

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

Table 1. Species and Evaluator Information

Species name (Latin binomial):	<i>Centaurea solstitialis</i>
Synonyms:	enter text here
Common names:	Yellow starthistle
Evaluation date (mm/dd/yy):	2/8/03
Evaluator #1 Name/Title:	Joe DiTomaso
Affiliation:	UC Davis
Phone numbers:	530-754-8715
Email address:	DiTomaso@vegmail.ucdavis.edu
Address:	Weed Science Program, Robbins Hall, Univ. California, Davis CA 95616
Evaluator #2 Name/Title:	enter text here
Affiliation:	enter text here
Phone numbers:	enter text here
Email address:	enter text here
Address:	enter text here

Section below for review committee use—please leave blank

Review committee members:	Carla Bossard, John Randall, Peter Warner, Doug Johnson, John Hall, Dana, Cindy Roye, Matt Brooks
Committee review date:	2/10/03
List date:	enter text here
Re-evaluation date(s):	enter text here

Table 2. Criteria, Section, and Overall Scores

1.1	Impact on abiotic ecosystem processes	A	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	Observational
1.4	Impact on genetic integrity	D	No Information

“Impact”
 Enter four characters from Q1.1-1.4 below:
AABD
 Use matrix determine the score; enter below:
A

2.1	Role of anthropogenic and natural disturbance	B 2	Observational
2.2	Local rate of spread with no management	A 3	Rev'd, Sci. Pub'n
2.3	Recent trend in total area infested within state	C 1	Observational
2.4	Innate reproductive potential	A 3	Rev'd, Sci. Pub'n
2.5	Potential for human-caused dispersal	A 3	Other Pub. Mat'l
2.6	Potential for natural long-distance dispersal	C 1	Rev'd, Sci. Pub'n
2.7	Other regions invaded	C 1	Rev'd, Sci. Pub'n

“Invasiveness”
 For questions at left, recall that an A gets 3 points, a B gets 2, a C gets 1, and a D or U gets=0. Enter the sum total of all points for Q2.1-2.7 below:
14
 Use matrix to determine score and enter below:
B

“Plant Score”
 Using matrix, determine the Overall Score and Alert Status from the three section scores and enter them below:
High
No Alert

3.1	Ecological amplitude	B	Other Pub. Mat'l
3.2	Distribution	A	Other Pub. Mat'l

“Distribution”
 Use matrix determine the score; enter below:
A

Worksheet A. Complete this worksheet to answer Question 2.4.

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 <i>both</i> self-pollination and cross-pollination	No: 0 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	No: 0 pt
7 pts	Total Unknowns 0
A (6+ pts)	

