

# 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**

<b>Species name</b> (Latin binomial):	<i>Sonchus asper</i> (L.) Hill; <i>Sonchus oleraceus</i> L. (USDA 2005).
<b>Synonyms:</b>	<i>Sonchus asper</i> : None listed in USDA (2005); <i>Sonchus oleraceus</i> : None listed in USDA (2005).
<b>Common names:</b>	<i>Sonchus asper</i> : Spiny sowthistle; prickly sowthistle; <i>Sonchus oleraceus</i> : Annual sowthistle, common sowthistle, sowthistle, pualele.
<b>Evaluation date</b> (mm/dd/yy):	03/25/04; updated 02/05
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<b>Committee review date:</b>	03/26/04 and 03/01/05
<b>List date:</b>	03/26/04; revised 03/01/05 (addressed Consistency Review Panel comments)
<b>Re-evaluation date(s):</b>	

**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	<b>“Impact”</b>  <b>Section 1 Score:</b>  <b>C</b>	<b>“Plant Score”</b>  <b>Overall Score:</b>  <b>Medium</b>  <b>Alert Status:</b>  <b>None</b>
1.2	Impact on plant community	B	Observational		
1.3	Impact on higher trophic levels	D	Observational		
1.4	Impact on genetic integrity	D	Other published material		
				<b>“Invasiveness”</b>  <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>  <b>13 pts</b>  <b>Section 2 Score:</b>  <b>B</b>	  Something you should know.
2.1	Role of anthropogenic and natural disturbance	B	Observational		
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	C	Observational		
2.6	Potential for natural long-distance dispersal	B	Other published material		
2.7	Other regions invaded	C	Observational		
				<b>“Distribution”</b>  <b>Section 3 Score:</b>  <b>A</b>	
3.1	Ecological amplitude	A	Observational		
3.2	Distribution	A	Observational		

**Table 3. Documentation**

**Note:** Most of the literature discussing sowthistles grouped the annuals *Sonchus asper* and *S. oleraceus* with the perennial *S. arvensis* (which includes the subspecies *S. arvensis arvensis* and *S. arvensis uliginosus* [USDA 2005]). *Sonchus arvensis* is listed as a noxious weed in many states, including Arizona. Impacts, growth responses, and invasiveness are not distinguished between the different species of *Sonchus*. Most of the descriptions simply refer to sowthistle and the assumption is that in general the authors are likely referring to *S. arvensis*.

*Sonchus asper* and *S. oleraceus* are evaluated together because they are similar in most respects with the exception of a few subtle morphology characteristics. They are often difficult to distinguish because of the high degree of within species variability. Both sowthistles have a milky sap that is secreted if the stem is broken. *Sonchus asper* is more abundant in Arizona than is *S. oleraceus* (Makarick 1999).

<b>Question 1.1</b> Impact on abiotic ecosystem processes	Score: <b>D</b> Doc'n Level: <b>Obs.</b>
<b>Identify ecosystem processes impacted:</b> Negligible.	
<b>Rationale:</b> Based on the facts that 1) sowthistles have been present in North America since the late 1800s; 2) various research has been conducted on these species (see below and Hutchinson et al. 1984) with none mentioning abiotic impacts; and 3) no documentation exists suggesting there are any impacts on abiotic ecosystems, it is inferred that the impacts are negligible.	
<b>Sources of information:</b> See cited literature. Score based on inference based on the literature.	
<b>Question 1.2</b> Impact on plant community composition, structure, and interactions	Score: <b>B</b> Doc'n Level: <b>Obs.</b>
<b>Identify type of impact or alteration:</b> Native plant displacement and competition for resources.	
<b>Rationale:</b> Lori Makarick (personal communication, 2005) has observed that along the upper stretches of the Colorado River within the Grand Canyon National Park, "populations exist that exclude everything else. Tiny rosettes blanket an entire area." With monotype stand formations, there would be direct competition for resources. This information refers to <i>S. asper</i> and <i>S. oleraceus</i> , but <i>S. arvensis</i> has also been found along the Colorado River and side canyons.	
<p>In Zollinger and Parker (1999) [Note: the following information is assumed to be for <i>Sonchus arvensis</i> because most papers published by Zollinger and collaborators in Zollinger and Parker (1999) are about this perennial species.]: most competitive under abundant precipitation, high soil moisture, and moderate climates; however it can tolerate low moisture levels. Abundant moisture allows established plants to expand rapidly, choking out natural and existing vegetation. "Sowthistle can dominate plant communities by allelopathic processes (Putman and Tang 1986, Zollinger and Kells 1993). Substances that inhibit other plant's seed germination and plant growth are produced by underground roots and the accumulation of toxins from decaying residue from the previous year's growth. As sowthistle infestations expand, allelochems destroy existing vegetation allowing sowthistle rapidly to capture soil space."</p>	
Most of the impact is to agricultural crops (Holm et al. 1991).	
<b>Sources of information:</b> See cited literature. Score based on observations by L. Makarick (Below the Rim Vegetation Program Manager, National Park Service, Grand Canyon National Park Science Center Flagstaff, Arizona, 2005) along the Grand Canyon and its tributaries and inferences based on the literature.	

