

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>Onopordum acanthium</i> L. (USDA 2005)
Synonyms:	None identified in USDA (2005).
Common names:	Scotch thistle, Scotch cotton thistle, Scots cottonthistle, cotton thistle, wooly thistle, downy thistle, silver thistle, winged thistle, Queen Mary’s thistle, heraldic thistle, asses’ thistle
Evaluation date (mm/dd/yy):	03/15/05
Evaluator #1 Name/Title:	Debra Crisp, Botanist
Affiliation:	USDA Forest Service, Coconino National Forest
Phone numbers:	(928) 527-3424
Email address:	dcrisp@fs.fed.us
Address:	1824 S. Thompson St., Flagstaff, Arizona 86001
Evaluator #2 Name/Title:	Dr. Francis E. Northam
Affiliation:	Weed Biology consultant
Phone numbers:	480/947-3882
Email address:	fnortham@msn.com
Address:	216 E. Taylor St., Tempe, Arizona 85281
List committee members:	P. Fenner, J. Hall, L. Making, F. Northam, T. Olson, G. Russell
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	Observational	<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	Other published material		
1.3	Impact on higher trophic levels	C	Other published material		
1.4	Impact on genetic integrity	D	Other published material		
				<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>14 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	Other published material		
2.2	Local rate of spread with no management	B	Observational		
2.3	Recent trend in total area infested within state	B	Observational		
2.4	Innate reproductive potential	B	Reviewed scientific publication		
2.5	Potential for human-caused dispersal	A	Other published material		
2.6	Potential for natural long-distance dispersal	C	Observational		
2.7	Other regions invaded	B	Other published material		
				<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: Obs.
<p>Identify ecosystem processes impacted: No documentation of impacts found in published literature. However numerous authors noted that this species establishes in areas subjected to extensive disturbance of soil surfaces such as cultivated pastures (Parsons 1973), rights-of-way, disturbed areas (Stubbendieck et al. 1994) and is especially abundant in disturbed habitats with high soil moisture (Beck 1999).</p>	
<p>Rationale: Based on inferences from the above citations, wildland sites where soil surfaces have been cleared of native vegetation by activities such as timber harvest, wildfires, fire-suppression operations with bulldozers, livestock trampling, pipeline construction or hiking/camping activities can be impacted by <i>Onopordum acanthium</i> removal of soil moisture and nutrients or through sunlight interception by dense foliage. This indicates Scotch thistle impacts will be restricted to recovery and restoration following intense disturbance to wildland soils.</p>	
<p>Sources of information: See cited literature. Score based on inference drawn from the literature.</p>	
Question 1.2 Impact on plant community composition, structure, and interactions	Score: C Doc'n
<p>Level: Other pub.</p>	
<p>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.</p>	
<p>Rationale: Scotch thistle can alter the composition, structure and function of the invaded plant community. Scotch thistle favors disturbed sites especially in areas of high soil moisture; however, dry sites also may be invaded. Scotch thistle is often associated with areas invaded by non-native annual grasses, such as cheatgrass (<i>Bromus tectorum</i>), in areas where annual grasses have displaced native sod-forming species (Beck 1999). Invading plants can compete with native species for water, light, nutrients, pollinators and space (Staphanian et al. 1998).</p>	
<p>Sources of information: See cited literature.</p>	
Question 1.3 Impact on higher trophic levels	Score: C Doc'n Level: Other pub.
<p>Identify type of impact or alteration: Mature plants are avoided by grazing animals, and compete with native forage plants.</p>	
<p>Rationale: Infestations of Scotch thistle may prevent or discourage access to suitable areas for grazing because of its spiny nature (Stubbendieck et al. 1994, Beck 1999). Dense colonies of Scotch thistle can reduce or eliminate desirable forage species (Julian and Rife Undated). Invading plants can compete with native species for water, light, nutrients, pollinators and space (Staphanian et al. 1998).</p>	
<p>Sources of information: See cited literature. Also considered information from J. Julian and J. Rife. Undated. Integrated weed management of Scotch Thistle. Douglas County Cooperative Extension, Castle Rock, Colorado. Available online at: http://www.douglas.co.us/DC/PublicWorks/Weeds/scotch_thistle.htm; accessed March 16, 2005.</p>	
Question 1.4 Impact on genetic integrity	Score: D Doc'n Level: Other pub.
<p>Identify impacts: No known hybridization.</p>	
<p>Rationale: No native plants in the genus <i>Onopordum</i> are known to exist in Arizona (Kearny and Peebles 1960). Although three species of the genus <i>Onopordum</i> (<i>O. acanthium</i> L., <i>O. illyricum</i> L., and <i>O. tauricum</i> Willd.) are known to occur in the U.S., all of these are introduced (USDA 2005). The absence of closely related native relatives reduces the chance of hybridization or introgression between non-native and native plants. No data were found to indicate that the three known introduced species hybridize.</p>	
<p>Sources of information: See cited literature.</p>	

