

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):	Carduus nutans L.
Synonyms:	enter text here
Common names:	musk thistle, giant plumeless thistle, nodding (plumeless) thistle,
Evaluation date (mm/dd/yy):	2/3/05
Evaluator #1 Name/Title:	Elizabeth Brusati, project manager
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Section below for list committee use—please leave blank

List committee members:	Carla Bossard, John Randall, Carri Piroso, 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	C	Rev'd, Sci. Pub'n
1.2	Impact on plant community	A	Rev'd, Sci. Pub'n
1.3	Impact on higher trophic levels	B	Anecdotal
1.4	Impact on genetic integrity	D	Other Pub. Mat'l

Impact

Enter four characters from Q1.1-1.4 below:

CABD

Using matrix, determine score and enter below:

B

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	B (2 pts)	Observational
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	C (1 pt)	Other Pub. Mat'l
2.6	Potential for natural long-distance dispersal	C (1 pt)	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:

13

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:

Medium

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>C Rev'd, Sci. Pub'n back</p>
<p>Identify ecosystem processes impacted: May deplete soil nitrogen.</p>	
<p>Rationale: <i>C. nutans</i> severely reduced the ability of <i>Trifolium repens</i> to fix nitrogen, and this inhibition lasted four months after <i>C. nutans</i> died. Effects were strongest in the summer, when nitrogen fixation would normally be highest, suggesting that patch effects created by thistles have the potential to greatly alter input of soil nitrogen for other native legume species (1).</p>	
<p>Sources of information: 1. Wardle, D.A., K. S. Nicholson, M. Ahmed, and A. Rahman. 1994. Interference effects of the invasive plant <i>Carduus nutans</i> L. against the nitrogen fixation ability of <i>Trifolium repens</i> L. <i>Plant and Soil</i>. 163:287-297</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: Forms dense stands. Inhibits growth of other plants through possible allelopathy.</p>	
<p>Rationale: Formed stands up to 150, 000 plants/ha in Canada (1). Flowering <i>C. nutans</i> strongly inhibited <i>T. repens</i> root growth, nodulation, and acetylene reduction. This appeared to be due to decomposition of rosette leaves. Experiments suggest that decomposing rosette leaves have a strong potential to inhibit <i>T. repens</i> nitrogen fixation (2). Bioassay experiments found that <i>C. nutans</i> inhibited germination of pasture plants, but <i>C. nutans</i> seedlings were not affected by their own species (3). Can colonize burned sites before other species and may prevent reestablishment of native plant community (4).</p> <p>Host plant for introduced weevil <i>Rhynocilus conicus</i>, which attacks native thistles, thereby reducing populations of the native plants (Gluesenkamp and Randall).</p> <p>Dan Gluesenkamp, Audubon Canyon Ranch, and John Randall, The Nature Conservancy, pers. obs.</p>	
<p>Sources of information: 1. Desrochers, A. M., J. F. Bain, and S. I. Warwick. 1988. The biology of Canadian weeds. 89. <i>Carduus nutans</i> L. and <i>Carduus acanthoides</i> L. <i>Canadian Journal of Plant Sciences</i>. 68: 1053-1068.</p> <p>2. Wardle et al. 1994.</p> <p>3. Wardle, D. A., M. Ahmed, K. S. Nicholson. 1991. Allelopathic influence of nodding thistle (<i>Carduus nutans</i> L.) seeds on germination and radicle growth of pasture plants. <i>New Zealand Journal of Agricultural Research</i>. 34:185-191</p> <p>4. Floyd-Hanna, L., W. Romme, D. Kendall, A. Loy, and M. Colyer. 1993. Succession and biological invasion at Mesa Verde NP. <i>Park Science</i>. vol:16-18</p>	
<p>Question 1.3 Impact on higher trophic levels</p>	<p>B Anecdotal back</p>
<p>Identify type of impact or alteration: Spiny nature of plants prevent livestock foraging and likely have the same effect on wildlife.</p>	
<p>Rationale: enter text here</p>	

