

Plant Assessment Form

For use with the “Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands” by the California Exotic Pest Plant Council and the Southwest Vegetation Management Association (Warner et al. 2003)

Printable version, February 28, 2003
(Modified for use in Arizona, 07/02/04)

Table 1. Species and Evaluator Information

Species name (Latin binomial):	<i>Cirsium vulgare</i> (Savi) Ten. (USDA 2005)
Synonyms:	<i>Carduus lanceolatus</i> L., <i>Carduus vulgaris</i> Savi, <i>Cirsium lanceolatum</i> (L.) Scop., non Hill, <i>Cirsium lanceolatum</i> (L.) Scop. var. <i>hypoleucum</i> DC. (USDA 2005)
Common names:	Bull thistle, common thistle, spear thistle
Evaluation date (mm/dd/yy):	12/14/04
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Committee review date:	04/22/05
List date:	04/22/05
Re-evaluation date(s):	

Table 2. Scores, Designations, and Documentation Levels

Question		Score	Documentation Level	Section Scores	Overall Score & Designations
1.1	Impact on abiotic ecosystem processes	C	Reviewed scientific publication	<p>“Impact”</p> <p>Section 1 Score:</p> <p>C</p>	<p>“Plant Score”</p> <p>Overall Score:</p> <p>Low</p> <p>Alert Status:</p> <p>None</p>
1.2	Impact on plant community	C	Reviewed scientific publication		
1.3	Impact on higher trophic levels	C	Reviewed scientific publication		
1.4	Impact on genetic integrity	U	Reviewed scientific publication		
				<p>“Invasiveness”</p> <p><i>For questions at left, an A gets 3 points, a B gets 2, a C gets 1, and a D or U gets=0. Sum total of all points for Q2.1-2.7:</i></p> <p>13 pts</p> <p>Section 2 Score:</p> <p>B</p>	<p>Something you should know.</p>
2.1	Role of anthropogenic and natural disturbance	B	Reviewed scientific publication		
2.2	Local rate of spread with no management	B	Other published material		
2.3	Recent trend in total area infested within state	U	Observational		
2.4	Innate reproductive potential	A	Reviewed scientific publication		
2.5	Potential for human-caused dispersal	A	Other published material		
2.6	Potential for natural long-distance dispersal	B	Observational		
2.7	Other regions invaded	C	Reviewed scientific publication		
				<p>“Distribution”</p> <p>Section 3 Score:</p> <p>B</p>	
3.1	Ecological amplitude	A	Observational		
3.2	Distribution	C	Observational		

