INDIANA
NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE
Form originally created for use in New York
Indiana Form version date: November 1, 2010

Scientific name:	*Conium maculatum* USDA Plants Code: COMA2
Common names:	Poison Hemlock, Poison Parsley, Deadly Hemlock
Native distribution:	Europe, northern Africa, and western Asia
Date assessed:	June 7, 2013
Assessors:	James Lin, Zach Deitch, Ellen Jacquart
Reviewers:	Stuart Orr, Bill Johnson, Kevin Gibson, Crystal Rehder
Date Approved:	June 30, 2013

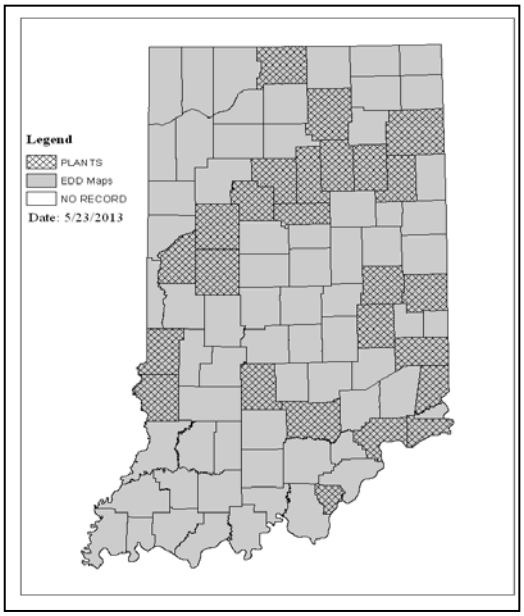
Indiana Invasiveness Rank: Very High (Relative Maximum Score >80.00)

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (40)	37
2	Biological characteristic and dispersal ability	25 (25)	22
3	Ecological amplitude and distribution	25 (25)	23
4	Difficulty of control	10 (10)	7
	Outcome score	100 (100)[b]	89 [a]
	Relative maximum score †		89
	Indiana Invasiveness Rank §	Very High	

* 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

A. DISTRIBUTION (KNOWN/POTENTIAL):

A1 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
A2What 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 A3
☐	Not likely – stop here. There is no need to assess the species



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Indiana CAPS database, http://extension.entm.purdue.edu/CAPS/index.html; Indiana IPSAWG reports (unpublished); and EDDMapS reports, http://eddmaps.org/

A3 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	Wetland Habitats	Upland Habitats
Rivers/streams	Marshes	Forest
Natural lakes and ponds	Fens	Savannas
Reservoirs/impoundments*	Bogs	Barrens
	Shrub swamps	Prairies
	Forested wetlands/riparian	Cultivated*
	Beaches/dunes	**Old Fields***
	Ditches*	**Roadsides***

Other potential or known suitable habitats within Indiana: Open flood plains of rivers and streams, field margins, low-lying waste areas.

Documentation: *Poison-hemlock inhabits uplands, wetlands, forests, fens, swamps, marshes, lakes, streams, waste ground, hedgerows, roadsides, field margins, ditchbanks, riparian woodlands, open floodplains of rivers and streams, banks of rivers and streams, pastures, meadows, damp ground, and wood lots. Conium maculatum is reported as a tenacious weed species particularly in moist habitat in North and South America, Europe, including the British Isles, temperate Asia and North Africa, Australia, and New Zealand. It is now widely naturalized in North America.*

Sources of information:
Wisconsin State Herbarium, 2007; Mitich, 1998. Vetter, 2004, Wisconsin Invasive Plant Assessment for *Conium maculatum*, http://dnr.wi.gov/topic/Invasives/documents/classification/LR_Conium_maculatum.pdf. Accessed: May 21, 2013. Jacquart, personal observation.

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	10

fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species)

U. Unknown

Score 10

Documentation:
Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)

Once established, hemlock can exclude most other native vegetation and forage crops. Fuel connectivity in solid hemlock patches is often insufficient to carry a fire.

Sources of information: Wisconsin Invasive Plant Assessment for *Conium maculatum.* *http://dnr.wi.gov/topic/Invasives/documents/classification/LR_Conium_maculatum.pdf*. Accessed: May 21, 2013.

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:
Plants establish readily on disturbed sites and may displace thin forage stands.

It may act as a pioneer species quickly colonizing disturbed sites.

Forms a solid canopy 5'-8' tall, shading out all plants below it (Jacquart, personal observation).
Sources of information:
Mitich, 1998. Vetter, 2004.

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 10

Documentation:
Identify type of impact or alteration:
The population of this weed is increasing along irrigation ditches and in alfalfa fields in Utah.
Once established, hemlock can exclude most other native vegetation and forage crops.
In Indiana, it invades floodplains and wet pastures to the exclusion of other species

(Jacquart, personal observation).