Sources of information:	
Question 1.4 Impact on genetic integrity	D Other Pub. Mat'l back
Identify impacts: None	
Rationale: No native <i>Carduus</i> spp.	
Sources of information: Hickman. 1993. The Jepson Manual.	
Question 2.1 Role of anthropogenic and natural disturbance in establishment	B Rev'd, Sci. Pub'n back
Describe role of disturbance: Prefers disturbed habitats.	
Rationale: Colonizes disturbed open sites, roadsides, pastures, annual grasslands, and waste areas (1, 2). In Mesa Verde National Park, Colorado, there was a rapid increase in <i>C. nutans</i> into areas that had been subjected to a hot fire (3). Preflowering mortality was lower and flowering thistles grew more on bare ground than in plots with grasses (4). Competes poorly with healthy established grasses and other vegetation. Fire can enhance or reduce musk thistle populations, depending on native plant community type, fire timing and intensity, and seedbank composition (1).	
Sources of information: 1. DiTomaso and Healy Weeds of California and Other Western States. in prep. 2. Stuckey, R. L., and J. L. Forsyth. 1971. Distribution of naturalized <i>Carduus nutans</i> (Compositae) mapped in relation to geology in northwestern Ohio. <i>Ohio Journal of Science</i> . 71:1-15. 3. Floyd-Hanna, L., W. Romme, D. Kendall, A. Loy, and M. Colyer. 1993. Succession and biological invasion at Mesa Verde NP. <i>Park Science</i> . vol:16-18 4. Wardle, D. A., K. S. Nicholson, M. Ahmed, and A. Rahman. 1995. Influence of pasture forage species on seedling emergence, growth, and development of <i>Carduus nutans</i> . <i>Journal of Applied Ecology</i> . 32:225-233	
Question 2.2 Local rate of spread with no management	B Observational back
Describe rate of spread: Slowly expanding in Siskiyou, Sierra, Nevada, and Placer Counties.	
Rationale: Expansion of the plant's local range by natural means is slow because many of the heads do not have fully developed achenes, the achenes do not readily become separated from the head, and heads tend to drop to the ground directly beneath the parent plant (2).	
Sources of information: 1. E-mail from Carri Piroso, California Dept. of Food and Agriculture, 4/7/05 2. Stuckey and Forsyth. 1971.	
Question 2.3 Recent trend in total area infested within state	B Observational back
Describe trend: Slowly expanding, although CDFA has been able to reduce the rate of expansion. Much larger problem in other states that do not have an active control program for this species.	

Rationale: enter text here	
Sources of information: 1. E-mail from Carri Pirosko, California Dept. of Food and Agriculture, 4/7/05	
Question 2.4 Innate reproductive potential	A Rev'd, Sci. Pub'n back
Describe key reproductive characteristics: Biennial or occasionally winter annual. Primarily outcrossing but can be selfing (1). Reproduces by seed. First flowerheads can produce 1500 seeds/head, but late flowerheads produce many fewer seeds, to 25 seeds/head (1). Seeds generally germinate 2-4 weeks after dispersal. Seeds rarely persist in soil seedbank for more than a few years. A seedbank study of soil in a permanent pasture suggested that seeds did not persist longer than three years because of germination (2).	
Rationale: enter text here	
Sources of information: 1. Desrochers et al. 1988 2. DiTomaso and Healy in prep	
Question 2.5 Potential for human-caused dispersal	C Other Pub. Mat'l back
Identify dispersal mechanisms: Can disperse through human activities, but this method is probably uncommon for long distance transport.	
Rationale: enter text here	
Sources of information: 1. DiTomaso and Healy in prep.	
Question 2.6 Potential for natural long-distance dispersal	C Rev'd, Sci. Pub'n back
Identify dispersal mechanisms: Seeds fall near parent plant (1,2) and disperse to greater distances with wind, water, birds, and small mammals (3).	
Rationale: In a laboratory test, <1% of seeds were blown further than 100m and most were deposited within 50m of the point of release (2).	
Sources of information: 1. DiTomaso and Healy. in prep 2. Smith, L. M. II, and L. T. Kok. 1984. Dispersal of musk thistle (<i>Carduus nutans</i>) seeds. Weed Science. 32:120-125	
Question 2.7 Other regions invaded	B Other Pub. Mat'l back
Identify other regions: Native to Europe, Siberia, Asia minor, and North Africa. Naturalized in North and South America, Australia, and New Zealand (1). Present in all contiguous U.S. states except possibly Florida, Maine, and Vermont (2, 3). Habitats in other states similar to those invaded in California.	

Rationale:	
Sources of information: 1. Popay, A. I., and R. W. Medd. year. The biology of Australian weeds 21. Carduus nutans L. ssp nutans. journal vol page 2. DiTomaso and Healy in prep. 3. Dunn, P.H. 1976. Distribution of Carduus nutans, C. acanthoides, C. pycnocephalus, and C. crispus, in the United States. Weed Science. 24:518-524	
Question 3.1 Ecological amplitude/Range	B Other Pub. Mat'l back
Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Occurs in Klamath Ranges, Cascade Range (central and south Siskiyou, north Shasta counties), northern Sierra Nevada (south and east Plumas, east Sierra, central and east Nevada counties), Modoc Plateau (Modoc, north and south Lassen counties) to 1200m. Previous infestations now eradicated occurred in the South Coast and Mojave Desert (1). Invades range, pasture, ditch banks, forested areas in new plantations (outshaded when trees grow), and sage scrub.	
Rationale:	
Sources of information: 1. DiTomaso and Healy. in prep. 2. E-mail from Carri Piroso, California Dept. of Food and Agriculture, 4/7/05	
Question 3.2 Distribution/Peak frequency	D Observational back
Describe distribution: Because of control program by CDFA, musk thistle is not widely distributed in California.	
Rationale: enter text here	
Sources of information: DiTomaso, observational.	

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	No: 0 pts
Viable seed produced with <i>both</i> self-pollination and cross-pollination	Yes: 1 pt
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
	6 pts Total Unknowns
	A (6+ pts)

Note any related traits: enter text here

Worksheet C - California Ecological Types

[back](#)

(*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	score
	alkali playa	score
	pebble plain	score
Bog and Marsh	bog and fen	score
	marsh and swamp	score
Riparian and Bottomland	riparian forest	score
	riparian woodland	score
	riparian scrub (incl. desert washes)	score
Woodland	cismontane woodland	score
	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).