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)**:**	*Leucanthemum vulgare* Lam. (USDA 2005)
Synonyms:	*Chrysanthemum leucanthemum* L., *Chrysanthemum leucanthemum* L. var. *boecheri* Boivin, *Chrysanthemum leucanthemum* L. var. *pinnatifidum* Lecoq & Lamotte, *Leucanthemum leucanthemum* (L.) Rydb., *Leucanthemum vulgare* Lam. var. *pinnatifidum* (Lecoq & Lamotte) Moldenke (USDA 2005)
Common names:	Oxeye daisy, field daisy, white daisy
Evaluation date (mm/dd/yy)**:**	4/15/04
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List committee members:	04/16/04: W. Albrecht, D. Backer, J. Crawford, J. Hall, F. Northam, T. Olson, K. Watters 06/23/04: W. Albrecht, D. Backer, J. Brock, J. Busco, J. Hall, C. Laws, B. Phillips, K. Watters
Committee review date:	04/16/04 and 06/23/04
List date:	06/23/04
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	**D**	Observational	**"Impact"** **Section 1 Score:** **C**	**"Plant Score"** **Overall Score:** **Low** **Alert Status:** **None**
1.2	Impact on plant community	**C**	Other published material		
1.3	Impact on higher trophic levels	**D**	Observational		
1.4	Impact on genetic integrity	**D**	Other published material		
2.1	Role of anthropogenic and natural disturbance	**C**	Other published material	**"Invasiveness"** *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:* **12 pts** **Section 2 Score:** **B**	
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	**A**	Other published material		
2.5	Potential for human-caused dispersal	**B**	Other published material		
2.6	Potential for natural long-distance dispersal	**C**	Other published material		
2.7	Other regions invaded	**C**	Other published material		RED FLAG **NO** Something you should know.
3.1	Ecological amplitude	**A**	Observational	**"Distribution"** **Section 3 Score:** **B**	
3.2	Distribution	**D**	Observational		

Table 3. Documentation

Question 1.1 Impact on abiotic ecosystem processes *Score:* **D** *Doc'n Level:* **Obs.**
Identify ecosystem processes impacted: Negligible perceived impact on ecosystem processes.
Rationale: Ecological, environmental, economical and sociological impacts are not well documented (Olson and Wallander 1999, Krueger and Sheley 2002). "Bare soil is more prominent in areas with high densities of oxeye daisy so the potential for soil erosion is increased" (Olson and Wallander 1999). Because of a relatively small tap root compared to fibrous roots of grasses, a heavy infestation may reduce the amount of organic matter contributed belowground annually, and in turn slow the rate of nutrient cycling (Olson and Wallander 1999). This information is speculative and no empirical studies in the literature suggest this to be the impact. This plant has been in the U.S. since the early 20th century and appears to be most associated with human-engineered systems (agriculture, pastures, waste areas, etc.); therefore the score assigned is negligible impact (**D**) and not unknown. Mitchell White (personal communication, 2004) conducted research on grassland communities on the Apache-Sitgreaves National Forests and observed no abiotic impacts that could be directly attributed to oxeye daisy other than inter-species competition.
Sources of information: See cited literature. Also considered personal communications with M. White (Rangeland Ecologist, U.S. Department of Agriculture, Forest Service, Apache-Sitgreaves National Forest, Springerville, Arizona, 2004). Score based on inference based on the literature.

Question 1.2 Impact on plant community composition, structure, and interactions *Score:* **C** *Doc'n Level:* **Other pub.**
Identify type of impact or alteration: Potential to compete with natives and form dense stands.
Rationale: Ecological, environmental, economical and sociological impacts are not well documented (Olson and Wallander 1999, Krueger and Sheley 2002). Yet the preceding authors both state that oxeye daisy has become an aggressive competitor and often forms dense patches especially in areas grazed by cattle (not specifically stated where this has occurred but Olson's research has been predominantly in southwest Montana and Idaho, and Krueger and Sheley are from Montana State University). Oxeye daisy is a common weed of disturbed areas but is increasingly becoming a problem in western rangelands (including pastures and meadows), particularly in Montana (Krueger and Sheley 2002). In California oxeye daisy displaces native plant species, growing so densely it excludes other vegetation (Alvarez 2000). In Colorado at Rocky Mountain National Park, the infestation forms dense mats and it is likely to be displacing native forbs (J. Knudson, personal communication, 2004). Can not compete with established vegetation on more fertile soils (Olson and Wallander 1999). Ground cover (litter or vegetation) can prevent establishment (Reader 1991 in Alvarez 2000). Has low shade tolerance (Olson and Wallander 1999). Mitchell White (personal communication, 2004) conducted research on grassland communities on the Apache-Sitgreaves National Forests and observed no abiotic impacts that could be directly attributed to oxeye daisy other than inter-species competition. His research suggested that oxeye daisy was a "secondary species" based on frequency of occurrence, cover and relative composition, in mesic montane grasslands and mesic meadows along riparian bench communities (below 8500 feet) but it did not seem to be altering or impacting plant communities in any noticeable way other than site occupation.
Sources of information: See cited literature. Also considered personal communications with J. Knudson (Exotic Biological Tech, National Park Service, Rocky Mountain National Park, 2004) and M. White (Rangeland Ecologist, U.S. Department of Agriculture, Forest Service, Apache-Sitgreaves National Forest, Springerville, Arizona, 2004).

