Part IV. Plant Assessment Form

For use with "Criteria for Categorizing Invasive Non-Native Plants that Threaten Colorado's Wildlands and Agriculture"

By the Colorado Noxious Weed Advisory Committee

Electronic version: December 4, 2008

Table 1. Species and Evaluator Information

Species name (Latin binomial)**:**	Pastinaca sativa L.
Synonyms:	P. sativa L. var. pratensis Pers, P. sylvestris L., P. sativum (L.) Bentham ex Hooker fil., Peucedanum sativum S. Wats.
Common names:	Wild parsnip, parsnip, bird's nest, hart's-eye, heeltrot, hockweed, madnip
Evaluation date (mm/dd/yy)**:**	04/27/2010
Evaluator #1 Name/Title:	Cameron Douglass, PhD Candidate
Affiliation:	Colorado State University
Phone numbers:	970-491-5426
Email address:	cameron.douglass@colostate.edu
Address:	114 Weed Research Lab, CSU, Ft. Collins, CO 80523
Evaluator #2 Name/Title:	Dr. Scott Nissen, Professor
Affiliation:	Colorado State University
Phone numbers:	970-491-3489
Email address:	scott.nissen@colostate.edu
Address:	115 Weed Research Lab, CSU, Ft. Collins, CO 80523

Section below for list committee use—please leave blank

List committee members:	enter text here
Committee review date:	enter text here
List date:	enter text here
Re-evaluation date(s):	enter text here

General comments on this assessment:

Listed as an 'invasive' or 'noxious' weed in the following states: Ohio, 'Prohibited noxious weed.'

Informally stated as being invasive in the following states: Michigan; Pennsylvania; Tennessee; Virginia; and, Wisconsin.

US Department of Agriculture, Forest Service (USFS), Forest Health Staff. 2006. Weed of the Week: Wild parsnip, Pastinaca sativa L. (Online). Last updated 28 August 2006. Newton Square, PA: USFS, Forest Health Staff. Available at: http://www.na.fs.fed.us/fhp/invasive_plants/weeds/wild-parsnip.pdf. Accessed 5:04 PM 27 April 2010.

US Department of Agriculture, Natural Resources Conservation Service (NRCS). 2010. The PLANTS Database (Online). Baton Rouge, LA: National Plant Data Center. Available at http://plants.usda.gov. Accessed 4:43 PM 27 April 2010.

Table 2. Criteria, Section, and Overall Scores

1.1	Impact on abiotic ecosystem processes	D	Other Pub. Mat'l	**Impact** *Enter four characters from Q1.1-1.4 below:* **DCDD** *Using matrix, determine score and enter below:* **C**		
1.2	Impact on plant community	C	Rev'd, Sci. Pub'n			
1.3	Impact on higher trophic levels	D	Rev'd, Sci. Pub'n			
1.4	Impact on genetic integrity	D	Rev'd, Sci. Pub'n			
2.1	Role of anthropogenic and natural disturbance	B (2 pts)	Rev'd, Sci. Pub'n	**Invasiveness** *Enter the sum total of all points for Q2.1-2.7 below:* **15** *Use matrix to determine score and enter below:* **B**		**Wildlands Plant Score** *Using matrix, determine Overall Score and Alert Status from the first, second, and third section scores and enter below:* **Limited** **No Alert**
2.2	Local rate of spread with no management	B (2 pts)	Rev'd, Sci. Pub'n			
2.3	Recent trend in total area infested within state	B (2 pts)	Rev'd, Sci. Pub'n			
2.4	Innate reproductive potential Wksht A	A (3 pts)	Rev'd, Sci. Pub'n			
2.5	Potential for human-caused dispersal	A (3 pts)	Rev'd, Sci. Pub'n			
2.6	Potential for natural long-distance dispersal	B (2 pts)	Rev'd, Sci. Pub'n			
2.7	Other regions invaded	C (1 pt)	Rev'd, Sci. Pub'n			
3.1	Ecological amplitude/Range	D	Rev'd, Sci. Pub'n	**Distribution** *Using matrix, determine score and enter below:* **B**		
3.2	Distribution/Peak frequency Wrksht B	A	Other Pub. Mat'l			

4.1	Poisonous to livestock	**B (2pts)**	**Rev'd, Sci. Pub'n**
4.2	Detrimental to economic crops	**C (1 pt)**	**Rev'd, Sci. Pub'n**
4.3	Detrimental to management of agricultural system, rangeland and pasture	**C (1 pt)**	**Rev'd, Sci. Pub'n**
4.4	Human impacts Wrksht C	**C (1 pt)**	**Rev'd, Sci. Pub'n**