Question 2.1 Role of anthropogenic and natural disturbance in establishment <i>Level: Other pub.</i>	<i>Score: B Doc'n</i>
Describe role of disturbance: Disturbance is necessary for Scotch thistle to establish. This can be either natural or anthropogenic disturbance.	
Rationale: Beck (1999) stated that disturbance favors the establishment of Scotch thistle. Biennial species including most thistles benefit from disturbance which provides “safe sites” for establishment (van der Meijden et al. 1992). Also see question 1.1. Numerous stream environments where human or natural flood activity has disturbed riparian soil are colonized in Arizona at elevations above 4000 feet (F. Northam, personal observation, 2005).	
Sources of information: See cited literature. Also considered personal observations of F. Northam while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000–2003 (Weed Biologist, Tempe, Arizona, 2005).	

Question 2.2 Local rate of spread with no management	<i>Score: B Doc'n Level: Obs.</i>
Describe rate of spread: Moderate depending on disturbance frequency.	
Rationale: No published rates of spread were found; however, observational information provided for the Prineville District, Bureau of Land Management (Julian and Rife Undated) indicates the potential to spread is high. Local spread in northern Arizona in the recent past has been clearly observable (D. Crisp, personal observation, 2004).	
Intense flooding as occurred during the winter of 2004–2005, or activities such as constructing stream crossings, mining sand/gravel, trampling riparian vegetation by livestock grazing or recreational vehicle traffic can create sites where <i>O. acanthium</i> will readily colonize (F. Northam, personal observation, 2005).	
Sources of information: See cited literature. Also considered personal observations of F. Northam while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000–2003 (Weed Biologist, Tempe, Arizona, 2005) and D. Crisp (Botanist, U.S. Department of Agriculture, Forest Service, Coconino National Forest, Flagstaff, Arizona, 2004) and information from J. Julian and J. Rife. Undated. Integrated weed management of Scotch Thistle. Douglas County Cooperative Extension, Castle Rock, Colorado. Available online at: http://www.douglas.co.us/DC/PublicWorks/Weeds/scotch_thistle.htm ; accessed March 16, 2005.	

Question 2.3 Recent trend in total area infested within state	<i>Score: B Doc'n Level: Obs.</i>
Describe trend: Numerous locations of Scotch thistle documented in the northern half of the state (CAIN 2005, SEINet 2005).	
Rationale: Scotch thistle occupies many disturbed areas along roadways, vacant lots, and other disturbed areas in northern Arizona, but the statewide trend in wildlands has not been documented. Three specimens, however, included within Arizona herbaria records were collected from streamside sites between 1961 and 2000 (SEINet 2005). Also see observations reported in questions 2.1 and 2.2. Based on inference based on the assumed continuance of natural flood disturbances, plus continuance of human alteration of riparian areas at elevations of 4,000 to 8,000 feet, it is concluded that Scotch thistle populations are increasing. It cannot be assumed, however, that the rate is doubling each year; as a result, a rating of “increasing but less rapidly than doubling in total range in <10 years” is assigned.	
Sources of information: [CAIN] California Information Node, CRISIS Maps accessed through Southwest Exotic Plant Information Clearinghouse (available online at: http://www.usgs.nau.edu/SWEPIC/swemp/maps.html ; accessed 2005). Also considered information from SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections ; accessed 2005). Score based on inference drawn from observations.	