Table 3. Documentation

Question 1.1 Impact on abiotic ecosystem processes	Score: C Doc'n Level: Rev. sci. pub.
Identify ecosystem processes impacted: Minor alteration of soil nutrients. The decay process of litter produced by dead leaves from adult bull thistle plants may immobilize soil nutrients, especially nitrogen (de Jong and Klinkhamer 1985).	
Rationale: In an experiment in the Netherlands, the decay process of litter produced by dead leaves from adult bull thistle plants was thought to immobilize soil nutrients, especially nitrogen (de Jong and Klinkhamer 1985). However, results were inconclusive.	
Sources of information: See cited literature.	
Question 1.2 Impact on plant community composition, structure, and interactions	Score: C Doc'n Level: Rev. sci. pub.
Identify type of impact or alteration: Invades disturbed areas. Population numbers and density increase after disturbance. Occupies habitat otherwise used by native species. Competes with native plants for resources.	
Rationale: Invades areas after disturbance including timber harvest, fire (Gluesenkamp 2001), grazing (George et al. 1970, Bullock et al. 1994). Increased bull thistle cover after disturbance (Petryna et al. 2002). Competition for resources between bull thistle and Suisan thistle (<i>Cirsium hydrophyllum</i> (Green) Jeps. var. <i>hydrophyllum</i>) a rare thistle in California contributed to the loss of the native species (Forcella and Randall 1994). May affect diameter growth in ponderosa pine plantations (Randall and Rejmanek 1993) Invading plants can compete with native species for water, light, nutrients, pollinators and space (Staphanian et al. 1998). Primary succession after fire (pumpkin Fire). Occupies niches available to native plants (D. Crisp, personal observation).	
Sources of information: See cited literature. Also considered personal observations by D. Crisp (Botanist, U.S. Department of Agriculture, Forest Service, Coconino National Forest).	
Question 1.3 Impact on higher trophic levels	Score: C Doc'n Level: Rev. sci. pub.
Identify type of impact or alteration: Adults avoided by grazing animals, and may occupy growing space used by more favorable plants. Seeds are a food source for small animals.	
Rationale: Spines on plant discourage use by grazing animals (Whitson et al. 1996). Bull thistle can occupy habitats that would otherwise support forage species for grazing animals (Bullock et al. 1994). In a study in California, seeds were eaten by several small mammals and insects (Gluesenkamp 2001), providing a food source that would not be available if exotic species was not present.	
Sources of information: See cited literature.	
Question 1.4 Impact on genetic integrity	Score: U Doc'n Level: Rev. sci. pub.
Identify impacts: No hybridization documented, but potential exists.	
Rationale: Nine hybrids between bull thistle and other species in the genus <i>Cirsium</i> have been described in Europe (Klinkhamer and de Jong 1993), but none have been documented in U.S. Forcella and Randall (1994) investigated hybridization between bull thistle and Suisan thistle (<i>Cirsium hydrophyllum</i> (Green) Jeps. var. <i>hydrophyllum</i>) as a cause for decline of the native species in California. However, solid evidence to support this hybrid is lacking.	
Sources of information: See cited literature.	
Question 2.1 Role of anthropogenic and natural disturbance in establishment	Score: B Doc'n Level: Rev. sci. pub.
Describe role of disturbance: Disturbance is necessary for the establishment of bull thistle. This can be either natural or anthropogenic.	

<p>Rationale: De Jong and Klinkhamer (1988) found that disturbance is necessary for establishment of bull thistle in its native habitat and it facilitates population persistence where it has been introduced. Some disturbances that facilitate bull thistle infestations are a result of human occupation and not related to a specific management activity (Doucet and Cavers 1996, Manku 1998) such as open lots and at the edges of golf courses which can be significant refugia for exotic plant infestations. Locally, bull thistle has been observed on recently developed golf courses (W. Albrecht, personal communication, 2005)</p> <p>Management activities have been implicated for contributing to the establishment, spread and persistence of bull thistle. Some of these activities include grazing (George et al. 1970, Michaux, 1989, Gillman et al. 1993, Bullock et al. 1994), prescribed fire (Randall 2000, Gluesenkamp 2001, Laterra and Solbrig 2001, Petryna et al. 2002), timber activities (Gluesenkamp 2001) and reforestation (Randall 2000).</p> <p>Disturbance that creates openings, removes competition or increases nutrient availability is needed for the establishment of new individuals or groups of bull thistle (de Jong and Klinkhamer 1988). The scale of disturbance can be small; the death of a parent plant or digging by an animal often provides enough disturbance to allow the establishment of a new seedling (de Jong and Klinkhamer 1988). Disturbance was also necessary for providing “safe sites” for bull thistle to become established (van der Meijden et al. 1992).</p> <p>Seedlings and rosettes of bull thistle are susceptible to drought (Klinkhamer and de Jong 1993). George et al. (1970) found that bull thistle infestations increased after an extended period of drought. They attributed this to the decrease in vegetative cover and competition from other plants that allowed the bull thistle plants to become established.</p> <p>Sources of information: See cited literature. Also considered personal communication with W. Albrecht (Natural Resources Educator and SFPWMA Coordinator, University of Arizona, Coconino Cooperative Extension, Flagstaff, Arizona, 2005).</p>