Ag/ Human Impacts
Total Points: 5
Score: B

Agriculture Plant Score
Overall Score: Moderate
Alert Status: No Alert

Table 3. Documentation

Question 1.1 Impact on abiotic ecosystem processes D Other Pub. Mat'l back
Identify ecosystem processes impacted: None reported in the literature.
Rationale:
Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287. Eckardt, N. 1987. Element Stewardship Abstract for Pastinaca sativa, Wild parsnip. Arlington, VA: The Nature Conservancy. Available at: http://www.imapinvasives.org/GIST/ESA/esapages/documnts/pastsat.pdf. Accessed 6:13 PM 27 April 2010.
Question 1.2 Impact on plant community composition, structure, and interactions C Rev'd, Sci. Pub'n back
Identify type of impact or alteration: Overall ecological impacts from wild parsnip invasions appear to be comparatively mild, as the species is not especially dominant, merely very competitive. Relatively stable, well-established grassland and prairies tend to be resistant to invasion by wild parsnip. Recruitment typically occurs first along the edges of ecologically-mature sites, or within localized, disturbed patches, from which the plant can spread into higher quality/value habitats over time.
Rationale: The natural history of wild parsnip - which are monocarpic perennials - allows the species to respond plastically to stem densities by shifting patterns of seedling emergence and/or maturation of rosettes into flowering stalks. Often, anthropogenic factors, such as the timing of mowing operations, do as much to suppress desireable resident vegetation and encourage the spread of wild parsnip as any inherent invasiveness in the exotic species.
Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287. Eckardt, N. 1987. Element Stewardship Abstract for Pastinaca sativa, Wild parsnip. Arlington, VA: The Nature Conservancy. Available at: http://www.imapinvasives.org/GIST/ESA/esapages/documnts/pastsat.pdf. Accessed 6:13 PM 27 April 2010. Pennsylvania Department of Conservation and Natural Resources (PDCNR). 1990. Fact Sheet - Wild parsnip, Pastinaca sativa L. (Online). Last updated February 1990. Available at: http://www.dcnr.state.pa.us/forestry/invasivetutorial/wild_parsnip.htm. Accessed 5:01 PM 27 April 2010. US Department of Agriculture, Forest Service (USFS), Forest Health Staff. 2006. Weed of the Week: Wild parsnip, Pastinaca sativa L. (Online). Last updated 28 August 2006. Newton Square, PA: USFS, Forest Health Staff. Available at: http://www.na.fs.fed.us/fhp/invasive_plants/weeds/wild-parsnip.pdf. Accessed 5:04 PM 27 April 2010. Wisconsin Department of Natural Resources (WDNR). 2008. Wild parsnip (Pastinaca sativa). Last updated 5 August 2008. Available at: http://dnr.wi.gov/invasives/fact/parsnip.htm. Accessed 5:30 PM 27 April 2010.
Question 1.3 Impact on higher trophic levels D Rev'd, Sci. Pub'n back
Identify type of impact or alteration: No major impacts are reported in the literature. Pastinaca species (as well as those in the Heracleum genus) are the primary natural hosts for the Parsnip webworm, which feed on the

plant's flowers.

Rationale:

Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287.

Question 1.4 Impact on genetic integrity D Rev'd, Sci. Pub'n back

Identify impacts: Within the Apiaceae family hybridization is uncommon; for example, cultivated parsnip (P. sativa ssp. sativa) rarely hybridizes with congeners.

Rationale: P. sativa has a chromosome number of 2n = 22. While worldwide there are over 3,000 species in 300 genera in the Apiaceae (Umbelliferae) family (440 species in 94 genera in the New World), and eight species in the genus Pastinaca, wild parsnip is the only member of the genus that is found in N America. Cultivated varities of P. sativa are more accurately placed within subspecies sativa.

Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287.

Constance, L. 1993. P. sativa L. In The Jepson Manual (Online). Berkeley, CA: Regents of the University of California. Available at: http://ucjeps.berkeley.edu/cgi-bin/get_JM_treatment.pl?329,495,496. Accessed 5:07 PM 27 April 2010.

Keeler, K.H., C.E. Turner, and M.R. Bolick. 1996. Movement of crop transgenes into wild plants. In S.O. Duke, Ed. Herbicide-Resistant Crops: Agricultural, Economic, Environmental, Regulatory, and Technological Aspects. Boca Raton, FL: CRC Research Press. Pp. 303-330.

