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:	Heracleum mantegazzianum	USDA Plants Code: HEMA17
Common names:	Giant Hogweed	
Native distribution:	Central Asia	
Date assessed:	July 16, 2012	
Assessors:	Pia Marie Paulone and Ellen Jacquart	
Reviewers:	Larry Bledsoe	
Date Approved:	September 21, 2012	

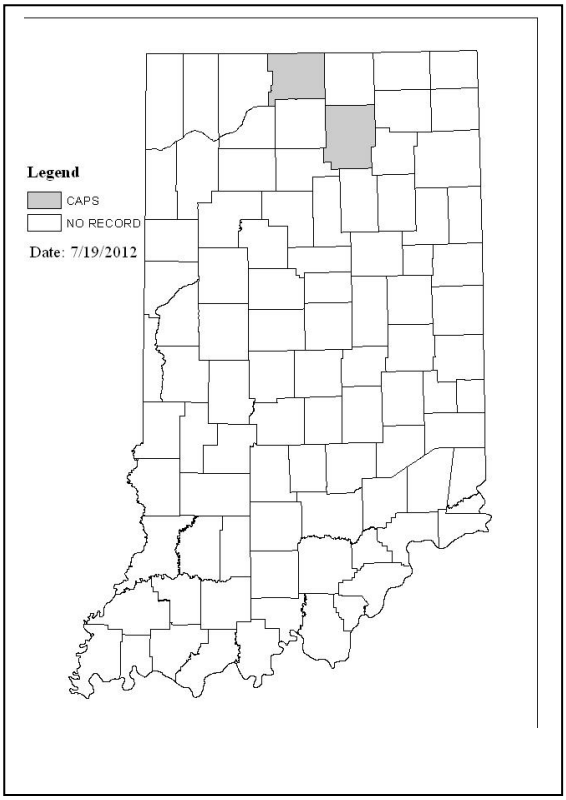
Indiana Invasiveness Rank: Moderate (Relative Maximum Score 50.00-69.99)

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (40)	24
2	Biological characteristic and dispersal ability	25 (25)	21
3	Ecological amplitude and distribution	25 (25)	16
4	Difficulty of control	10 (10)	6
	Outcome score	100 (100)[b]	67[a]
	Relative maximum score †		67.00
	Indiana Invasiveness Rank §	Moderate	

* 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)	
x	Yes – continue to A2.2
☐	No – continue to A2.1
A2. 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)	
x	Likely – continue to A3
☐	Not likely



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Indiana CAPS database, http://extension.entm.purdue.edu/CAPS/index.html; Indiana IPSAWG reports (unpublished); and EDDMapS reports, http://eddmaps.org/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:
Railways and waste ground. Sites often characterized by high productivity in productivity in combination with lack of land use and recent or historic disturbances of habitat changes.

Documentation:
Sources of information:
Shishkin, 1951; Tiley et al. 1996; Page, N. A. et al. 2006; Thiele & Otte. 2006.

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 7

Documentation:
Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)
Can increase stream bank erosion during the winter months when senescent. One study (Vanderhoeven et al 2005) found increased concentrations of exchangeable essential nutrients under the canopy, most strikingly so for K and Mn. Dense stands decrease light levels below (SRC).

Sources of information:
Vanderhoeven, 2005; Page et al. 2006

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:
Large colonies containing 2000 plants have been recorded; sometimes forming dense monospecific stands, especially in open situations. One study in Europe found densities ranging from 4-5 plants per square meter to 11 plants per square meter. Hogweed is a very large plant with large leaves. At such densities hogweed would likely create a new layer and eliminate most or all layers below. "Attains a maximum height of 4 to 5 m which is taller than our native herbaceous vegetation (Case and Beaman 1992), thus creating a new layer."
Sources of information:
Case and Beaman, 1992; Tiley, 1996; CAPS Survey, 2003; Page et al. 2006; Pergl et al., 2006; Huels, et al. 2007.

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 7

Documentation:
Identify type of impact or alteration:
Tomaino: "It forms a dense canopy and once established, crowds out native plant species (WA State 2003). Forms extensive populations whose large rosettes crowd out native species and reduce species richness (Weber 2003)."
Sources of information:
Toamino, 2004; WA State, 2003; Weber, 2003.

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 3

Documentation:
Identify type of impact or alteration:
Can increase stream bank erosion during the winter months when senescent thus causing possible degradation to fish spawning beds. Sap in contact with moist human skin causes a severe phytophotodermatitis. Effect on wildlife unknown.
Sources of information:
Camm, 1976; Page et al. 2006.

Total Possible 40
Section One Total 24

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):
Each plant has potential to produce up to 100,000 seeds.
Sources of information:
Tiley et al. 1996.

