

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:	<u>Pastinaca sativa</u>	USDA Plants Code: PASA2
Common names:	<u>Wild Parsnip</u>	
Native distribution:	<u>Europe & Asia</u>	
Date assessed:	<u>7-23-2013</u>	
Assessors:	<u>Zach Deitch, Ellen Jacquart</u>	
Reviewers:	<u>Ted Anchor</u>	
Date Approved:	<u>8-15-2013</u>	
Reassessed by:	<u>Will Drews</u>	
Reassessment Reviewer:	<u>Ellen Jacquart</u>	<u>Date: 10/28/19</u>

Indiana Invasiveness Rank: High

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (<u>40</u>)	20
2	Biological characteristic and dispersal ability	25 (<u>25</u>)	22
3	Ecological amplitude and distribution	25 (<u>25</u>)	23
4	Difficulty of control	10 (<u>10</u>)	6
	Outcome score	100 (<u>100</u>) ^b	71 ^a
	Relative maximum score [†]		71
	Indiana Invasiveness Rank [§]	High	

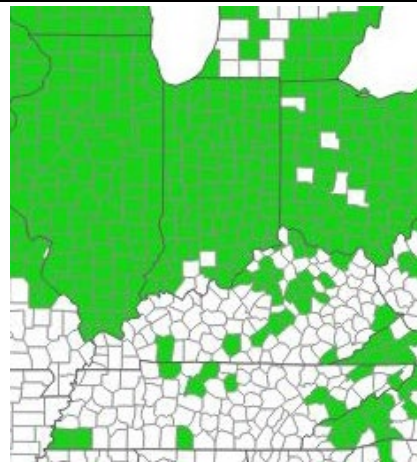
* For questions answered "unknown" do not include point value in "Total Answered Points Possible." If "Total Answered Points Possible" is less than 70.00 points, then the overall invasive rank should be listed as "Unknown."

[†] 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)	
<input checked="" type="checkbox"/>	Yes – continue to A2.2
<input type="checkbox"/>	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)	
<input checked="" type="checkbox"/>	Likely – continue to A3
<input type="checkbox"/>	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; Indiana IPSAWG reports (unpublished); and EDDMapS reports, 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/>

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

Other potential or known suitable habitats within Indiana: Prairie edges, disturbed patches within high-quality natural areas, railroad rights-of-ways, CRP grasslands, forest edges, oak openings.

Documentation: *Found in open places along roadsides, pasture lands, disturbed sites, and in waste places throughout the United States and Canada, from British Columbia to California and Vermont south to Florida. Also, can be found in prairies and savannas especially after a disturbance.*

It is widespread in temperate regions of Europe, extending through eastern Europe into western Central Asia, through Turkey into Iran and the Caucasus, and southeastward from the Pamirs to the western Himalayan region; and, is also present in Africa, South America, New Zealand, and Australia.

Sources of information:

- Wisconsin Invasive Plant Assessment for *Conium maculatum*, 2012.
- Invasive Plants Association of Wisconsin. 2013.
- EDDMapS accessed 10/24/19
- Cain *et al.* 2010.
- Hilty 2019

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 3

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Documentation:

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

Well-established prairies are not likely to be invaded by parsnip, but it can become quite abundant on prairie edges and in disturbed patches within otherwise high-quality prairies. Once established at the edges, parsnip can spread into adjacent high-quality areas.

Fuel connectivity in solid thistle patches is often insufficient to carry a fire

Sources of information:

Kennay & Fell, 1992.

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

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:

Once established at the edges, parsnip can spread into adjacent high-quality areas. Wild parsnip out-competes other lower-growing herbaceous vegetation by its luxuriant growth and may displace species that are important nectar sources.

Mature parsnip plants are taller than the dry prairie species they replace.

Sources of information:

Kennay & Fell, 1992.

Cain *et al.* 2010.

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

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

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Documentation:

Identify type of impact or alteration:

In high-quality prairies, aggressive growth by other species sometimes can outcompete and eventually displace the parsnip.

Decreases species richness and diversity.

Sources of information:

Kennay & Fell, 1992.