US Department of Agriculture, Natural Resources Conservation Service (NRCS). 2010. The PLANTS Database (Online). Baton Rouge, LA: National Plant Data Center. Available at http://plants.usda.gov. Accessed 4:43 PM 27 April 2010.

Question 2.1 Role of anthropogenic and natural disturbance in establishment B Rev'd, Sci. Pub'n back

Describe role of disturbance: Mowing, and transportation of equipment and soil transports seeds in the fall and aids in the species spread.

Rationale: Mowing during peak seed production and dispersal periods in the late summer can easily spread seeds locally, and the transportation of equipment used for such efforts can lead to longer-distance dispersal of seeds. Furthermore, mowing during the summer can reduce the vigor of other species that might out-compete wild parsnip, and actually increase stem densities of the later species. Movement of soil inocculated with wild parsnip seeds (which can remain viable for up to four years) can also lead to spread of the species.

Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287.

Baskin, J.M. and C.M. Baskin. 1979. Studies on the autoecology and population biology of the weedy monocarpic perennial, Pastinaca sativa. Journal of Ecology 67: 601-610.

Eckardt, N. 1987. Element Stewardship Abstract for Pastinaca sativa, Wild parsnip. Arlington, VA: The Nature

Conservancy. Available at: http://www.imapinvasives.org/GIST/ESA/esapages/documnts/pastsat.pdf. Accessed 6:13 PM 27 April 2010.

Johnson, L. and D.J. Eagan. 2007. Wild parsnip (Pastinaca sativa) – A major threat to Wisconsin's prairies, fields and roadsides. Madison, WI: Boards of Regents of the University of Wisconsin System, Cooperative Extension of the University of Wisconsin Extension. Available at: http://wihort.uwex.edu/landscape/Parsnipfinal1.pdf. Accessed 5:45 PM 27 April 2010.

Question 2.2 Local rate of spread with no management B Rev'd, Sci. Pub'n back

Describe rate of spread: Local rate of spread without management is likely to be limited due to the species restricted sexual reproduction. Seed dispersal generally occurs within a 10 foot radius of the mother plant, constraining local spread of wild parsnip.

Rationale: P. sativa can only spread via seeds, and has difficulty successfully establishing in stable, well-established pastures or forest understories.

Sources of information: Johnson, L. and D.J. Eagan. 2007. Wild parsnip (Pastinaca sativa) – A major threat to Wisconsin's prairies, fields and roadsides. Madison, WI: Boards of Regents of the University of Wisconsin System, Cooperative Extension of the University of Wisconsin Extension. Available at: http://wihort.uwex.edu/landscape/Parsnipfinal1.pdf. Accessed 5:45 PM 27 April 2010.

Jongejans, E. and A. Telenius. 2001. Field experiments on seed dispersal by wind in ten umbelliferous species (Apiaceae). Plant Ecology 152: 67-78.

Question 2.3 Recent trend in total area infested within state B Rev'd, Sci. Pub'n back

Describe trend: Trend is difficult to access precisely due to a lack of information on the size of populations and little information on the species distribution. Given the species known life history traits and invasion history it is more than likely that the species is widespread in the given Colorado counties where it is reported, but is not abudant or particularly dominant there.

Rationale:

Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287.

Biota of North America Program (BONAP). 2010. Draft U.S. County-Level Atlas of the Vascular Flora of North America (Online). Chapel Hill, NC: BONAP. Available at: http://bonap.org/genera-list.html. Accessed 4:53 PM 27 April 2010.

EDDMapS. 2009. Wild parsnip, Pastinaca sativa L. Athens, GA: University of Georgia, Warnell School of Forestry and Natural Resources, Center for Invasive Species and Ecosystem Health. Last updated 10:46 AM 8 April 2009. Available at: http://www.eddmaps.org/distribution/usstate.cfm?sub=6147. Accessed 5:13 PM 27 April 2010.

US Department of Agriculture, Natural Resources Conservation Service (NRCS). 2010. The PLANTS Database (Online). Baton Rouge, LA: National Plant Data Center. Available at http://plants.usda.gov. Accessed 4:43 PM 27 April 2010.