<b>Question 1.3</b> Impact on higher trophic levels	<i>Score: D Doc'n Level: Obs.</i>
<b>Identify type of impact or alteration:</b> Potential interference with native pollinators yet considered negligible. Sowthistle provides forage.	
<b>Rationale:</b> In Zollinger and Parker (1999): sowthistle is a minor element in the diet of some North American birds (Martin et al. 1951). Some achenes may germinate after ingestion and excretion by birds and animals, serving as minor dispersal agents (Stevens 1926, Salisbury 1964).	
<b>Sources of information:</b> See cited literature. Score based on inference based on the literature.	

<b>Question 1.4</b> Impact on genetic integrity	<i>Score: D Doc'n Level: Other pub.</i>
<b>Identify impacts:</b> No known hybridization.	
<b>Rationale:</b> No known native congeners (Kearney and Peebles 1960). Hybridization between <i>S. asper</i> and <i>S. oleraceus</i> is not known.	
<b>Sources of information:</b> See cited literature.	

<b>Question 2.1</b> Role of anthropogenic and natural disturbance in establishment	<i>Score: B Doc'n Level: Obs.</i>
<b>Describe role of disturbance:</b> Requires natural and/or anthropogenic disturbance to establish.	
<b>Rationale:</b> Pioneering species invading natural habitats and disturbed sites (Zollinger and Parker 1999). <i>Sonchus asper</i> and <i>S. oleraceus</i> are pioneer species, invading human-disturbed sites, over-grazed sites, and naturally disturbed sites; without disturbance, they have a limited habitation on a site (Watt 1981 in Hutchinson et al. 1984).	
Original discussion and score (C) was based on the literature and Working Group member observations that sowthistle first needs to have a human disturbance (typically agriculture or garden) in the area before it can become established under natural disturbance. After further discussion with L. Makarick (personal communication, 2005), the score was changed to a B based on observations in the Grand Canyon National Park. Makarick has observed populations in side canyons where there is no human disturbance and only natural disturbance (flash flooding).	
<b>Sources of information:</b> See cited literature. Also considered personal communication with by L. Makarick (Below the Rim Vegetation Program Manager, National Park Service, Grand Canyon National Park Science Center Flagstaff, Arizona, 2005).	

<b>Question 2.2</b> Local rate of spread with no management	<i>Score: B Doc'n Level: Obs.</i>
<b>Describe rate of spread:</b> Increasing but not doubling in <10years.	
<b>Rationale:</b> According to observations in Grand Canyon National Park (L. Makarick, personal communication, 2004), populations continue to spread, particularly up side canyons. In some areas, particularly areas with excess moisture, <i>Sonchus</i> spp. is increasing (L. Makarick, personal communication, 2005).	
In Zollinger and Parker (1999): two biocontrol insects have been released in Canada to control annual and perennial sowthistles. A limited number of pathogens are available that are specific to sowthistle in North America (Conners 1967). Only one nematode and one virus are known to affect sowthistle.	
<b>Sources of information:</b> See cited literature. Also considered personal communications with by L. Makarick (Below the Rim Vegetation Program Manager, National Park Service, Grand Canyon National Park Science Center Flagstaff, Arizona, 2004 and 2005).	

<b>Question 2.3</b> Recent trend in total area infested within state	<i>Score: B Doc'n Level: Obs.</i>
<b>Describe trend:</b> Increasing, but not doubling area infested in <10 years.	