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

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 7

Documentation:

Identify type of impact or alteration:

Some people are sensitive to the touch of the leaves and soon develop a rash if their skin contacts the leaves or plant sap in the presence of sunlight. A very painful rash can develop that in some people leaves scars that can persist for several months or longer. Wild parsnip is most irritating at the time of flowering.

Topical contact or ingestion of some furanocoumarins, followed by subsequent exposure to UV radiation causes lesions and cell damage in humans and livestock (including birds) as well as various invertebrates, microorganisms, and plants.

*The furanocoumarins in parsnip are known to be toxic to most insects, besides its specialist (*Depressaria pastinacella*). The concentrations of these compounds have been shown to increase with increased UV-B radiation, which is one of the consequences of climate change.*

*After accidental introduction of native predator (*Depressaria pastinacella*), wild parsnip has increased its toxic compound in its evolutionary arms race. This allows it to be even less palatable to other species and increase its allelopathic characteristics, which could expand its range.*

Sources of information:

Kennay & Fell, 1992.

Cain *et al.* 2010.

Bassman 2004

Zangerl & Berenbaum 2005

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Total Possible	40
Section One Total	20

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):

2000 fruits per plant. One or both of the two mericarps in each fruit may contain a seed, although mature fruits lacking seeds are also common.

Wild parsnip is a perennial that exists as a basal rosette for at least one year and then flowers and dies. Wild parsnip often flowers and sets seed during its second year, although it may not flower until subsequent years.

In the growing season, seeds dispersed in late summer and autumn of the previous year are the first to germinate. Plants emerging from spring-germinating seeds are better able to survive extended periods of low precipitation during the summer, and low temperatures during the winter.

The size of a rosette in a given year determines its fate in the following year, and a critical minimum size prior to vernalization (cold period) is required to initiate flowering. If rosettes do not reach the critical minimum biomass flowering may be delayed for one or more years until sufficient reserves have accumulated to support the reproductive growth phase.

Sources of information:

Baskin & Baskin, 1979.

Cain *et al*, 2010.

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

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Score

4

Documentation:

Identify dispersal mechanisms:

Deer may feed on the plant as well as birds and small mammals may consume the seeds and disperse them.

Sources of information:

Invasive Plants Association of Wisconsin, 2013.

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: *The seeds are dispersed when the shoots are cut by mowing. Food/Medicine.*

Unintentional: *Bird Animal Vehicles/Human Wind Water Other*

Sources of information:

Cain *et al.*, 2010.

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

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.) Note: Invades slowly until a threshold population density is reached, then spreads rapidly.

Wild parsnip poses a severe threat to native plants and humans. This plant readily moves into disturbed habitats and along road edges. Once populations build, they can spread rapidly and quickly displace native vegetation. From roadsides its can spread into woodland openings, prairies, and drainages. The ability for this plant to encroach on a wide range of habitats can have profound impacts on sensitive areas.

It endures a wide range of edaphic conditions, usually dry to mesic soils, but occasionally will be found in wet meadows. Plant grows best on calcareous, alkaline soils and do not

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tolerate shade well.

Wild parsnip can be a problem weed in mesic prairie communities

Sources of information:

Cain *et al.* 2010.

Invasive Plants Association of Wisconsin, 2013.

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

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: 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

Documentation:

Describe germination requirements:

A range of soil conditions are suitable for wild parsnip, including dry to mesic soils, as well as in wet meadows and ditches. Grows best on calcareous, alkaline soils.

Well-established prairies are not likely to be invaded by parsnip, but it can become quite abundant on prairie edges and in disturbed patches within otherwise high quality prairies. It is also highly persistent on sites that remain disturbed or bare such as rocky areas, paths, or roadsides.

Sources of information:

Eckardt, 1987.

Invasive Plants Association of Wisconsin, 2013.

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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 2

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

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Documentation:

Identify type of habitats where it occurs and degree/type of impacts:
Ten habitats, five of them natural, 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

Documentation:

Identify type of disturbance:
Pastinaca sativa invades disturbed bare areas. Well-established prairies are not likely to be invaded by parsnip, but it can become quite abundant on prairie edges and in disturbed patches within otherwise high quality prairies. It is also highly persistent on sites that remain disturbed or bare such as rocky areas, paths, or roadsides.