Question 2.4 Innate reproductive potential A Rev'd, Sci. Pub'n back

Describe key reproductive characteristics: Wild parsnip is a biennial that can behave as a monocarpic perennial herb, and reproduces solely by vegetatative means. It requires vernalization after germination and before flowering, though plants can delay flowering for several seasons after initial germination. Flowering and seed maturation occur during a brief period (2 weeks) in June-July, with seed dispersal typically concluding by September. Sexual maturation can be delayed by up to a month in colder, more northern climates. Individual plants can produce up to 1,000 seeds, which are viable in the seedbank for up to four years (although a large proportion - 60% - appear to germinate within the first year after dispersal). Germination (on average 16% of seeds successfully germinate) can occur in the fall following dispersal. However, fall-germinated seedlings have very high mortality (99%) compared to those that germinate in the spring; which typically represent the majority (80%) of seedlings emerging in a year. P. sativa flowers are hermaphroditic and protandrous (separate pistillate and staminate phases) which prevents self-fertilization. Plants can readily re-sprout from taproots following burns or aboveground biomass removal.

Rationale: Plants require a critical rosette size before flowering (in order for the taproot to grow large enough to produce and support the flowering stalk); generally plants whose root crown is less than 5 mm in diameter will not flower the same season. Given these parameters the species normally requires 2 or more years to mature and produce seed. Plants will senesce and die after flowering. Hendrix et al. (1991) found that smaller seeds (less mass) represented the majority of the propagules germinating in the spring, relative to those seeds that germinated during the fall. Furthermore, the authors found that seeds of a smaller mass survived better than heavier seeds during periods of drought that predictably occur in the introduced range of wild parsnip.

Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287.

Baskin, J.M. and C.M. Baskin. 1979. Studies on the autoecology and population biology of the weedy monocarpic perennial, Pastinaca sativa. Journal of Ecology 67: 601-610.

Constance, L. 1993. P. sativa L. In The Jepson Manual (Online). Berkeley, CA: Regents of the University of California. Available at: http://ucjeps.berkeley.edu/cgi-bin/get_JM_treatment.pl?329,495,496. Accessed 5:07 PM 27 April 2010.

Doll, J. and M. Renz. Agronomy Advice: Wild parsnip. Madison, WI: University of Wisconsin, Agronomy Department. Last updated June 2007. Available at: http://ipcm.wisc.edu/LinkClick.aspx?fileticket=Lql8F88eJhM%3D&tabid=116&mid=678. Accessed 5:41 PM 27 April 2010.

Hendrix, S.D. and E.J. Trapp. 1992. Population demography of Pastinaca sativa (Apiaceae): Effects of seed mass on emergence, survival, and recruitment. American Journal of Botany 79: 365-375.

Hendrix, S.D., E. Nielsen, T. Nielsen and M. Schutt. 1992. Are seedlings from small seeds always inferior to seedlings from large seeds? Effects of seed biomass on seedling growth in Pastinaca sativa L. New Phytologist 119: 299-305.

Johnson, L. and D.J. Eagan. 2007. Wild parsnip (Pastinaca sativa) – A major threat to Wisconsin's prairies, fields and roadsides. Madison, WI: Boards of Regents of the University of Wisconsin System, Cooperative Extension of the University of Wisconsin Extension. Available at: http://wihort.uwex.edu/landscape/Parsnipfinal1.pdf. Accessed 5:45 PM 27 April 2010.

Pennsylvania Department of Conservation and Natural Resources (PDCNR). 1990. Fact Sheet - Wild parsnip, Pastinaca sativa L. (Online). Last updated February 1990. Available at: http://www.dcnr.state.pa.us/forestry/invasivetutorial/wild_parsnip.htm. Accessed 5:01 PM 27 April 2010.

Roberts, H.A. 1979. Periodicity of seedling emergence and seed survival in some Umbelliferae. Journal of Applied Ecology 16: 195-201.

US Department of Agriculture, Forest Service (USFS), Forest Health Staff. 2006. Weed of the Week: Wild parsnip, Pastinaca sativa L. (Online). Last updated 28 August 2006. Newton Square, PA: USFS, Forest Health

Staff. Available at: http://www.na.fs.fed.us/fhp/invasive_plants/weeds/wild-parsnip.pdf. Accessed 5:04 PM 27 April 2010.

Question 2.5 Potential for human-caused dispersal A Rev'd, Sci. Pub'n back

Identify dispersal mechanisms: Wild parsnip was likely introduced and spread intentionally, i.e. planted in gardens, by orginal settlers for its original value as a food crop (the root of cultivated varieties is edible). After introduction the species could have escaped from cultivation and reverted to its natural form.