Question 2.4 Innate reproductive potential	<i>Score: B Doc'n Level: Rev. sci. pub.</i>
Describe key reproductive characteristics: Reproduction is solely from seed and is a monocarpic biennial. Individual plants reproduce only once during a lifetime. No information was found that indicates this species reproduces vegetatively or by apomixis.	
Rationale: Scotch thistle reproduces solely from seed (Beck 1999). Emergence of <i>Onopordum acanthium</i> from seeds is variable and complex and depends on factors including photoperiod, soil, genetics and depth of burial. The seeds have an impermeable seed coat that must be dissolved by water before germination can occur. The thickness of the seed coat is also thought to be genetically controlled (Qaderi et al. 2002). Seed longevity in the seed bank is affected by depth of burial; seeds buried at 3 cm or deeper can remain viable for several years (Qaderi et al. 2002). Young and Evans (1969) reported Scotch thistle produced 110 to 140 seeds per head and plants produced 70 to 310 heads/plant; however, similar levels seed production has not been documented in Arizona.	
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: Water, wind, livestock and human activities disperse Scotch thistle seed (Beck 1999).	
Rationale: Recreational vehicles, gravel trucks, livestock fur and hunting/fishing/hiking activities provide numerous opportunities for transporting scotch thistle seed. Local dispersal may be from seeds dispersed by vehicles, by contaminated seed or hay, or by water (D. Crisp, personal observation, 2004).	
Sources of information: See cited literature. Also considered personal observations of D. Crisp (Botanist, U.S. Department of Agriculture, Forest Service, Coconino National Forest, Flagstaff, Arizona, 2004).	

Question 2.6 Potential for natural long-distance dispersal	<i>Score: C Doc'n Level: Obs.</i>
Identify dispersal mechanisms: Long distance dispersal may occur via attachment to animal fur.	
Rationale: Seeds are equipped with pappi, specialized attachments that provide occasional opportunity for dispersal in the fur of livestock (Parsons 1973). Based on this information it is inferred that Arizona wildlife can transport seed <1 km; however, no information was found indicating wildlife graze this plant. Furthermore, <i>O. acanthium</i> plants are so uncomfortable because of their spines that animals will not walk through dense populations (Stubbendieck et al. 1994). Even though the potential exists for long distance animal dispersal, it is most likely an infrequent occurrence.	
Sources of information: See cited literature. Score based on inference drawn from the literature.	

Question 2.7 Other regions invaded	<i>Score: B Doc'n Level: Other pub.</i>
Identify other regions: <i>Onopordum acanthium</i> populations have been detected in 39 of the 48 contiguous states of the U.S. (USDA 2005). In Utah, <i>O. acanthium</i> invades sagebrush (<i>Artemisia</i> spp.) ecological types that are similar to Great Basin desertscrub in Arizona. In addition, Utah has native plant communities invaded by <i>O. acanthium</i> at elevations of 3700 to 7000 feet that includes an ecological type similar to southwestern interior chaparral scrub in Arizona (Welsh et al. 1993). Both Great Basin desertscrub and southwestern interior chaparral scrub are not yet invaded by <i>O. acanthium</i> in Arizona.	
<i>Onopordum acanthium</i> occurs in the Australian states of Victoria, New South Wales, and Tasmania in regions with 20 to 35 inches of rainfall per year (Parsons 1973).	
Rationale: Two major and two minor Arizona ecological types do not have <i>Onopordum acanthium</i> populations, but similar areas elsewhere in North America do have wildlands with established populations of Scotch thistle.	
Sources of information: See cited literature.	