Sources of information:
Jeffrey, 1990. Parsons, W. T. 1973. Jacquart, personal observation

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 10

Documentation:
Identify type of impact or alteration:
All parts of the plant are poisonous and are toxic to all classes of livestock and human beings. Ingestion in sub-lethal quantities causes undesirable flavors in milk and milk products and reduces milk production. It also has teratogenic effects on calves and piglets whose mothers ingest plant parts during gestation.

Since poison-hemlock is also one of the few green plants in late winter pastures, hungry livestock may eat it. In addition to killing livestock, poison-hemlock consumption lowers meat and milk production, may cause abortions or de-formed offspring, and imparts a foul flavor to milk.
Sources of information:
Jeffrey, 1990. Mitich, 1998.

Total Possible 40
Section One Total 37

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):
A single plant may produce 38,000 seeds which usually fall near the parent plant but also can be spread by water, rodents, and birds.

In north-central Kentucky, United States (38"N, 80°30'W),where we have studied the species, growth of flowering shoots(bolting) begins in mid-April. The flowering season lasts from mid-May to mid to late June, with the peak occurring in lateMay. Seeds (mericarps) are ripe by mid to late July, but dispersal does not begin until mid-September. By mid-October about 50% of the seeds are dispersed, and by mid-December75-90% of them are shed.
Sources of information:
Mitich, 1998; Baskin, 1990.

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 4

Documentation:
Identify dispersal mechanisms:
Seeds may be found on tangled branches of fallen stems that are somewhat protected from the wind. Seeds adapted for wind and water dispersal.

Sources of information:
Baskin, 1990. Pitcher, D. 2004.

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 3

Documentation:
Identify dispersal mechanisms:
Intentional: Ornamental Forage/Erosion control Medicine/Food: Other: Brought to the United States as a garden plant (2).

Unintentional: Bird Animal Vehicles/Human
Wind Water Other: Seeds can adhere to farm machinery, vehicles, agricultural produce, mud and clothing (5).
Sources of information:
(2)
Pitcher, D. 2004.
(5)
Parsons, W. T. 1973.

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 6

Documentation:
Rate of Spread:
HIGH(1-3 yrs) Notes: Readily colonizes bare ground. Increases in density once the stand is established (2).

Evidence of competitive ability:
The long dispersal period of C. maculaturn seeds and the induction of many of the undispersed seeds into MPD in late autumn and winter have an effect on germination phenology and thus the population biology of this species. Based on the data obtained in the germination phenology study, if all seeds were dispersed in early to mid-September, most of them would germinate at this time. Thus, few newly germinated seedlings would appear at a population site the Following spring and autumn. On the other hand, seeds dispersed in October and November can give rise to a seedling cohort in autumn, late winter, and the following autumn, and those dispersed in late winter can result in a seedling cohort in spring and the following autumn. The longer dispersal is delayed, the higher the germination percentage of the seeds the following autumn.

Shade enhances seedling survival.
Sources of information:
Mitich, 1998. Baskin, 1990.

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 2

Documentation:
Describe growth form: Forms a dense layer above shorter vegetation (Jacquart, personal observation).

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 3

Documentation:
Describe germination requirements:
Seeds germinate in autumn and plants develop rapidly throughout the winter and spring. Hemlock is capable of rapid establishment after autumn rains, particularly on disturbed sites or where little vegetation exists at the start of the autumn growing season. Once it is firmly established under such conditions, hemlock can preclude most other vegetation and established pastures.
Poison hemlock has a large range of conditions in which it can germinate. It can germinate at temperatures greater than 9.4 C and lower than 33.8 C. It can germinate in darkness as well as in light. About 85 percent of seed produced is able to germinate as soon as it leaves the parent plant. The remainder is dormant and requires certain environmental conditions (thought to be summer drying) in order to germinate (Baskin and Baskin 1990).

Sources of information:
Pitcher, D. 2004. Baskin and Baskin 1990.

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

A. No 0
B. Yes 3
U. Unknown

Score 0

Documentation:
No other species in the genus invasive in Indiana.
Species:

Total Possible 25
Section Two Total 22

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 4

Documentation:
Identify reason for selection, or evidence of weedy history:
This species is forming dense stands throughout Indiana, particularly along roads and in old fields (Jacquart, personal observation).

Sources of information:
Jacquart, personal 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 6

Documentation:
Identify type of habitats where it occurs and degree/type of impacts:
Eleven habitats identified in A3.

Sources of information:
See A3.

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:
Can propagate on disturbed sites as a pioneer species.

Hemlock is capable of rapid establishment after autumn rains, particularly on disturbed sites or where little vegetation exists at the start of the autumn growing season. Once it is firmly established under such conditions, hemlock can preclude most other vegetation and established pastures.

Sources of information:
Mitich, 1998. Pitcher, D. 2004.