Rationale: Wild parsnip has been cultivated and widely consumed since the time of Pliny and the height of the Roman empire. The species was widespread - both wild and cultivated varities - throughout Europe by the timethat N America was settled, and as an important food crop of the time was likely brought to the New World by settlers. Specimens in Wisconsin suggest that the plant was already naturalized by the late 1890s. Wild varities of the species are considered to be inedible.

Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287.

Baskin, J.M. and C.M. Baskin. 1979. Studies on the autoecology and population biology of the weedy monocarpic perennial, Pastinaca sativa. Journal of Ecology 67: 601-610.

Doll, J. and M. Renz. Agronomy Advice: Wild parsnip. Madison, WI: University of Wisconsin, Agronomy Department. Last updated June 2007. Available at: http://ipcm.wisc.edu/LinkClick.aspx?fileticket=Lql8F88eJhM%3D&tabid=116&mid=678. Accessed 5:41 PM 27 April 2010.

Eagan, D.J. 1999. Burned by wild parsnip. Wisconsin Natural Resources Magazine June 1999. Available at: http://dnr.wi.gov/wnrmag/html/stories/1999/jun99/parsnip.htm. Accessed 4:21 PM 29 April 2010.

Greenwood, E. 2010. Parsnip, Pastinaca sativa. In Maud Grieve's 'A Modern Herbal' (Online). Arcata, CA: Ed Greenwood. Available at: http://www.botanical.com/botanical/mgmh/p/parsni12.html. Accessed 5:56 PM 27 April 2010.

Johnson, L. and D.J. Eagan. 2007. Wild parsnip (Pastinaca sativa) – A major threat to Wisconsin's prairies, fields and roadsides. Madison, WI: Boards of Regents of the University of Wisconsin System, Cooperative Extension of the University of Wisconsin Extension. Available at: http://wihort.uwex.edu/landscape/Parsnipfinal1.pdf. Accessed 5:45 PM 27 April 2010.

Pennsylvania Department of Conservation and Natural Resources (PDCNR). 1990. Fact Sheet - Wild parsnip, Pastinaca sativa L. (Online). Last updated February 1990. Available at: http://www.dcnr.state.pa.us/forestry/invasivetutorial/wild_parsnip.htm. Accessed 5:01 PM 27 April 2010.

Question 2.6 Potential for natural long-distance dispersal B Rev'd, Sci. Pub'n back

Identify dispersal mechanisms: Birds and smaller mammals eat seeds and are thought to be responsible for dispersing propagules. The median dispersal distance for Pastinaca seeds is roughly 10.2 feet, though some seeds can move as far as 46 feet.

Rationale:

Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287.

Doll, J. and M. Renz. Agronomy Advice: Wild parsnip. Madison, WI: University of Wisconsin, Agronomy

Department. Last updated June 2007. Available at: http://ipcm.wisc.edu/LinkClick.aspx?fileticket=Lql8F88eJhM%3D&tabid=116&mid=678. Accessed 5:41 PM 27 April 2010.

Jongejans, E. and A. Telenius. 2001. Field experiments on seed dispersal by wind in ten umbelliferous species (Apiaceae). Plant Ecology 152: 67-78.

Question 2.7 Other regions invaded C Rev'd, Sci. Pub'n back

Identify other regions: Wild parsnip is widespread now throughout the United States and Canada, with the exception of a few southeastern US states and Hawai'i. In Illinois, the species is reported as particularly problematic in mesic prairies.

Rationale: Elsewhere in N America the plant is reported as common in the following habitats: roadways and other right-of-ways; fence rows; old fields; CRP sites and other inadequately managed pastures, particularly those that are sporadically mowed.

Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287.

Doll, J. and M. Renz. Agronomy Advice: Wild parsnip. Madison, WI: University of Wisconsin, Agronomy Department. Last updated June 2007. Available at: http://ipcm.wisc.edu/LinkClick.aspx?fileticket=Lql8F88eJhM%3D&tabid=116&mid=678. Accessed 5:41 PM 27 April 2010.

Pennsylvania Department of Conservation and Natural Resources (PDCNR). 1990. Fact Sheet - Wild parsnip, Pastinaca sativa L. (Online). Last updated February 1990. Available at: http://www.dcnr.state.pa.us/forestry/invasivetutorial/wild_parsnip.htm. Accessed 5:01 PM 27 April 2010.

Wisconsin Department of Natural Resources (WDNR). 2008. Wild parsnip (Pastinaca sativa). Last updated 5 August 2008. Available at: http://dnr.wi.gov/invasives/fact/parsnip.htm. Accessed 5:30 PM 27 April 2010.