Can invade natural areas with fertile soil, especially prairies and savannas. One of the priority species controlled at the Midewin National Tallgrass Prairie.

Sources of information:
Eckardt, 1987.
Hilty 2019
USDA USFS 2015

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:
*Primarily a plant of temperate regions.
Invasive throughout much of the globe.*

Sources of information:
Cain *et al*, 2010.

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

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- 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:

In Canada, wild parsnip occurs in all provinces and territories except Nunavut. It is present in all American states except Hawaii, Mississippi, Alabama, Georgia, and Florida.

Sources of information:

Cain *et al*, 2010.

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

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

Score

Documentation:

Describe distribution:

Documented in 87 counties of Indiana.

Sources of information:

See A1

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:

Seed can remain viable in the soil for up to four years

Sources of information:

Kennay & Fell, 1992.

Invasive Plants Association of Wisconsin, 2013.

4.2. Vegetative regeneration

- A. No regrowth following removal of aboveground growth 0

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- 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 when the primary umbel begins flowering (May to June) may be most effective at reducing fruit production because the considerable biomass allocation to stem production reduces reserves available for flower and seed production.

Sources of information:

Cain *et al.*, 2010.

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

3

Documentation:

Identify types of control methods and time-term required:

Although eradication of this exotic is desirable from a human safety as well as ecological standpoint, in some situations the best control measure is to do nothing. In high-quality prairies, aggressive growth by other species sometimes can outcompete and eventually displace the parsnip.

Mechanical Control: The best control is achieved mainly through hand-pulling. Plants should be pulled and removed so that seeds do not develop, and plants do not resprout. Another effective practice involves cutting the plant below the root crown before seed set during spring of the second year. Mowing probably favors parsnip maturation by allowing more sunlight to reach immature parsnip plants, which are too low to be damaged by the mower. Mowing also reduces the density, height, and flowering of other species that are potentially good competitors against parsnip, such as common goldenrod.

Prescribed Fire: Burning does not successfully control parsnip because it removes litter and taller plants, providing favor-able conditions for parsnip rosettes to develop. However, periodic burning maintains the vigor of native plants, allowing them to compete with parsnip.

Biocontrol: The parsnip webworm damages some individual plants severely but is not known to eradicate whole patches and is not likely to be useful as a biocontrol agent.

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Chemical Control: If mechanical methods have failed to control wild parsnip or are not feasible, a 2% spot application of the herbicide Roundup (glyphosate) to basal rosettes is a recommended treatment. Roundup should be applied to individual plants with a hand sprayer in late fall after most native vegetation is dormant. Late fall application minimizes the potential harm to nontarget species. It may be necessary to treat the same area again annually until missed plants and plants originating from the seed bank are eliminated. Chemical controls are effective but should be used sparingly on quality natural areas. The best method is to burn the site, then follow with spot application of 1-3% active ingredient glyphosate. Immediately after a burn, wild parsnip is one of the first plants to green. Glyphosate can be spot applied to the basal rosette of the parsnip with little effect on dormant species.

Management can be difficult and does require follow up treatment in edge habitats and conservation plantings. One patch in Knox County did require over 2 years of control with more than 10-man hours to suppress population

Sources of information:
 Cain *et al*, 2010.
 Kennay & Fell, 1992.
 Invasive Plants Association of Wisconsin., 2013
 Drews, personal observation

Total Possible	10
Section Four Total	6

Total for 4 sections Possible	100
Total for 4 sections	71

References for species assessment:

Baskin, J. M. Baskin C. C. 1979. "Studies on the Autecology and Population Biology of the Weedy Monocarpic Perennial, *Pastinaca sativa*" *Journal of Ecology* 67(2). p. 601-610.

Bassman, J.H. 2004. "Ecosystem Consequences of Enhanced Solar Ultraviolet Radiation: Secondary Plant Metabolites as Mediators of Multiple Trophic Interactions in Terrestrial Plant Communities." *Photochemistry and Photobiology*; Lawrence Vol. 79, Iss. 5, (May 2004): 382-98.

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