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:
Invasive throughout much of the globe.

Sources of information:
Pitcher, D. 2004. USDA, NRCS. 2007.

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
U. Unknown

Score 4

Documentation:
Identify states and provinces invaded:
It occurs in nearly every state of the contiguous United States and in Southern Canada.

Sources of information:
Jeffery, 1990.

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 4

Documentation:
Describe distribution:
Documented in all 92 counties of Indiana.
Sources of information:
See A1

Total Possible 25
Section Three Total 23

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 2

Documentation:
Seed can remain viable in the soil for up to three years
Sources of information:
Baskin and Baskin 1990.

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 1

Documentation:
Describe vegetative response:
Mowing or slashing of the plants just before flowering is often effective, but sometimes new growth which requires re-treatment is produced from the base

Sources of information:
Pitcher, D. 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^2). 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

Documentation:
Identify types of control methods and time-term required:
The biological control of the plant is a theoretical possibility only. The hemlock is infected often by one or more virus strains such as ringspot virus, carrot thin leaf virus (CTLV), alfalfa mosaic virus (AMV) or celery mosaic virus (CeMV). The methods of using viral infection or phytophagous insects to control and remove the plant need more research.

Hand pulling works easiest with wet soils and with small infestations. When grubbing, it is not necessary to remove the entire root system since the plant is not perennial. It is best to pull or grub out the plant prior to flowering. Multiple mowings close to the ground may eventually kill Conium maculatum. If extensive areas are covered with Conium maculatum, chemical controls are simpler and less labor intensive.

Control of poison hemlock with herbicide is most effective when applied to plants in the first year of growth or prior to bolting and flowering in the second year. The closer to reproductive stages, the less effective the herbicide.

Easy to control, but takes several years to eradicate. Eradication may be difficult, but worth it. Control may require the use of herbicides and additives.

The most effective control may be mowing to prevent seed production, followed with herbicide applications to rosettes and resprouts.

Sources of information:
Pitcher, D. 2004. Vetter, 2004. Lopez, 1999. Legleiter & Johnson, 2012. Wisconsin Invasive Plant Assessment for *Conium maculatum.* *http://dnr.wi.gov/topic/Invasives/documents/classification/LR_Conium_maculatum.pdf*. Accessed: May 21, 2013. Eubank and Rathfon, 2012.

Total Possible	10
Section Four Total	7
Total for 4 sections Possible	100
Total for 4 sections	89

References for species assessment:

Baskin, JM and C.C. Baskin. (1990). "Seed-germination ecology of poison hemlock, *Conium maculatum*". *Canadian Journal of Botany (0008-4026)*, 68 (9), p. 2018

Eubank, E. and R. Rathfon. (2012). Southern Indiana Cooperative Weed Management Area Invasive Plant Series Fact Sheets – Poison Hemlock. Purdue Extension, FNR – 437 – W.

Jeffrey, LS (1990). "Poison-hemlock (*Conium maculatum*) control in alfalfa (*Medicago sativa*)". *Weed Technology (0890-037X)*, 4 (3), p. 585.

Legleiter, T. Johnson, B (2012). "Poison Hemlock (*Conium maculatum*)- A Mini Review". *Purdue Weed Science.*

López, T.A (1999). "Biochemistry of hemlock (*Conium maculatum* L.) alkaloids and their acute and chronic toxicity in livestock. A review". Toxicon (Oxford) (0041-0101), 37 (6), p. 841.

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Parsons, W. T. 1973. Noxious weeds of Victoria. Inkata Press, Ltd., Melbourne, Australia. 300 pp.

Pitcher, D. 2004. Element Stewardship Abstract for *Conium maculatum* L. The Nature Conservancy. Arlington, VA.

USDA, NRCS. 2007. The PLANTS Database (http://plants.usda.gov, 16 March 2007). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Vetter, J. (2004). "Poison hemlock (*Conium maculatum* L.)". Food and chemical toxicology (0278-6915), 42 (9), p. 1373.

Wisconsin State Herbarium. 2007. WISFLORA: Wisconsin Vascular Plant Species (http://www.botany.wisc.edu/wisflora/). Dept. Botany, Univ. Wisconsin, Madison, WI 53706-1381 USA.

Citation: This IN ranking form may be cited as: Jacquart, E.M. 2011. 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 ranking form is an adaptation for Indiana use of the form created for New York by Jordan et al. (2009), cited below. Documentation for species assessed for New York are used for Indiana where they are applicable. 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.

References for the Indiana ranking form:

Jordan, M.J., G. Moore, and T.W. Weldy. 2009. Invasiveness ranking system for non-native plants of New York. Unpublished. The Nature Conservancy, Cold Spring Harbor, NY; Brooklyn Botanic Garden, Brooklyn, NY; The Nature Conservancy, Albany, NY.

References for the New York 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.