Question 3.1 Ecological amplitude/Range D Rev'd, Sci. Pub'n back

Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Was recorded in Weber's 1976 flora as "escaped from cultivation" and being "well established locally in the piedmont valleys." Given wild parsnip's history of cultivation and use by original European settlers in N America it is very likely that the species was introduced to Colorado well before 1976, and persisted at low densities in isolated populations. More recently, Ackerfield (2009) noted the species as being commonly found in the state in disturbed sites, along roads and ditches and in abandoned agricultural lands.

Rationale: Wild parsnip appears to be widespread and sometimes abundant in sunny portions of natural areas (especially prairies, oak openings and calcareous fens) and disturbed right-of-ways; the species seems to grow more vigorously on dry-mesic and calcareous or alkaline soils. The plant is normally restricted to 5,000-8,000 ft in elevation. The species is very well adapted to summer drought conditions, and percent cover of wild parsnip in one experiment (Sternberg et al. 1999) actually increased under summer drought conditions compared to suplemental rainfall. Again, the monocarpic biennial life history of wild parsnip is likely the driver behind the species strong drought adaptations, and a reason that the plant thrives in ideal sites.

Sources of information: Ackerfield, J. 2009. The Flora of Colorado. Ft. Collins, CO: Colorado State University Herbarium. 407 pp.

Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing

concern. Weed Technology 21: 279-287.

Eckardt, N. 1987. Element Stewardship Abstract for Pastinaca sativa, Wild parsnip. Arlington, VA: The Nature Conservancy. Available at: http://www.imapinvasives.org/GIST/ESA/esapages/documnts/pastsat.pdf. Accessed 6:13 PM 27 April 2010.

Johnson, L. and D.J. Eagan. 2007. Wild parsnip (Pastinaca sativa) – A major threat to Wisconsin's prairies, fields and roadsides. Madison, WI: Boards of Regents of the University of Wisconsin System, Cooperative Extension of the University of Wisconsin Extension. Available at: http://wihort.uwex.edu/landscape/Parsnipfinal1.pdf. Accessed 5:45 PM 27 April 2010.

Pennsylvania Department of Conservation and Natural Resources (PDCNR). 1990. Fact Sheet - Wild parsnip, Pastinaca sativa L. (Online). Last updated February 1990. Available at: http://www.dcnr.state.pa.us/forestry/invasivetutorial/wild_parsnip.htm. Accessed 5:01 PM 27 April 2010.

Sternberg, M., V.K. Brown, G.J. Masters and I.P Clarke. 1999. Plant community dynamics in a calcareous grassland under climate change manipulations. Plant Ecology 143: 29-37.

US Department of Agriculture, Forest Service (USFS), Forest Health Staff. 2006. Weed of the Week: Wild parsnip, Pastinaca sativa L. (Online). Last updated 28 August 2006. Newton Square, PA: USFS, Forest Health Staff. Available at: http://www.na.fs.fed.us/fhp/invasive_plants/weeds/wild-parsnip.pdf. Accessed 5:04 PM 27 April 2010.

Weber, WA. 1976. Rocky Mountain Flora. Niwot, CO: University Press of Colorado. P. 300.

Question 3.2 Distribution/Peak frequency A Other Pub. Mat'l back

Describe distribution: According to the PLANTS database (USDA 2010), wild parsnip is only reported to occur in the following counties in Colorado: Boulder; Huerfano; Pitkin; Rio Grande. The Biota of North America Program (2010) and EDDMapS (2009) have additional reports of occurences in the following counties: Archuleta; Chaffee; Larimer; Routt and Saguache.

Rationale:

Sources of information: Biota of North America Program (BONAP). 2010. Draft U.S. County-Level Atlas of the Vascular Flora of North America (Online). Chapel Hill, NC: BONAP. Available at: http://bonap.org/genera-list.html. Accessed 4:53 PM 27 April 2010.

EDDMapS. 2009. Wild parsnip, Pastinaca sativa L. Athens, GA: University of Georgia, Warnell School of Forestry and Natural Resources, Center for Invasive Species and Ecosystem Health. Last updated 10:46 AM 8 April 2009. Available at: http://www.eddmaps.org/distribution/usstate.cfm?sub=6147. Accessed 5:13 PM 27 April 2010.