Table 3. Documentation

Question 1.1 Impact on abiotic ecosystem processes
Identify ecosystem processes impacted: Yellow starthistle significantly depletes soil moisture reserves in grasslands of California and Oregon.
Rationale: Deep root system allows starthistle to utilize deep soil moisture late into the growing season. Consequently, the next seasons soil moisture recharge is less than native perennial grasslands and annual grasslands.
Sources of information: Enloe, S.F. 2002. PhD dissertation. UC Davis; Borman, M.M., D.E. Johnson, and W.C. Krueger. 1992. Soil moisture extraction by vegetation in a Mediterranean/Maritime climatic regime. <i>Agronomy Journal</i> 84:897-904; Gerlach, J.D., A. Dyer, and K.J. Rice. 1998. Grassland and foothill woodland ecosystems of the Central Valley. <i>Fremontia</i> 26:39-43.
Question 1.2 Impact on plant community composition, structure, and interactions
Identify type of impact or alteration: Starthistle infestations can reduce wildlife habitat and forage, displace native plants, and decrease native plant and animal diversity. Dense infestations not only displace native plants and animals, but also threaten natural ecosystems and nature reserves by fragmenting sensitive plant and animal habitat.
Rationale: Because of the spiny nature of yellow starthistle, livestock and wildlife avoid grazing in heavily infested areas. In addition, yellow starthistle has been experimentally shown to have greater than 80% in heavily infested areas.
Sources of information: DiTomaso, J.M. http://wric.ucdavis.edu/ystr/impacts/impacts.html ; Sheley, R.L. and L.L. Larson. 1994a. Observation: Comparative live-history of cheatgrass and yellow starthistle. <i>Journal of Range Management</i> 47:450-456; Roché, B.F., Jr., C.T. Roché, and R.C. Chapman. 1994. Impacts of grassland habitat on yellow starthistle (<i>Centaurea solstitialis</i> L.) invasion. <i>Northwest Science</i> 68:86-96.
Question 1.3 Impact on higher trophic levels
Identify type of impact or alteration: Probably reduces wildlife forage once it produces spines.
Rationale: Because of the spiny nature of yellow starthistle and its negative impact on livestock grazing, it is expected that it would have a similar impact on my wildlife species.
Sources of information: DiTomaso, J.M. http://wric.ucdavis.edu/ystr/impacts/impacts.html ; observational and anecdotal information for many sources, including DiTomaso, J.M.
Question 1.4 Impact on genetic integrity
Identify impacts: None
Rationale: There are no native <i>Centaurea</i> species in California, thus it is assumed that there is no opportunity to have an impact.
Sources of information: None
Question 2.1 Role of anthropogenic and natural disturbance in establishment
Describe role of disturbance: Any form of soil disturbance can lead to establishment of yellow starthistle. Over grazing and domination by annual grasses in open areas can also lead to establishment and dominance by yellow starthistle.
Rationale: Much evidence indicates that yellow starthistle can invade disturbed areas, particularly roadsides. From here it has been shown to move into grasslands that area either disturbed or undisturbed within the past several years. These grasslands have over 100 year history of disturbance and are now annual grasslands, having been converted from perennial grasslands before European settlement in the west.
Sources of information: Gerlach, J.D., Jr. 1997b. The introduction, dynamics of geographic range expansion, and ecosystem effects of yellow starthistle (<i>Centaurea solstitialis</i>). <i>Proc., California Weed Science Society</i> 49:136-141; also see DiTomaso, J.M. http://wric.ucdavis.edu/ystr for more information. Much of the evidence for movement into undisturbed sites is observational, particularly by Enloe, DiTomaso and Gerlach.
Question 2.2 Local rate of spread with no management
Describe rate of spread: By 1958, it was estimated to have invaded over 1 million acres of California, much of this in range or grasslands. Today, it is thought to have spread to over 15 million acres in California, and can be found in 56 of the 58 counties in California.
Rationale: Over the past 40 years, yellow starthistle has spread exponentially to infest rangelands, native grasslands, orchards, vineyards, pastures, roadsides, and wasteland areas.
Sources of information: Maddox, D.M. and A. Mayfield. 1985. Yellow starthistle infestations are on the increase. <i>California Agriculture</i> 39(11/12):10-12; Pitcairn, M.J., R.A. O'Connell, and J.M. Gendron. 1998b. Yellow starthistle: survey of statewide distribution. Pages 64-66. D.M. Woods, ed. In, <i>Biological Control Program Annual Summary, 1997</i> . California Department of Food and Agriculture, Plant Health and Pest Prevention Services, Sacramento, CA.