<p><b>Rationale:</b> Three sowthistle species, <i>S. asper</i>, <i>S. oleraceus</i>, and <i>S. arvensis</i>, are found within the inner canyon of the Grand Canyon National Park. Observations by L. Makarick during 2004 and 2005 (personal communication, 2004 and 2005) suggested that this species is moving into new territory, such as up drainages and to higher up the canyon because of increased stream flows and increased precipitation.</p> <p><i>Sonchus</i> spp. is widespread in North America and most likely within Arizona (except <i>S. arvensis</i> [USDA 2005]); all niches where sowthistles can invade seem to be invaded (Parker 1972, Zollinger and Parker 1999). <i>Sonchus asper</i> was documented in almost all Arizona counties by 1960 (Kearney and Peebles 1960) and all counties by 1972 (Parker 1972). <i>Sonchus oleraceus</i> was listed in six counties by Kearney and Peebles (1960).</p>
<p><b>Sources of information:</b> See cited literature. Also considered personal communications with by L. Makarick (Below the Rim Vegetation Program Manager, National Park Service, Grand Canyon National Park Science Center Flagstaff, Arizona, 2004 and 2005).</p>

<p><b>Question 2.4</b> Innate reproductive potential <span style="float: right;">Score: <b>A</b> Doc'n Level: <b>Other pub.</b></span></p>
<p><b>Describe key reproductive characteristics:</b> Reproduces annually and only by seed; self- and cross-pollination; &gt;1000 seeds per plant.</p>
<p><b>Rationale:</b> <i>Sonchus asper</i> and <i>S. oleraceus</i> germinate each spring, bolt, flower, set seed and complete their life cycle each summer (Boulos 1960 in Zollinger and Parker 1999). See Worksheet A.</p>
<p><b>Sources of information:</b> See cited literature.</p>

<p><b>Question 2.5</b> Potential for human-caused dispersal <span style="float: right;">Score: <b>C</b> Doc'n Level: <b>Obs.</b></span></p>
<p><b>Identify dispersal mechanisms:</b> Low-human dispersal is infrequent or inefficient</p>
<p><b>Rationale:</b> Positive human uses noted in Zollinger and Parker (1999) including eaten as a salad green and fed to animals (Holm et al. 1991). Used medicinally and as food (Zollinger and Parker 1999); evaluated as a potential crop for petrochemical production; contains glycosylglycerides (lipids used for industrial and pharmaceutical purposes (Zollinger and Parker 1999). Although these uses have been demonstrated, no documentation indicates intentional planting.</p>
<p><b>Sources of information:</b> See cited literature. Also considered information from the Illinois Plant Information Network for <i>S. asper</i> and <i>S. oleraceus</i> (D. Ketzner and J. Karnes [data compilers], Illinois Natural History Survey, Champaign, Illinois; available online at: <a href="http://www.fs.fed.us/ne/delaware/ilpin/2846.co">http://www.fs.fed.us/ne/delaware/ilpin/2846.co</a> [and 2847.co, respectively]; accessed March 2004). Score based on inference based on the literature.</p>

<p><b>Question 2.6</b> Potential for natural long-distance dispersal <span style="float: right;">Score: <b>B</b> Doc'n Level: <b>Other pub.</b></span></p>
<p><b>Identify dispersal mechanisms:</b> Wind (primarily); animals; water.</p>
<p><b>Rationale:</b> In Zollinger and Parker (1999): “pappus-born seeds allow for long-distance travel;... pappus may tangle in the feathers of birds or the wool and hair of animals, aiding in long-range dispersal” (see also Hutchinson et al. 1984). Some achenes may germinate after ingestion and excretion by birds and animals, serving as minor dispersal agents (Stevens 1926, Salisbury 1964). Seeds carried by wind or water (Holm et al. 1991); observed floating on water for three days (Ridley 1930 in Guertin and Halvorson 2003). It is also noted that <i>Sonchus</i> spp. seeds may be dispersed by animals after ingestion and passage through their digestive tracts (Salisbury 1964 in Hutchinson et al. 1984). Seed morphology is designed for traveling long distances.</p>
<p><b>Sources of information:</b> See literature cited.</p>

<p><b>Question 2.7</b> Other regions invaded <span style="float: right;">Score: <b>C</b> Doc'n Level: <b>Obs.</b></span></p>
<p><b>Identify other regions:</b> Only those ecological types that are also invaded in Arizona.</p>

