

INDIANA

NON-NATIVE PLANT INVASIVENESS RANKING FORM

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

Scientific name: Cirsium arvense (L.) Scop. (C. setosum, C. incanum, Carduus arvensis, Serratula arvensis & all varieties of C. arvense) USDA Plants Code: CIAR4

Common names: Creeping thistle, Californian thistle, Canada thistle, field thistle

Native distribution: Eurasia

Date assessed: July 15, 2012

Assessors: Ellen Jacquart, Alison Clements

Reviewers: Ken Collins, Larry Bledsoe

Date Approved: September 21, 2012

Indiana Invasiveness Rank: High (Relative Maximum Score 70.00-80.00)

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (40)	20
2	Biological characteristic and dispersal ability	25 (25)	21
3	Ecological amplitude and distribution	25 (25)	21
4	Difficulty of control	10 (10)	9
	Outcome score	100 (100) ^b	71 ^a
	Relative maximum score [†]		71.00
	Indiana Invasiveness Rank [§]	High (Relative Maximum Score 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

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="text-align: center;"> </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>	

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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; Indiana IPSAWG reports (unpublished); and EDDMapS reports, 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
Bogs
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:
Wastelands, unmanaged urban landscapes.

Documentation:

Sources of information:
Jacquart and Bledsoe, 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 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

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absence of impact information)

Despite the high number of studies performed on this species, no targeted studies on the impact on natural ecosystem processes or system-wide parameters located. Nonetheless, the species can grow in dense stands much taller than the rest of the herb layer and significantly limit light availability to the lower herb layer. Allelopathy has also been suggested (Nuzzo, 1997; Thunhorst and Swearingen, 2001) and a study from Tasmania showed that extracts from the plant inhibited germination and growth of its own as well as other plant species (Bend All, 2006). No evidence of irreversible impacts to ecosystem processes.

Sources of information:

Nuzzo, 1997; Fellows, 2004; Thunhorst & Swearingen, 2001; Jacquart personal observations.

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 3

Documentation:

Identify type of impact or alteration:

Increases the density, and oftentimes the height, of the herb layer. No evidence of significant or major alteration of structure.

Sources of information:

Fellows, 2004; Jacquart personal observations.

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:

Species can grow in dense stands, significantly altering the community composition. No evidence of major alteration of structure.

Sources of information:

Thunhorst and Swearingen, 2001; Fellows, 2004.

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 |
|----|-----------------------------|---|

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- 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:

Species known to hybridize with *C. hookerianum* in the West. Not known to hybridize with any native *Cirsium* species in the Northeast. Species is exceptionally prickly. Other studies on other species or species groups are not known. Soil microflora could be impacted by compounds produced by the plant, especially those involved with allelopathy.

Sources of information:

Fellows, 2004.

Total Possible

40

Section One Total

20

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

4

Documentation:

Describe key reproductive characteristics (including seeds per plant):

One individual plant can produce over 5200 seeds; also abundant asexual spread. Species is dioecious, and seed set in some populations can be quite low when the colony is comprised of only one sex.

Sources of information:

Hay, 1937.

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

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Documentation:

Identify dispersal mechanisms:

Seeds are readily dispersed long distances by wind and water.

Sources of information:

Thunhorst & Swearingen, 2001; Beck, 2004; Fellows, 2004; author's pers. obs.

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:

Seeds readily attach to and are spread by humans and farm and mowing equipment.

Sources of information:

Thunhorst & Swearingen, 2001; Beck, 2004; Fellows, 2004; Jacquart 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 infertile soils, allelopathic.

Sources of information:

Thunhorst & Swearingen, 2001; Beck, 2004; Fellows, 2004; Bend All, 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

Documentation:

Describe growth form:

Can form a dense layer above shorter vegetation.

Sources of information:

Jacquart pers. obs.

2.6. Germination/Regeneration

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- 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

2

Documentation:
 Describe germination requirements:
 Seedlings have trouble establishing in existing vegetation with mature individuals of C. arvensis due to allelopathy.
 Sources of information:
 Thunhorst & Swearingen, 2001; Beck, 2004; Fellows, 2004; Bend All, 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:
 Other non-native species but none listed as invasive.

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:
 Large stands known, but in disturbed areas with other invasives present.
 Sources of information:
 Fellows, 2004; author's pers. obs.

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

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- 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, 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

Documentation:

Identify type of disturbance:

Readily establishes in disturbed areas; not known to require anthropogenic disturbance or occur in undisturbed areas.

Sources of information:

Thunhorst & Swearingen, 2001; Fellows, 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

Documentation:

Describe what part of the native range is similar in climate to Indiana:

Europe, temperate Asia.

Sources of information:

Fellows, 2004; Brooklyn Botanic Garden, 2009.

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

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Documentation:

Identify states and provinces invaded:

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.

U.S.D.A., 2009.

3.6. Current distribution of the species outside of cultivation 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:

Total Possible	<input style="width: 50px;" type="text" value="25"/>
Section Three Total	<input style="width: 50px;" type="text" value="21"/>

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 can remain viable for up to at least 20 years.

Sources of information:

Thunhorst and Swearingen 2001; Beck 2004; Fellows, 2004.

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:

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Describe vegetative response:
Regrowth from extensive underground root system.
Sources of information:
Thunhorst and Swearingen 2001; Beck 2004; Fellows, 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

4

Documentation:
Identify types of control methods and time-term required:
Potential occurrence in wetlands, prickly leaves and stem, long-lived seed bank, extensive dense stands pose major control problems.
Sources of information:
Fellows, 2004.

Total Possible	10
Section Four Total	9

Total for 4 sections Possible	100
Total for 4 sections	70

References for species assessment:

Alley, H. P., and N. E. Humburg. 1979. Perennial weed control. Wyoming Agricultural Experiment Station, Research Journal 137: 2-12.

Amor, R. L., and R. V. Harris. 1974. Distribution and seed production of *Cirsium arvense* (L.) Scop. in Vitoria, Australia. Weed Res. 14: 317-323.

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- Detmers, F. 1927. Canada thistle (*Cirsium arvense* Tourn), field thistle, creeping thistle. *Ohio Experiment Station Bulletin* 414: 1-45.
- Donald, W. W. 1984. Chlorsulfuron effects on shoot growth and root buds of Canada thistle (*Cirsium arvense*). *Weed Science* 32: 42-50.
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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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