

Part IV. Plant Assessment Form

For use with “Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands”
by the California Exotic Pest Plant Council and the Southwest Vegetation Management Association

Electronic version, February 28, 2003

Table 1. Species and Evaluator Information

Species name (Latin binomial):	Centaurea maculosa Lam.
Synonyms:	Centaurea biebersteinii, Centaurea stoebe ssp. stoebe and ssp. maculosa
Common names:	Spotted knapweed
Evaluation date (mm/dd/yy):	1/21/05
Evaluator #1 Name/Title:	Gina Skurka
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Section below for list committee use—please leave blank

List committee members:	Carla Bossard, John Randall, Carri Pirosko, Dan Gluesenkamp, Gina Skurka, Brianna Richardson
Committee review date:	7/8/05
List date:	enter text here
Re-evaluation date(s):	enter text here

General comments on this assessment:

enter text here

Table 2. Criteria, Section, and Overall Scores

1.1	Impact on abiotic ecosystem processes	B	Rev'd, Sci. Pub'n
1.2	Impact on plant community	A	Rev'd, Sci. Pub'n
1.3	Impact on higher trophic levels	A	Rev'd, Sci. Pub'n
1.4	Impact on genetic integrity	D	Other Pub. Mat'l

Impact

Enter four characters from Q1.1-1.4 below:

BAAD

Using matrix, determine score and enter below:

A

2.1	Role of anthropogenic and natural disturbance	B (2 pts)	Rev'd, Sci. Pub'n
2.2	Local rate of spread with no management	A (3 pts)	Other Pub. Mat'l
2.3	Recent trend in total area infested within state	B (2 pts)	Observational
2.4	Innate reproductive potential Wksht A	A (3 pts)	Rev'd, Sci. Pub'n
2.5	Potential for human-caused dispersal	B (2 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	B (2 pts)	Other Pub. Mat'l

Invasiveness

Enter the sum total of all points for Q2.1-2.7 below:

16

Use matrix to determine score and enter below:

B

Plant Score

Using matrix, determine Overall Score and Alert Status from the three section scores and enter below:

**High
No Alert**

3.1	Ecological amplitude/Range	A	Other Pub. Mat'l
3.2	Distribution/Peak frequency Wksht C	D	Observational

Distribution

Using matrix, determine score and enter below:

B

Table 3. Documentation

<p>Question 1.1 Impact on abiotic ecosystem processes</p>	<p>B Rev'd, Sci. Pub'n back</p>
<p>Identify ecosystem processes impacted: Stout elongated taproot may decrease soil moisture. Knapweed infestation can increase surface run-off and sedimentation. They are poor protectors of soil and water resources and they pose a wildfire threat. Success could be attributed to greater use, or more efficient use, of available soil nitrogen. Soil N often limits growth on semi-arid grasslands. Greater or more efficient use of soil N by spotted knapweed may inhibit establishment, survival, or reproduction of native grasses, if this occurred, but it doesn't. Also, Centaurea's success as an invasive species in North America cannot be attributed to greater use of soil water or greater water-use efficiency than native grasses. Knapweed infestation on bunchgrass rangeland is detrimental to water and soil resources. Lacy 1989 determined that surface water runoff and stream sediment yield were 56 and 192% higher, respectively, for spotted knapweed-dominated sites compared to bunchgrass-dominated sites. Bareground and water infiltration rates were greater on sites with unclipped bunchgrass than on those with spotted knapweed.</p>	
<p>Rationale: Moderate alteration of ecosystem processes by decreasing soil moisture and facilitating erosion.</p>	
<p>Sources of information:</p> <p>Hoffman, Kerns. Wisconsin Manual of Control Recommendations for Ecologically Invasive Plants. Pgs 44-47. 1997.</p> <p>Roche, B.F. Jr. , C.T. Roche. Identification, Introduction, Distribution, Ecology, and Economics of Centaurea Species. Noxious Range Weeds. 1991. 274-291. Ed. James L.F. et al. Westview Press, Boulder, San Francisco, Oxford.</p> <p>Blicker, P.S., B.E. Olson, and R.Engel. 2002. Traits of the invasive Centaurea maculosa and two native grasses: effect of N supply. Plant and Soil V. 247(2) P. 261-269.</p> <p>Blicker, P.S., B.E. Olson, and J.M. Wraith. Water use and water-use efficiency of the invasive Centaurea maculosa and three native grasses. Plant and Soil. v. 254(2) p. 371-381.</p> <p>Sheley, R.L., Jacobs, J.S., Carpinelli M.F., Distribution, Biology and of Diffuse Knapweed (Centaurea diffusa) and Spotted Knapweed (Centaurea maculosa). Weed Technology 12: 353-362. 1998.</p>	
<p>Question 1.2 Impact on plant community composition, structure, and interactions</p>	<p>A Rev'd, Sci. Pub'n back</p>
<p>Identify type of impact or alteration: Spotted knapweed often attains high densities on sunny wild lands, even those undisturbed by human or livestock activity. Knapweed tends to dominate sites at the expense of community diversity or forage production. C. maculosa reduces the productivity of desirable forage plants and floristic diversity. It has the ability to invade mature native bunchgrass communities. Decreased bluebunch wheatgrass yield was correlated with increased production of spotted knapweed. Bluebunch wheatgrass-rough fescue production was reduced by 88% by knapweed invasion.</p>	
<p>Rationale: Moderate alteration of plant community composition by reduction in survivorship of native grasses</p>	
<p>Sources of information: Hoffman, Kerns. Wisconsin Manual of Control Recommendations for Ecologically Invasive PLants. Pgs. 44-47. 1997.</p> <p>Blicker, P.S., B.E. Olson, and R.Engel. 2002. Traits of the invasive Centaurea maculosa and two native grasses: effect of N supply. Plant and Soil V. 247(2) P. 261-269.</p> <p>Lacey, J.R., P. Husby, and G. Handl, Observations on Spotted and Diffuse Knapweed Invasion into Ungrazed</p>	