Question 2.3 Recent trend in total area infested within state
Describe trend: Appears to be stable or perhaps even declining a bit.
Rationale: The leveling out of yellow starthistle infestations in California is probably due to two factors, 1) it has nearly reached its full available range and sites, and 2) a more concerted effort by state, federal, county and local groups and private citizens to manage for yellow starthistle. However, its range and level of infestation is increasing exponentially in the western US outside of California.
Sources of information: Observational by DiTomaso.
Question 2.4 Innate reproductive potential
Describe key reproductive characteristics: Produces seed every year at levels of 10,000 per square meter. Plant is an annual and does not reproduce vegetatively. Seeds can live for 3 or more years in the soil.
Rationale: Seed production and establishment are high.
Sources of information: Many publications have documented the reproduction of yellow starthistle, as well and its seed longevity, and germination characteristics. These are summarized in DiTomaso, J.M. http://wric.ucdavis.edu/yst .
Question 2.5 Potential for human-caused dispersal
Identify dispersal mechanisms: The movement of contaminated hay and uncertified seed are important long distance transportation mechanisms. The use of tractors and other equipment spread starthistle seed to other locations, including grain fields. Seed is transported in large amounts by road maintenance equipment and on the undercarriage of vehicles. In past several years, it is likely that yellow starthistle movement has been initially along roadsides, probably due to contaminated hay and soil.
Rationale: Since the 1960's three factors greatly contributed to its further spread, including extensive road building, increased suburban development, and an expansion in the ranching industry.
Sources of information: Observations by many individuals. See DiTomaso, J.M. http://wric.ucdavis.edu/yst for more information.
Question 2.6 Potential for natural long-distance dispersal
Identify dispersal mechanisms: Primarily wind blown seed. Some dispersal by birds and mammals after ingestion, but very few seed likely remain viable after passing through the digestive system.
Rationale: About 90% of the seed have been shown to fall within 2 ft of the parent plant.
Sources of information: Roché, B.F., Jr. 1992. Achene dispersal in yellow starthistle (<i>Centaurea solstitialis</i> L.). Northwest Science 66:62-65.
Question 2.7 Other regions invaded
Identify other regions: Yellow starthistle is in grasslands throughout the Pacific Northwest states. Today yellow starthistle can be found in most of the temperate areas around the world.
Rationale: All Mediterranean climates around the world are susceptible to invasion by yellow starthistle.
Sources of information: Maddox, D.M., A. Mayfield, and N.H. Poritz. 1985. Distribution of yellow starthistle (<i>Centaurea solstitialis</i>) and Russian knapweed (<i>Centaurea repens</i>). Weed Science 33(3):315-327; Sheley, R.L., L.L. Larson, and J.S. Jacobs. 1999b. Yellow starthistle. Pages 409-416. Sheley, R.L. and J.K. Petroff, eds. In, Biology and Management of Noxious Rangeland Weeds. Oregon State University Press, Corvallis.
Question 3.1 Ecological amplitude
Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Its introduction in North America probably occurred sometime after 1849 as a seed contaminant in Chilean-grown alfalfa seed, also known as Chilean clover.
Rationale: Because yellow starthistle does not do well in shaded areas, it is restricted to open sites, particularly grasslands. Since grasslands of California are dominated with shallow rooted annual species, starthistle has become very competitive and can dominate these sites.
Sources of information: Gerlach, J.D., Jr. 1997. The introduction, dynamics of geographic range expansion, and ecosystem effects of yellow starthistle (<i>Centaurea solstitialis</i>). Proc., California Weed Science Society 49:136-141; Gerlach, J.D., Jr. 1997. How the west was lost: reconstructing the invasion dynamics of yellow starthistle and other plant invaders of western rangelands and natural areas. Proc., California Exotic Pest Plant Council Symposium 3:67-72.
Question 3.2 Distribution
Describe distribution: By 1958, it was estimated to have invaded over 1 million acres of California, much of this in range or grasslands. Today, it is thought to have spread to over 15 million acres in California, and can be found in 56 of the 58 counties in California.
Rationale: Primarily invades grasslands and grassland areas within oak woodlands.
Sources of information: Maddox, D.M. and A. Mayfield. 1985. Yellow starthistle infestations are on the increase. California Agriculture 39(11/12):10-12; Pitcairn, M.J., R.A. O'Connell, and J.M. Gendron. 1998b. Yellow starthistle: survey of statewide distribution. Pages 64-66. D.M. Woods, ed. In, Biological Control Program Annual Summary, 1997. California Department of Food and Agriculture, Plant Health and Pest

Prevention Services, Sacramento, CA; Gerlach, J.D., A. Dyer, and K.J. Rice. 1998. Grassland and foothill woodland ecosystems of the Central Valley. *Fremontia* 26:39-43.

Complete the worksheet that corresponds to your state using the letter codes and instructions in Section 3.

Worksheet C - California Ecological Types

(*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	score
	chenopod scrub	score
	montane dwarf scrub	score
Upper Sonoran subshrub scrub	score	
Grasslands, Vernal Pools, Meadows, and other Herb Communities	coastal prairie	B. 20-50%
	valley and foothill grassland	A. >50%
	Great Basin grassland	B. 20-50%
	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	B. 20-50%
	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	score
	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).