<p>Question 3.1 Ecological amplitude</p>	<p>Score: A Doc'n Level: Obs.</p>
<p>Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Five major ecological types and six minor types—plains and Great Basin shrub-grassland, montane wetlands, montane riparian, Great Basin conifer woodland, Madrean evergreen woodland, and montane conifer forest—are known to have <i>O. acanthium</i> populations in wildlands. Most of the herbarium specimens, however, are from roadside rights-of-way.</p>	
<p>Rationale: The oldest Arizona herbarium record for <i>O. acanthium</i> was collected in 1961 and the second one was in 1976 (SEINet 2005). Nineteen additional specimens were deposited in Arizona herbaria between 1986 and 2000, but only three were from wildland sites. Additional evidence of ecological amplitude was obtained from field observations (D. Crisp, personal observation, 2004; F. Northam, personal observation, 2005).</p>	
<p>Sources of information: SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed 2005). Also considered personal observations of F. Northam while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000–2003 (Weed Biologist, Tempe, Arizona, 2005) and D. Crisp (Botanist, U.S. Department of Agriculture, Forest Service, Coconino National Forest, Flagstaff, Arizona, 2004).</p>	
<p>Question 3.2 Distribution</p>	<p>Score: C Doc'n Level: Obs.</p>
<p>Describe distribution: Populations have been observed in six minor Arizona ecological types (see question 3.1 and Worksheet B). Within all ecological types infested, the degree of Scotch thistle occurrence frequency is in all cases less than 20%.</p>	
<p>Rationale: Observed in disturbed areas in Ponderosa pine forests and pinyon-juniper woodlands, along the Rio de Flag drainage in Flagstaff (D. Crisp, personal observation, 2004), and around at least one spring in the Stoneman Lake area (Lutz 1997). Herbarium specimen locations from Granite Creek in Prescott and in plains and Great Basin shrub-grassland in northwest Mohave County (Arizona Strip) are available in SEINet (2005). Current distribution data indicate seed sources are available in disturbed areas through out Arizona ecological types above 4500 feet. New Scotch thistle populations are likely to encroach into future road construction sites, fire abatement trails, pipeline scars, landscaped camp grounds/recreational areas, military operations, etc in lands presently dominated with native plant vegetation. As a result, the currently limited distribution of Scotch thistle has the potential to increase.</p>	
<p>Sources of information: SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed 2005). Also considered personal observations of D. Crisp (Botanist, U.S. Department of Agriculture, Forest Service, Coconino National Forest, Flagstaff, Arizona, 2004) and information from D. Lutz. 1997. Noxious Weed Survey, Coconino National Forest. Unpublished document on file at Supervisor's Office, Coconino National Forest, Flagstaff, Arizona.</p>	

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: 4 Total unknowns: 2			
Score : B			

Note any related traits: No data were found on pollination mechanisms for Scotch thistle. Heslop-Harrison (1978) stated that members of the family Asteraceae have a genetically controlled system that makes the plants self incompatible; however, self-pollination has been documented in bull thistle (*Cirsium vulgare*) (van Leeuwen 1981).

Populations are assumed to be cohorts so all plants in the population would produce seed within the same years, as opposed to continual reproduction as in a perennial plant.

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	D
	semi-desert grassland	
Freshwater Systems	lakes, ponds, reservoirs	
	rivers, streams	
Non-Riparian Wetlands	Sonoran wetlands	
	southwestern interior wetlands	
	montane wetlands	C
	playas	
Riparian	Sonoran riparian	
	southwestern interior riparian	
	montane riparian	C
Woodlands	Great Basin conifer woodland	C
	Madrean evergreen woodland	D
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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