Question 1.3 Impact on higher trophic levels *Score:* **D** *Doc'n Level:* **Obs.**
Identify type of impact or alteration: Negligible
Rationale: Ecological, environmental, economical and sociological impacts are not well documented (Olson and Wallander 1999, Krueger and Sheley 2002). Although cattle may not eat the species, other livestock do but it is unclear if native ungulates use it for forage. Horse, sheep and goats graze on oxeye daisy but cows and pigs tend not to (Howarth and Williams 1968 in Olson and Wallander 1999). Cattle avoid grazing oxeye daisy thus enhancing its natural competitive abilities to occupy sites and ultimately decreasing other forage available for grazing ungulates.
Sources of information: See cited literature. Score based on inference based on the literature.

Question 1.4 Impact on genetic integrity *Score:* **D** *Doc'n Level:* **Other pub.**
Identify impacts: No known hybridization
Rationale: No native congeners
Sources of information: Kearney and Peebles (1960).

Question 2.1 Role of anthropogenic and natural disturbance in establishment *Score:* **C** *Doc'n Level:* **Other pub.**
Describe role of disturbance: First requires an anthropogenic disturbance before it will establish in naturally areas.
Rationale: Abundance is partly related to intensity of cutting or grazing of associated species, suggesting that oxeye daisy requires reduced competition from existing vegetation by grazing or possible a disturbance to establish (Olsen and Wallander 1999). In Rocky Mountain National Park only known in two places, both of which were anthropogenically disturbed (J. Knudson, personal communication, 2004). In areas of the Apache-Sitgreaves National Forests, oxeye daisy establishes in areas where there has been a history of long-term livestock grazing and fire suppression (M. White, personal communication, 2004).
Sources of information: See cited literature. Also considered personal communications with J. Knudson (Exotic Biological Tech, National Park Service, Rocky Mountain National Park, 2004) and M. White (Rangeland Ecologist, U.S. Department of Agriculture, Forest Service, Apache-Sitgreaves National Forest, Springerville, Arizona, 2004).

Question 2.2 Local rate of spread with no management *Score:* **B** *Doc'n Level:* **Obs.**
Describe rate of spread: Increasing but less rapidly than doubling in <10 years.
Rationale: Starts at roadside or at some other human-caused disturbance and then moves into natural areas from there; one example is from Kachina Village (B. Phillips, personal communication, 2004). Lauren Johnson (personal communication, 2004) hasn't observed it below the rim on the portion of the Kaibab National Forest south of the Grand Canyon. In the White Mountains area, oxeye daisy has been increasing over the years as a result of grazing and fire suppression, but oxeye daisy has not been doubling its area of infestation (M. White, personal communication, 2004). At Rocky Mountain National Park, there is no one present that knows the history of the two populations in the park (J. Knudson, personal communication, 2004).
Sources of information: Score based on Working Group consensus and personal observations/ communications by/with B. Phillips (Zone Botanist, U.S. Department of Agriculture, Forest Service, Coconino, Kaibab, and Prescott National Forests, Flagstaff, Arizona, 2004), L. Johnson (U.S. Department of Agriculture, Forest Service, Kaibab National Forest, 2004), M. White (Rangeland Ecologist, U.S. Department of Agriculture, Forest Service, Apache-Sitgreaves National Forest, Springerville, Arizona, 2004), and J. Knudson (Exotic Biological Tech, National Park Service, Rocky Mountain National Park, 2004).