US Department of Agriculture, Natural Resources Conservation Service (NRCS). 2010. The PLANTS Database (Online). Baton Rouge, LA: National Plant Data Center. Available at http://plants.usda.gov. Accessed 4:43 PM 27 April 2010.

Question 4.1 Poisonous to Livestock B Rev'd, Sci. Pub'n back

Describe impacts in terms of high probability of death, long-term health impacts, or short-term health impacts: Despite the presence of harmful compounds within the plant's sap and reproductive structures, it appears that these compounds are not toxic to livestock or wildlife, and there are reports in the literature of grazing animals preventing the species from establishing or expanding locally. However, animals with little or no hair and fair-colored skin can be similarly affected by phyto-photodermatitis. There is also some evidence in the literature that repeated ingestion of parsnip roots could have toxicological consequences.

Rationale: Mammalian toxicity (measured as LD 50) to furocoumarins (in the absence of UV light, such as in the digestive tract) is relatively low, i.e. 300-600 mg/kg body weight for rats and mice. When simultaneously exposed to UV light, oral toxicity of the compounds is much lower, e.g. 1 mg/kg body weight in humans.
Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287. Doll, J. and M. Renz. Agronomy Advice: Wild parsnip. Madison, WI: University of Wisconsin, Agronomy Department. Last updated June 2007. Available at: http://ipcm.wisc.edu/LinkClick.aspx?fileticket=Lql8F88eJhM%3D&tabid=116&mid=678. Accessed 5:41 PM 27 April 2010. Ivie, G.W. 1978. Toxicological significance of plant furocoumarins. In R.F. Keeler, K.R. Van Kampen and L.F. James, Eds. Effects of Poisonous Plants on Livestock. New York, NY: Academic Press. Pp. 475-485. Ivie, G.W., D.L. Holt, and M.C. Ivey. 1981. Natural toxicants in human foods: psoralens in raw and cooked parsnip root. Science 213: 909-910.
Question 4.2 Detrimental to Economic Crops C Rev'd, Sci. Pub'n back
Describe impacts to all aspects of cropping systems (see guidelines): There are no reports of impacts on cropping systems due to parsnip populations. There is evidence that wild parsnip is susceptible to and a host for powdery mildew and alternaria blight viruses, as well as other more specific pathogenic organisms. Although there are cultivated varities of the species (ssp. sativa), there is no evidence in the literature that: 1) wild parsnip populations are detrimental to industrial production of cultivated varities; 2) wild varieties are relatively inedible compared to cultivated varieties, so there managmeent would no impact production of the crop.
Rationale:
Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287. Greenwood, E. 2010. Parsnip, Pastinaca sativa. In Maud Grieve's 'A Modern Herbal' (Online). Arcata, CA: Ed Greenwood. Available at: http://www.botanical.com/botanical/mgmh/p/parsni12.html. Accessed 5:56 PM 27 April 2010.
Question 4.3 Detrimental to Mgmt of Agricultural System, Rangeland and Pasture C Rev'd, Sci. Pub'n back
Describe impacts to water diversion systems, increased water use, reduced forage for livestock: There could be minimal impacts to rangeland or pastures that are degraded or poorly managed, thereby allowing for recruitment and establishment of the species.
Rationale: Management of wild parsnip is fairly straight forward compared to other invasive exotic plants, so any impacts to agronomic systems could be quickly and in most cases fairly cheaply remediated.
Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287. Eckardt, N. 1987. Element Stewardship Abstract for Pastinaca sativa, Wild parsnip. Arlington, VA: The Nature Conservancy. Available at: http://www.imapinvasives.org/GIST/ESA/esapages/documnts/pastsat.pdf. Accessed

6:13 PM 27 April 2010.

Question 4.4 Human Health Impacts C Rev'd, Sci. Pub'n back

Describe key human impacts such as; irritants, property values, recreational values, and industry impacts: Exposure of humans and other animals with light colored skin results relatively rapidly in severe burns and blisters. In particular, incidents of exposure that result from clearing of invaded pastures with scythes or string trimmers that pulverize plant tissues appear to cause especially painful cases. Sap within the leaves and stems is most irritating when the plants are in flower. Furthermore, Ivie et al. (1981) reported that edible roots of cultivated varieties of the species that were being sold for human consumption contained potentially harmful levels of the same compounds; this indicates that accidental or intentional ingestion of the wild varieties may also pose a public health risk.