<p>Bunchgrass Communities in Western Montana. <i>Rangelands</i> 12 (1). 1990. 30-32.</p> <p>Sheley, R.L., Jacobs, J.S., Carpinelli M.F., Distribution, Biology and of Diffuse Knapweed (<i>Centaurea diffusa</i>) and Spotted Knapweed (<i>Centaurea maculosa</i>). <i>Weed Technology</i> 12: 353-362. 1998.</p>	
<p>Question 1.3 Impact on higher trophic levels</p>	<p>A Rev'd, Sci. Pub'n back</p>
<p>Identify type of impact or alteration: Knapweeds are grazed by deer and sheep. These plants also provide nectar and pollen for domestic bees. Domestic animals and wildlife such as elk rely on range grasses and herbs for up to 80% of diet. Knapweed encroachment can destroy the forage base and would result in a significant decline in deer and elk numbers. Detrimental to range resource values because they have low palatability to livestock and wildlife. Spotted knapweed reduces livestock forage and negatively impacts wildlife. Elk use was reduced by 98% on spotted knapweed-dominated range compared to bunchgrass-dominated sites. Spoon 1983 predicted a loss of 220 elk annually in Montana because of spotted knapweed infestations on winter range.</p>	
<p>Rationale:</p>	
<p>Sources of information:</p> <p>Knapweed: Its Cost to British Columbia. Pamphlet from Province of British Columbia, Ministry of Agriculture, Fisheries and Food.</p> <p>Roche, B.F. Jr. , C.T. Roche. Identification, Introduction, Distribution, Ecology, and Economics of <i>Centaurea</i> Species. <i>Noxious Range Weeds</i>. 1991. 274-291. Ed. James L.F. et al. Westview Press, Boulder, San Francisco, Oxford.</p> <p>Sheley, R.L., Jacobs, J.S., Carpinelli M.F., Distribution, Biology and of Diffuse Knapweed (<i>Centaurea diffusa</i>) and Spotted Knapweed (<i>Centaurea maculosa</i>). <i>Weed Technology</i> 12: 353-362. 1998.</p>	
<p>Question 1.4 Impact on genetic integrity</p>	<p>D Other Pub. Mat'l back</p>
<p>Identify impacts: none</p>	
<p>Rationale: No native <i>Centaurea</i> species in California.</p>	
<p>Sources of information: Hickman, J. (ed.) 1993. <i>The Jepson Manual, Higher Plants of California</i>. University of California Press. Berkeley, CA.</p>	
<p>Question 2.1 Role of anthropogenic and natural disturbance in establishment</p>	<p>B Rev'd, Sci. Pub'n back</p>
<p>Describe role of disturbance: Spotted knapweed has invaded relatively undisturbed native plant communities and natural areas as well as heavily disturbed sites.</p>	
<p>Rationale: Moderate invasive potential - this species may occasionally establish in undisturbed areas but can readily establish in areas with natural disturbances.</p>	
<p>Sources of information:</p> <p>Hoffman, Kerns. <i>Wisconsin Manual of Control Recommendations for Ecologically Invasive Plants</i>. Pgs 44-47.</p>	

