NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE
Form version date: July 10, 2009

Score

Documentation:

Describe growth form:

Forms thickets

Sources of information:

Jacquart, personal observation.

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

Documentation:

Describe germination requirements:

Seedlings found in mature forests, disturbed forests, dunes in existing vegetation.

Sources of information:

Jacquart, personal observation

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

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

Score

Documentation:

Species:

Brooklyn Botanic Garden, 2008; Weldy & Werier, 2005; U.S.D.A., 2008.

Total Possible

Section Two Total

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

Documentation:

Identify reason for selection, or evidence of weedy history:

Large stands in southeast and northwest Indiana; scattered populations elsewhere, for the

INDIANA
NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE
Form version date: July 10, 2009

most part.
Sources of information:
Jacquart, pers. observation.

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 habitat. 4
- 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

Documentation:
Identify type of habitats where it occurs and degree/type of impacts:
See A2.2
Sources of information:
Brooklyn Botanic Garden, 2008; New York Flora Association, 2008; United State Department of Agriculture Department, 2008; Swearingen & Pannill, 2008; Jacquart, pers. obs.

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

Documentation:
Identify type of disturbance:
Can establish in both natural and disturbed habitats.
Sources of information:
Burch, & Zedaker, 2003; Howard, 2004; Invasive Species Specialist Group, 2005; Miller & Yawney, 1990; Shah, 1997; Swearingen & Pannill, 2006.

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

Documentation:
Describe what part of the native range is similar in climate to Indiana:
Native to China.
Sources of information:
Burch, & Zedaker, 2003; Howard, 2004; Invasive Species Specialist Group 2005; Miller & Yawney, 1990; Shah, 1997; Swearingen & Pannill, 2006.

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

INDIANA
NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE
Form version date: July 10, 2009

- 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
- U. Unknown

Score

Documentation:

Identify states and provinces invaded:

CT, DC, DE, IA, IL, IN, KY, MA, MD, ME, MI, NJ, NY, OH, PA, RI, TN, VA, WI, WV;
BC, ON, QC.

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

U.S.D.A., 2008.

3.6. Current distribution of the species outside of cultivation in the eight Indiana State PRISMs (Partnerships for Regional Invasive Species Management)

- 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 A1.2

Sources of information:

Total Possible
Section Three Total

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:

Seeds remain viable for a year; no evidence for greater than 10 years.

INDIANA
NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE
Form version date: July 10, 2009

Sources of information:
Jacquart, personal observation.

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

Documentation:

Describe vegetative response:
Both stump and root produced sprouts.

Sources of information:
Burch, & Zedaker, 2003; Howard, 2004; Invasive Species Specialist Group 2005; Miller & Yawney, 1990; Shah, 1997; Swearingen & Pannill, 2006.

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 ft²). 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

Documentation:

Identify types of control methods and time-term required:
With deep root system and big trunk – it is very hard to eradicate completely. Need to use herbicide and come back multiple times.

Sources of information:
Burch, & Zedaker, 2003; Howard, 2004; Invasive Species Specialist Group, 2005; Miller & Yawney, 1990; Shah, 1997; Swearingen & Pannill, 2006.

Total Possible	10
Section Four Total	8

Total for 4 sections Possible	100
Total for 4 sections	78

References for species assessment:

Brooklyn Botanic Garden. 2008. AILANTHUS database. [Accessed March 1, 2008].

INDIANA
NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE

Form version date: July 10, 2009

Burch, P. L. and S. M. Zedaker. 2003. Removing the invasive tree *Ailanthus altissima* and restoring natural cover. *Journal of Arboriculture* 29(1): 18-24.

Gilman, E.F. and D.G. Watson. 1993. *Ailanthus altissima* Tree-of-Heaven. Fact Sheet ST-67, adapted from a series by the Environmental Horticulture Department, University of Florida for the United States Forest Service.

Gleason, H. A. and A. Cronquist. 1991. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*. 2nd ed. The New York Botanical Garden, Bronx. 993 pp.

Gomez-Aparicio, L. and C.D. Canham. 2008. Neighborhood models of the effects of invasive tree species on ecosystem processes. *Ecological Monographs*, Vol. 78, No. 1, pp. 69-86.

Howard, J. L. 2004. *Ailanthus altissima*. Fire Effects Information System. USDA Forest Service <<http://www.fs.fed.us/database/feis/plants/tree/ailalt/all.html>> (Accessed on 2 March 2008).

Invasive Species Specialist Group 2005. Global Invasive Species Database <<http://www.issg.org/database/species/ecology.asp?si=319&fr=1&sts=sss>>. [Accessed March 1, 2008].

Mergen, F. 1959. A toxic principle in the leaves of *Ailanthus*. *Botanical Gazette* 121: 32-36.

Miller, J. H. and H. W. Yawney (1965, revised December 1990). *Ailanthus altissima*. *Silvics of Forest Trees of the United States*, Volume 2. United States Department of Forestry <http://na.fs.fed.us/pubs/silvics_manual/volume_2/ailanthus/altissima.htm>. [Accessed March 2, 2008].

New York Flora Association. 2008. New York Flora Atlas. <<http://atlas.nyflora.org/>> [Accessed March 2, 2008].

Shah, B. 1997. The Checkered Career of *Ailanthus altissima*. *Arnoldia* 57 (3): 21-27.

Swearingen, J. M. and P. Pannill, 2006. Plant Conservation Alliance's Alien Plant Working Group - Least Want: Gout Weed, <<http://www.nps.gov/plants/alien/fact/aial1.htm>> [Accessed March 1, 2008].

United States Department of Agriculture, National Resources Conservation Service. 2008. The PLANTS Database. National Plant Data Center, Baton Rouge, Louisiana [Accessed March 1, 2008].

Weldy, T. and D. Werier. 2005. New York Flora Atlas. [S.M. Landry, K.N. Campbell, and L.D. Mabe (original application development), Florida Center for Community Design and Research. University of South Florida]. New York Flora Association, Albany, New York. [Accessed March 1, 2008].

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

INDIANA

NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE

Form version date: July 10, 2009

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.

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.

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 and 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.