Question 2.3 Recent trend in total area infested within state *Score:* **B** *Doc'n Level:* **Obs.**
Describe trend: Increasing in area infested.
Rationale: Mitchell White (personal communication, 2004) has observed oxeye daisy increasing in range as a function of increased vehicular traffic, road maintenance, and road construction.
Sources of information: Personal communication with M. White (Rangeland Ecologist, U.S. Department of Agriculture, Forest Service, Apache-Sitgreaves National Forest, Springerville, Arizona, 2004). Communication with White took place on August 3, 2004. Although this was after the date the Working Group "signed off" on the scores, they deferred to White for additional comments and rationale relative to question 2.3.

Question 2.4 Innate reproductive potential *Score:* **A** *Doc'n Level:* **Other pub.**
Describe key reproductive characteristics: High reproductive potential.
Rationale: See Worksheet A.
Sources of information: See Worksheet A.

Question 2.5 Potential for human-caused dispersal *Score:* **B** *Doc'n Level:* **Other pub.**
Identify dispersal mechanisms: Sold as ornamental; in seed mixes; contaminated hay/seeds, and along transportation corridors.
Rationale: Sold as an ornamental mainly in seed packets; hay and grain seed contaminant (Olson and Wallander 1999). Has been noted in seed packets in Phoenix nurseries (F. Northam, personal observations, 2004). First cutting of hay in southwest Montana coincides with the beginning of seed set of this species. *Leucanthemum vulgare* is not common in Arizona's agriculture/hay field (Working Group comments). Was once cultivated for natural medicine and used in salads (Krueger and Sheley 2002).
Sources of information: See cited literature. Also considered personal observations by F. Northam (Weed Biologist, Tempe, Arizona, 2004).
Question 2.6 Potential for natural long-distance dispersal *Score:* **C** *Doc'n Level:* **Other pub.**
Identify dispersal mechanisms: Animals and water.
Rationale: Seeds dispersed by wind fall close to the parent plant because the seed lacks a pappus (Olson and Wallander 1999). Seeds are small and fall to the ground up to 2 m from parent plant (Alvarez 2000). Seeds may be carried by animals (Olson and Wallander 1999), water, earth-moving machinery, and human traffic (Alvarez 2000). If the seed head is eaten, less than 40% passing through a cow are viable. Olson suggests that other large ungulates may intentionally or incidentally ingest oxeye daisy and pass the seeds in their feces.
Sources of information: See cited literature.

Question 2.7 Other regions invaded *Score:* **C** *Doc'n Level:* **Other pub.**
Identify other regions: Same ecological types as in Arizona.
Rationale: Native to Europe; introduced in northeastern U.S. Introduced in contaminated seed and as an ornamental. Common along roadsides, waste grounds, and pastures in Montana (Dorn 1984 in Olson and Wallander 1999) and Pacific Northwest (Taylor 1990 in Olson and Wallander 1999). Occurs in meadows, native grasslands, pastures, waste grounds and along railway embankments (Olson and Wallander 1999; don't provide specific regions). In the West *Leucanthemum vulgare* is considered a noxious weed in Colorado, Montana, Washington, and Wyoming (USDA 2005). In California it is found in both the North Coast Range and northern Sierra Nevada from sea level bluffs and canyons to alpine mountain meadows to 7000 feet and from central California into Oregon (Alvarez

2000). Commonly found in disturbed areas and former homesteads (Cowell 1973 and Peck 1961 [reported as 1993] in Alvarez 2000). Rapidly spreads into wildlands and is found in a variety of plant communities including prairie, scrub, wet meadows, riparian forests, and open-canopy forests (Alvarez 2000; mostly likely this is from California).

Julie Knudson (personal communication, 2004) and M. Margo (personal communication, 2004) both noted that oxeye daisy is on the western slopes of Rocky Mountain National Park in two known areas: along a shoreline and in a meadow, both at approximately 8000 feet in elevation. As a result, the plant is in areas that have wet soils and have been disturbed by humans. Maria Alvarez (personal communication, 2004) indicated the plant is plastic, has broad environmental tolerances, and is not limited by elevation. She commented that the plant will adapt to whatever environment it is in (for example, growing a six foot flower stalk in a cottonwood-willow forest). Moreover, she has observed dense patches in riparian areas and open wetland areas (with sedges and rushes) in Yosemite Valley.