1997. Roche, B.F. Jr. , C.T. Roche. Identification, Introduction, Distribution, Ecology, and Economics of Centaurea Species. Noxious Range Weeds. 1991. 274-291. Ed. James L.F. et al. Westview Press, Boulder, San Francisco, Oxford. Blicker, P.S., B.E. Olson, and R.Engel. 2002. Traits of the invasive Centaurea maculosa and two native grasses: effect of N supply. Plant and Soil V. 247(2) P. 261-269.	
Question 2.2 Local rate of spread with no management	A Other Pub. Mat'l back
Describe rate of spread: Has spread rapidly in most other western states.	
Rationale: enter text here	
Sources of information: Duncan, C.L. and J.K. Clark (eds.). 2005. Invasive plants of range and wildlands and their environmental, ecological, and societal impacts. WSSA.	
Question 2.3 Recent trend in total area infested within state	B Observational back
Describe trend: Through the efforts of CDFA, spotted knapweed populations have remained about stable over the past few years. Without these efforts it is very likely that the infestations would expand exponentially, as they have in so many other states.	
Rationale: enter text here	
Sources of information: DiTomaso, observational.	
Question 2.4 Innate reproductive potential	A Rev'd, Sci. Pub'n back
Describe key reproductive characteristics: Reproduces solely by seed. Individual flower heads bloom from late June through August for 2-6 days each. The bracts reopen after about 20 days and scatter seeds. Plants average about 1,000 seeds per plant. Seeds are viable for seven years, and germinate throughout the growing season. Seed production was 1,000-fold that needed to maintain observed levels of infestation. Lives up to 9 years and is able to produce seeds each year. Seed production of spotted knapweed ranges from 5,000 to 40,000 seeds/m ² , with more seeds produced during wet years.	
Rationale: High. 7 points	
Sources of information: Hoffman, Kerns. Wisconsin Manual of Control Recommendations for Ecologically Invasive Plants. Pgs 44-47. 1997. Schirman R. Seed Production and Spring Seedling Establishment of Diffuse and spotted Knapweed. Journal of Range Management 34(1). 1981. 45-47. Sheley, R.L., Jacobs, J.S., Carpinelli M.F., Distribution, Biology and of Diffuse Knapweed (<i>Centaurea diffusa</i>) and Spotted Knapweed (<i>Centaurea maculosa</i>). Weed Technology 12: 353-362. 1998.	

Question 2.5 Potential for human-caused dispersal	B Rev'd, Sci. Pub'n back
<p>Identify dispersal mechanisms: People spread knapweed as it is easily caught up and transported great distances in the undercarriage and doors of recreational vehicles, trains, light aircraft landing at infested air strips, logging trucks and heavy machinery. It is also spread by florists who use knapweed in dried floral arrangements, movement of hay from knapweed infested to non-infested areas. Spotted knapweed flower heads also become attached to the undercarriages of vehicles, are transported long distances in mud, and commonly become attached to or drop into shoes. May also be transported in wood brought from Washington for log cabin kits.</p>	
<p>Rationale: There are numerous opportunities for dispersal to new areas, but not as high as some other species.</p>	
<p>Sources of information:</p> <p>Knapweed: Its Cost to British Columbia. Pamphlet from Province of British Columbia, Ministry of Agriculture, Fisheries and Food.</p> <p>Sheley, R.L., Jacobs, J.S., Carpinelli M.F., Distribution, Biology and of Diffuse Knapweed (<i>Centaurea diffusa</i>) and Spotted Knapweed (<i>Centaurea maculosa</i>). Weed Technology 12: 353-362. 1998.</p>	
Question 2.6 Potential for natural long-distance dispersal	B Rev'd, Sci. Pub'n back
<p>Identify dispersal mechanisms: Spread by cattle, deer, and elk may pick up the weed and disperse it, and some bird species and small rodents eat knapweed seed. Soil disturbance provides an ideal seedbed for new knapweed infestation. Spotted knapweed plants do not break off at ground level, and populations are largely extended through peripheral enlargement of existing stands. Movement of stem by wind or passing animals can flick the loosely held achenes up to 1 m from the parent plant. Long distance transport occurs when achenes become attached to passing animals, or by rodents and birds.</p>	
<p>Rationale: Long-distance dispersal by animals or abiotic mechanisms can occur but is not the primarily means of dispersal.</p>	
<p>Sources of information:</p> <p>Knapweed: Its Cost to British Columbia. Pamphlet from Province of British Columbia, Ministry of Agriculture, Fisheries and Food.</p> <p>Sheley, R.L., Jacobs, J.S., Carpinelli M.F., Distribution, Biology and of Diffuse Knapweed (<i>Centaurea diffusa</i>) and Spotted Knapweed (<i>Centaurea maculosa</i>). Weed Technology 12: 353-362. 1998.</p>	
Question 2.7 Other regions invaded	C Other Pub. Mat'l back
<p>Identify other regions: This plant was probably introduced in the late 1890s as a contaminant in alfalfa or hay seed from Europe and Asia. Spotted knapweed, a native of Europe, was collected on Vancouver Island, British Columbia, in 1905 and San Juan Island, Washington, in 1923. By the 1930s it was common in Montana and northern Idaho.</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information: Duncan, C.L. and J.K. Clark (eds.). 2005. Invasive plants of range and wildlands and</p>	