<p>Question 2.2 Local rate of spread with no management <i>Score: B Doc'n Level: Other pub.</i></p> <p>Describe rate of spread: Common in disturbed areas. Bull thistle tends to become absent from a plant community after a disturbance passes, but persists in continuously or severely disturbed sites.</p> <p>Rationale: Second most common noxious weed on Coconino and Kaibab national Forests in 1997 (Crisp 1997, Crisp and Lutz 1997), but some groups of bull thistle later disappeared from the documented locations. However, groups on severely disturbed sites tend to persist and provide seed sources for future infestations (Crisp 2004). New disturbances make new sites as old sites disappear. More disturbance equals more thistle. Management actions such as prescribed burning and thinning contribute to creation of new sites.</p> <p>Sources of information: See cited literature.</p>
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<p>Question 2.3 Recent trend in total area infested within state <i>Score: U Doc'n Level: Obs.</i></p> <p>Describe trend: Numerous locations of bull thistle documented in the northern half of the state Southwest Exotic Plant Mapping Program (SWEMP)-Cain Crisis map records (2005).</p> <p>Rationale: Bull thistle occupies many disturbed areas in ponderosa pine forests in northern Arizona but the statewide trend is unknown.</p> <p>Sources of information: SWEMP-Cain Crisis map records (available at: http://cain.nbio.gov/cgi-bin/mapserv?map=../html/cain/crisis/crisismaps/crisis.map&mode=browse&layer=state&layer=county; accessed online in 2005).</p>

Question 2.4 Innate reproductive potential	<i>Score: A Doc'n Level: Rev. sci. pub.</i>
Describe key reproductive characteristics: Bull thistle reproduces solely from seed and is a monocarpic biennial. Plants reproduce only once during their lifespan, but can form through apomixis or self-pollination.	
Rationale: Bull thistle is monocarpic, monoecious, and reproduces solely from seeds. Because bull thistle seeds have little innate dormancy (Doucet and Cavers 1996), seed is capable of germinating as soon as it is dispersed if conditions are favorable (Klinkhamer and de Jong 1993). Persistence of bull thistle groups would be dependent on a continual supply of seeds from plants growing on the site or on seeds dispersed from other sites. Mortality in seeds and variability in seed production have a greater influence on population fluctuations than mortality in adult plants (Klinkhamer et al. 1988). Populations in areas such as in the Mediterranean region mature and reproduce as annuals (Wesselingh et al. 1994). Seeds form singly by apomixis, self-pollination or cross-pollination (van Leeuwen 1981) or by insects (Klinkhamer and de Jong 1993), but the potential for self-pollination is disputed (Michaux 1989). A successful bull thistle plant could form up to 8000 seeds (Klinkhamer et al. 1988). Bull thistle seeds can persist for periods from 30 months (Michaux 1989) to over three years (Doucet and Cavers 1996)	
Sources of information: See cited literature.	

Question 2.5 Potential for human-caused dispersal	<i>Score: A Doc'n Level: Other pub.</i>
Identify dispersal mechanisms: Contaminated seed and hay, vehicles, domestic animals, ship ballast (soil from foreign sources).	
Rationale: The species entered North America in colonial times and has spread to many locations throughout the country. The source of introduction into the United States might have been from contaminated seed or from the ballast of a ship (Randall 2000). However, it is likely that multiple introductions from Europe occurred, perhaps over many years (Whitson et al. 1996). Bull thistle was documented in herbarium collections in the northwestern United States in 1882 in Oregon (Mitich 1998) and then spread eastward into most of the northwestern United States (Forcella and Harvey 1988). The presence of bull thistle seeds in adobe bricks in the southwestern United States provides evidence of the existence of the species in the region in the 1800s. Bull thistle seeds were found in adobe bricks used in construction during the post mission period, which occurred sometime after 1824 (Mitich 1998).	
Sources of information: See cited literature.	

Question 2.6 Potential for natural long-distance dispersal	<i>Score: B Doc'n Level: Obs.</i>
Identify dispersal mechanisms: Wind dispersed seeds, possibly water or an unknown source.	
Rationale: Bull thistle seeds are equipped with pappi, specialized attachments that allow wind dispersal (Klinkhamer and de Jong 1993). Locally, bull thistle has been observed in Wilderness areas where the plants were greater than 1 km. from the nearest known population. An example of this is in the West Fork of Oak Creek where bull thistle has been found along creek banks. Therefore, wind, water or other unknown dispersal agents are present (B. Phillips and D. Crisp, personal observations).	
Sources of information: See cited literature. Also gave consideration to personal communication with B. Phillips (Zone Botanist, U.S. Department of Agriculture, Forest Service, Coconino, Kaibab, and Prescott National Forests, Flagstaff, Arizona) and personal observations by D. Crisp (Botanist, U.S. Department of Agriculture, Forest Service, Coconino National Forest, Flagstaff, Arizona).	