Sources of information: See cited literature. Also considered personal communications with J. Knudson (Exotic Biological Tech, National Park Service, Rocky Mountain National Park, 2004), M. Margo (National Park Service, Rocky Mountain National Park, 2004), and M. Alvarez (Natural Resources, National Park Service, Golden Gate National Recreation Area. California, 2004).

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: See below. Earliest record in Arizona herbaria (SEINet 2004) is 1936 in Navajo County, Lakeside.

Rationale: Based on the limited current data for Arizona, the response is based primarily on the herbaria collection records and personal observations of Working Group members.

Locations taken from Arizona herbaria records (SEINet 2004): Lockwood Draw, Coconino County ; Grand Canyon, North Rim, Swamp Ridge, Kaibab National Forest, Coconino County; Upper Ash Creek (below mill site and above Slick Rock), Graham County; Hannigan Meadows, White Mountains, Greenlee County; Apache National Forest on west bank of Black River, White Mountains; Apache County; Lakeside Ranger station in wet meadow near lake shore; Navajo County; 4 miles west of Coronado Trail along Beaver creek, Apache County. Two of these collections were taken from mixed conifer forests (University of Arizona collections) and three from open area near lake or stream. In the Grand Canyon National Park, on the south rim at Grandview Junction (Makarick 1999).

Has a wide edaphic tolerance; more often found on basic or neutral soils (Howarth and Williams 1968 in Olson and Wallander 1999) and has a moderate requirement for nitrogen (Ellenburg 1950 in Olson and Wallander 1999). Unaffected by light frost and tolerates drought well, though it is usually found in more moist areas (Olson and Wallander 1999).

Personal observations: Kachina Village (B. Phillips, personal communication, 2003) and North Rim near Route 64 (K. Watters, personal communication, 2004). At the Apache-Sitgreaves National Forests, observed in research plots in isolated abundance in mesic montane grasslands, mesic meadows, along montane riparian bench communities, and large open grasslands within Ponderosa Pine (M. White, personal communication, 2004).

Sources of information: See cited literature. Also considered personal communications with B. Phillips (Zone Botanist, U.S. Department of Agriculture, Forest Service, Coconino, Kaibab, and Prescott National Forests, Flagstaff, Arizona, 2004), K. Watters (Research Technician, National Park Service, Southern Colorado Plateau Network, Flagstaff, Arizona, 2004), and M. White (Rangeland Ecologist, U.S. Department of Agriculture, Forest Service, Apache-Sitgreaves National Forest, Springerville, Arizona, 2004) (June 2004; B. Phillips, June 2004; and M. White, August 2004) and information from

SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed April 15, 2004). Working Group applied inference based on the literature, herbaria records, and personal observations considered.

Question 3.2 Distribution *Score:* **D** *Doc'n Level:* **Obs.**
Describe distribution: Limited (less than 5% of any ecological type invaded).
Rationale: Oxeye daisy in the montane conifer forest is in the opening between the ponderosa pines (Working Group member's comments). Information is limited to the few known occurrences and no significant "infestation" occurs in Arizona. The Working Group member consensus was that the distribution was limited.
Sources of information: Score based on Working Group member observations and inference.

Worksheet A. Reproductive Characteristics

Complete this worksheet to answer Question 2.4.

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

Total pts: 9 Total unknowns: 1

Score : A

Note any related traits: From Olson and Wallander (1999): resprouts when mowed; reproduces vegetatively; robust plants produce about 26,000 seeds and smaller plants produced from 1300 to 4000 seeds per plant (Dorph-Peterson 1925 in Olson and Wallander 1999). Most seeds (82%) remain viable for at least six years (Toole and Brown 1946 in Olson and Wallander 1999) and by some estimates viability can extend to 20 years (Parsons 1992 in Alvarez 2000). Flowers late spring through late summer (Alvarez 2000).

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	**D**
	plains and Great Basin shrub-grassland	
	semi-desert grassland	
Freshwater Systems	lakes, ponds, reservoirs	
	rivers, streams	
Non-Riparian Wetlands	Sonoran wetlands	
	southwestern interior wetlands	
	montane wetlands	**D**
	playas	
Riparian	Sonoran riparian	
	southwestern interior riparian	**D**
	montane riparian	**D**
Woodlands	Great Basin conifer woodland	
	Madrean evergreen woodland	
Forests	Rocky Mountain and Great Basin subalpine conifer forest	
	montane conifer forest	**D**
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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