<p>their environmental, ecological, and societal impacts. WSSA. Hoffman, Kerns. Wisconsin Manual of Control Recommendations for Ecologically Invasive Plants. Pgs 44-47. 1997.</p>	
<p>Question 3.1 Ecological amplitude/Range</p>	<p>A Other Pub. Mat'l back</p>
<p>Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Can occur in Great Basin grasslands, foothill prairie, riparian habitats, along gravel bars. Habitats based on review committee observations.</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information: Duncan, C.L. and J.K. Clark (eds.). 2005. Invasive plants of range and wildlands and their environmental, ecological, and societal impacts. Weed Science Society of America. Carla Bossard, St. Mary's College; John Randall, The Nature Conservancy; Carri Pirosko, California Dept. of Food and Agriculture, pers. obs.</p>	
<p>Question 3.2 Distribution/Peak frequency</p>	<p>D Observational back</p>
<p>Describe distribution: Not commonly encountered because of the efforts of CDFA</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information: DiTomaso, observational.</p>	

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	No: 0 pt
Seeds remain viable in soil for three or more years	Yes: 2 pts
Viable seed produced with <i>both</i> self-pollination and cross-pollination	Unknown: 0 pts
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	No: 0 pt
Fragments easily and fragments can become established elsewhere	No: 0 pts
Resprouts readily when cut, grazed, or burned	Yes: 1 pt
	7 pts 2 unknowns
	A (6+ pts)
Note any related traits: enter text here	

Worksheet C - California Ecological Types

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(*sensu* Holland 1986)

Major Ecological Types	Minor Ecological Types	Code*
Marine Systems	marine systems	score
Freshwater and Estuarine Aquatic Systems	lakes, ponds, reservoirs	score
	rivers, streams, canals	score
	estuaries	score
Dunes	coastal	score
	desert	score
	interior	score
Scrub and Chaparral	coastal bluff scrub	score
	coastal scrub	score
	Sonoran desert scrub	score
	Mojavean desert scrub (incl. Joshua tree woodland)	score
	Great Basin scrub	D. presen
	chenopod scrub	score
	montane dwarf scrub	score
	Upper Sonoran subshrub scrub	score
	chaparral	score
Grasslands, Vernal Pools, Meadows, and other Herb Communities	coastal prairie	score
	valley and foothill grassland	D. presen
	Great Basin grassland	D. presen
	vernal pool	score
	meadow and seep	D. presen
	alkali playa	score
	pebble plain	score
Bog and Marsh	bog and fen	score
	marsh and swamp	score
Riparian and Bottomland	riparian forest	D. presen
	riparian woodland	score
	riparian scrub (incl. desert washes)	score
Woodland	cismontane woodland	D. presen
	piñon and juniper woodland	score
	Sonoran thorn woodland	score
Forest	broadleaved upland forest	score
	North Coast coniferous forest	score
	closed cone coniferous forest	score
	lower montane coniferous forest	D. presen
	upper montane coniferous forest	score
	subalpine coniferous forest	score
Alpine Habitats	alpine boulder and rock field	score
	alpine dwarf scrub	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).