Question 2.7 Other regions invaded	<i>Score: C Doc'n Level: Rev. sci. pub.</i>
Identify other regions: This species is now found in all 48 contiguous United States and in many foreign countries where it is exotic.	
Rationale: Bull thistle has been studied as an invasive exotic in New Zealand (Michaux, 1989), Australia (George et al. 1970), Argentina (Laterra and Solbrig 2001, Petryna et al. 2002), and Canada (Doucet and Cavers 1996, Manku 1998, Downs and Cavers 2000). Bull thistle was documented in	

herbarium collections in the northwestern United States in 1882 in Oregon (Mitich 1998) and then spread eastward into most of the northwestern United States (Forcella and Harvey 1988). Today it is widespread throughout the United States and Canada (Whitson et al. 1996). It is listed as a noxious weed in 10 states. This species invades elsewhere but only in ecological types already invaded in Arizona.

Sources of information: See cited literature.

Question 3.1 Ecological amplitude Score: **A** Doc'n Level: **Obs.**

Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Observed in montane conifer forests, montane riparian areas and wetlands, and along lake shores.

Rationale: Widespread throughout the ponderosa pine forests (montane conifer forests) of northern Arizona (Crisp 2004). Also observed along lake shores (D. Crisp, personal observation) and in montane riparian areas (B. Phillips and D. Crisp, personal observations), and in wetlands.

Sources of information: See cited literature. Also gave consideration to personal communication with B. Phillips (Zone Botanist, U.S. Department of Agriculture, Forest Service, Coconino, Kaibab, and Prescott National Forests, Flagstaff, Arizona) and personal observations by D. Crisp (Botanist, U.S. Department of Agriculture, Forest Service, Coconino National Forest, Flagstaff, Arizona).

Question 3.2 Distribution Score: **C** Doc'n Level: **Obs.**

Describe distribution: See worksheet B.

Rationale: See question 3.1.

Sources of information: See question 3.1.

Worksheet A. Reproductive Characteristics

Complete this worksheet to answer Question 2.4.

Reaches reproductive maturity in 2 years or less	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Dense infestations produce >1,000 viable seed per square meter	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	2 pt.
Populations of this species produce seeds every year.	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Seed production sustained for 3 or more months within a population annually	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Seeds remain viable in soil for three or more years	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	2 pt.
Viable seed produced with <i>both</i> self-pollination and cross-pollination	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Fragments easily and fragments can become established elsewhere	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	2 pt.
Resprouts readily when cut, grazed, or burned	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Total pts: 6 Total unknowns: 0			
Score : A			

Note any related traits:

Worksheet B. Arizona Ecological Types

(*sensu* Brown 1994 and Brown et al. 1998)

Major Ecological Types	Minor Ecological Types	Code*
Dunes	dunes	
Scrublands	Great Basin montane scrub	
	southwestern interior chaparral scrub	
Desertlands	Great Basin desertscrub	
	Mohave desertscrub	
	Chihuahuan desertscrub	
	Sonoran desertscrub	
Grasslands	alpine and subalpine grassland	
	plains and Great Basin shrub-grassland	
	semi-desert grassland	
Freshwater Systems	lakes, ponds, reservoirs	D
	rivers, streams	
Non-Riparian Wetlands	Sonoran wetlands	
	southwestern interior wetlands	
	montane wetlands	D
	playas	
Riparian	Sonoran riparian	
	southwestern interior riparian	
	montane riparian	C
Woodlands	Great Basin conifer woodland	
	Madrean evergreen woodland	
Forests	Rocky Mountain and Great Basin subalpine conifer forest	
	montane conifer forest	C
Tundra (alpine)	tundra (alpine)	

*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).

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