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:
By water (hydrochory), animals (epizoochory) and possibly by wind (anemochory). Fruit from native range reported with remote marginal spines; however fruit studied from the UK

was found to usually be glabrous or only villous.
Sources of information:
Shishkin, 1951; Tiley et al., 1996.

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 2

Documentation:
Identify dispersal mechanisms:
Widely cultivated ornamental; seed heads used for flower arrangements. Seeds used in Middle Eastern cooking and imported in luggage of foreign travelers to US.
Sources of information:
Shishkin, 1951; Tiley et al., 1996.

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:
Evidence of competitive ability:
Tolerates shade; once established, the large taproot also provides some resistance to drought. Some evidence for allelopathy. Flowers self-compatible. Perennial but monocarpic (after seed set, the whole plant dies). Population reproductive output maintained over time by a stable proportion of flowering plants. High phenotypic plasticity in the timing of flowering- plants ranging in age from 3-10 years.
Sources of information:
Shishkin, 1951; Tiley et al., 1996; Page et al., 2006; Pergl et al., 2006.

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:
Although it usually occurs in small groups of plants (<50), larger colonies containing 2000

plants have been recorded; sometimes forms dense monospecific stands, especially in open situations. On study in Europe found densities ranging from 4-5 plants per square meter to 11 plants per square meter.
Sources of information:
Tiley et al., 1996; Pergl et al., 2006; Huels et al., 2007; Page et al., 2006.

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 readily (one European study found a mean germination rate of 91%), especially with adequate light and moisture, but may require cold winters for breaking dormancy.
Sources of information:
Pysek et al., 1998; Willis & Hulme, 2002; Krinke, 2005; Moravcova, 2005, 2006; Page et al., 2006;

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

A.	No	0
B.	Yes	3
U.	Unknown	

Score 0

Documentation:
Species:
Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008

Total Possible 25
Section Two Total 21

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 2

Documentation:

Identify reason for selection, or evidence of weedy history:
Tomaino (2004): "As of August 2003, it has been found in 16 towns and 6 counties in Connecticut (CIPWG 2003). It is unknown when these sites originated but it is apparently expanding. The species forms extensive populations whose large rosettes crowd out native species (Weber 2003). "
Sources of information:
Weber, 2003; Tomaino, 2004.

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 4

Documentation:
Identify type of habitats where it occurs and degree/type of impacts:
See A2.2.
Sources of information:
Cavers et al., 1979; Byers & Quinn, 1987; Nuzzo, 1992a, 1993a; Brooklyn Botanic Garden, 2008; CAPS, 2007.

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:
This species able to enter a diversity of habitats various degress of recent disturbance; however, disturbance does appear to often facilitate establishment. Not known to require human disturbance to establish.
Sources of information:
Tiley et al., 1996; Pysek, 1998.

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:
Central Asia, Caucuses Mountains- continental climate with hot summers and cold winters.

Sources of information:
Shishkin, 1951; Tiley et al. 1996.

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:
CT, IL, IN, ME, MI, NY, PA.
CANADA: New Brunswick, Ontario, Quebec.
Sources of information:
See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.
Page et al. 2006; U.S.D.A., 2008.

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 1

Documentation:
Describe distribution:
See A1.1.
Sources of information:

Total Possible	25
Section Three Total	16

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:
Identify longevity of seed bank:
Length of viability somewhat unclear; some studies state in situ viability up to 15 years, while other studies suggest that most seeds not viable after three years.
Sources of information:
Tiley et al., 1996; Krinke et al., 2005; Moravcova et al., 2006; Page et al., 2006.

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 2

Documentation:
Describe vegetative response:
Tomaino (2004): "It also has a persistent root stalk and reproduces vegetatively from perennating buds (WA State 2003). If the plant is cut, it can regrow quickly from the auxilliary buds (Caffrey 1994 in Mayer 1999).
Sources of information:
Shishkin ed. 1951; Tiley et al., 1996; Tomaino, 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 2

Documentation:
Identify types of control methods and time-term required:
Chemical- most commercial herbicides effective, one study achieved almost complete eradication after four years; mechanical, and livestock grazing have proven effective, but no cost or time requirements provided. Bio-control efficacy still in trials. The species is easily detectable on aerial photographs taken at flowering and early fruiting times.
Sources of information:
Tiley et al., 1996; Mullerova et al., 2005; Page et al., 2006

Total Possible 10
Section Four Total 6

Total for 4 sections Possible	100
Total for 4 sections	67

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Krinke, L. et al. 2005. Seed bank of an invasive alien, Heracleum mantegazzianum, and its seasonal dynamics. Seed Sci. Res. 15: 239-248.

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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 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.

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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.

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