Rationale: The sap within P. sativa foliage and stems contains a class of chemical (furocoumarins, e.g. xanthotoxin, bergapten and imperatorin) that cause phyto-photodermatitis. This condition occurs when furocoumarins that have been absorbed into the skin and bound to DNA and cell membranes become energized by UV light and are radicalized. Blisters usually form 1-2 days after intial exposure to sap and sunlight, they rupture within a few days and begin to heal; though scars can remain in the burned areas up up to several years. The production of furocoumarins such as xanthotoxin in wild parsnip is induced by damage, either mechanical or herbivorous. Therefore, damaging plants during weed trimming operations (for example) can actually increase concentrations of the iritating chemicals in parsnip tissues. Furocoumarins are also common in other members of the family, including cow parsnip and hogweed species, wild carrot and Queen Anne's lace.

Sources of information: Averill, K.M. and A. Ditommaso. 2007. Wild parsnip (Pastinaca sativa): A troublesome species of increasing concern. Weed Technology 21: 279-287.

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Eagan, D.J. 1999. Burned by wild parsnip. Wisconsin Natural Resources Magazine June 1999. Available at: http://dnr.wi.gov/wnrmag/html/stories/1999/jun99/parsnip.htm. Accessed 4:21 PM 29 April 2010.

Ivie, G.W., D.L. Holt, and M.C. Ivey. 1981. Natural toxicants in human foods: psoralens in raw and cooked parsnip root. Science 213: 909-910.

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Zangerl, A.R. and M.R. Berenbaum. 1994/1995. Spatial, temporal, and environmental limits on xanthotoxin induction in wild parsnip foliage. Chemecology 5/6: 37-42.

Worksheet A

back

Reaches reproductive maturity in 2 years or less	**Yes: 1 pt**

Dense infestations produce >1,000 viable seed per square meter	**Yes: 2 pts**
Populations of this species produce seeds every year.	**Yes: 1 pt**
Seed production sustained over 3 or more months within a population annually	**Yes: 1 pt**
Seeds remain viable in soil for three or more years	**Yes: 2 pts**
Viable seed produced with *both* self-pollination and cross-pollination	**No: 0 pt**
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	**No: 0 pts**
Fragments easily and fragments can become established elsewhere	**No: 0 pts**
Resprouts readily when cut, grazed, or burned	**Yes: 1 pt**

8 pts	**Total Unknowns**
A (6+ pts)	

Note any related traits: enter text here

Worksheet B - Colorado Ecological Types and Land Use

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Major Ecological and Land Use Types	Minor Ecological and Land Use Types	Code*
Freshwater and Aquatic Systems	lakes, ponds, reservoirs	**score**
	rivers, streams, canals	**score**
Riparian and wetlands	Riparian forest	**score**
	Riparian shrublands	**score**
	Wet meadows	**score**
Grasslands	Shortgrass prairie	**D. present**
	Tallgrass prairie	**D. present**
	Sandsage prairie	**score**
	Montane meadows	**score**
Irrigated Agriculture	Hay meadows	**D. present**
	Irrigated crops (alfalfa, corn, sugar beets)	**score**
Dryland Agriculture	Dryland crops (wheat, corn, millet, dryland grass hay, sunflowers, mustard for biodiesel)	**score**
Developed Lands	Urban, exurban, industrial	**D. present**
Arid Shrublands	Sagebrush shrublands	**score**
	Foothills shrublands	**score**
	Gambel oak shrublands	**score**
Woodlands	Pinyon - juniper	**score**
	Ponderosa pine	**score**
	Limber pine	**score**
Forest	Lodgepole pine	**score**
	Spruce-fir	**score**
Alpine	Boulder and rock fields	**score**
	Dwarf shrublands	**score**
	Tundra	**score**
Barrens (lower elevation)	Dunes	**score**
	Rock outcrops	**score**
	Canyonlands	**score**

* A. means >50% of type occurrences are invaded; B means >20% to 50%; C. means >5% to 20%; D. means present but ≤5%; U. means unknown (unable to estimate percentage of occurrences invaded).

Worksheet C – Human Impacts

Human health impacts; irritants (sap), spines, poisonous, and/or smoke impacts	**Yes: 1 pt**
Property values are decreased due to increased risk of fire	**No: 0 pts**
Decreased property value due to moderate to heavy infestations	**No: 0 pts**
Decreased land value for recreational use; boating, fishing, camping, etc.	**No: 0 pts**
Impact of listing detrimental to industry; agriculture, horticulture, nursery, and/or seed	**No: 0 pt**
1 pt	**Total Unknowns**
C (1-2)	
Note any related traits: enter text here	