<p><b>Rationale:</b> All sources consulted indicated that this plant has been here since the 19<sup>th</sup> century (possibly earlier in other parts of North America) and both <i>S. asper</i> and <i>S. oleraceus</i> exist in all U.S. contiguous states (USDA 2005). Origin is Europe (Stevens 1926 in Zollinger and Parker 1999, Hutchinson et al 1984, Holm et al. 1991) and North Africa (Hutchinson et al 1984, Holm et al. 1991) and tropical and temperate Asia (Hutchinson et al 1984). Introduced to North America in contaminated crops (Boulos 1961 in Zollinger and Parker 1999). Also occurs in Canada, Asia, Africa, Australia, New Zealand (numerous authors; see Zollinger and Parker 1999). Little information available on climatic limitations; “cosmopolitan” distribution indicates a broad tolerance of variation (Zollinger and Parker 1999).</p>
<p><b>Sources of information:</b> See cited literature. Score based on inference based on the literature.</p>

<p><b>Question 3.1</b> Ecological amplitude</p>	<p>Score: <b>A</b> Doc'n Level: <b>Obs.</b></p>
<p><b>Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known:</b> <i>Sonchus asper</i> and <i>S. oleraceus</i> have broad ecological amplitudes. each occurs within a number of ecological types. Earliest record for <i>S. asper</i> is 1892 (Pima County, Tucson in association with riparian desertscrub) and for <i>S. oleraceus</i> the earliest record is 1882 (Pima County, Tucson) (SEINet 2004). <i>Sonchus oleraceus</i> was established in California by 1824 (Frenkel 1977 in Burgess et al. 1991). It was present in Tucson, Arizona by 1897 (Toumey 1897 in Burgess et al. 1991).</p>	
<p><b>Rationale:</b> Both <i>S. asper</i> and <i>S. oleraceus</i> are found throughout the West (several authors). <i>Sonchus asper</i> occurs at elevations that range from 150 to 8000 feet and flowers February through August. It is present in Apache, Cochise, Coconino, Santa Cruz, Pima, and Yuma Counties (Kearney and Peebles 1960). <i>Sonchus oleraceus</i> flowers March through September. It is present in Graham, Cochise, Coconino, Mohave, Pima, and Yuma Counties (Kearney and Peebles 1960). Also see Distribution (question 3.2). Both <i>S. asper</i> and <i>S. oleraceus</i> are found primarily in cultivated fields, gardens, orchards, lawns, roadside and waste places (numerous authors).</p>	
<p><b>Sources of information:</b> See cited literature; also see information in question 3.2. Also considered information from SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: <a href="http://seinet.asu.edu/collections">http://seinet.asu.edu/collections</a>; accessed March 1, 2004; note all records have not yet been entered into the database).</p>	

<p><b>Question 3.2</b> Distribution</p>	<p>Score: <b>A</b> Doc'n Level: <b>Obs.</b></p>
<p><b>Describe distribution:</b> See below.</p>	
<p><b>Rationale:</b> <i>Sonchus asper</i> occurs at elevations that range from 150 to 8000 feet and is present in Apache, Cochise, Coconino, Santa Cruz, Pima, and Yuma Counties (Kearney and Peebles 1960). At Organ Pipe Cactus National Monument, <i>S. asper</i> can be found in wet places near springs and ponds, along washes, in old fields, under trees, and less frequently on sandy flats (Felger 1990).</p> <p><i>Sonchus oleraceus</i> is present in Graham, Cochise, Coconino, Mohave, Pima, Yuma counties (Kearney and Peebles 1960). At Organ Pipe Cactus National Monument, <i>Sonchus oleraceus</i> can be found with <i>S. asper</i> in wet places and riparian habitat near springs and ponds, and along washes; and only in exceptionally wet years is it observed away from wetland habitats (Felger 1990). Van Devender et al. (1997) identifies <i>S. oleraceus</i> as a riparian zone species.</p> <p>In the Grand Canyon National Park, <i>S. asper</i> is listed as occurring in disturbed areas, beaches and dry creek beds in the Inner Canyon from 1200 to 2850 feet. The park herbarium has three specimens: one from Clear Creek from the dry stream bed near Bright Angel Creek and one at Tapeats. The Bright Angel and Tapeats occurrences are in riparian or wetland type of areas. This species is not that abundant in the canyon, but it potentially occurs in all of the desertscrub communities in addition to riparian). <i>Sonchus oleraceus</i> occurs in disturbed areas in the Inner Canyon, but was also found in disturbed areas on the South Rim. It was listed at 104 Mile Canyon and on the South Rim near the El Tovar (Ponderosa</p>	

<p>Pine, which may be a recently recorded occurrence) (L. Makarick, personal communication, 2004).</p> <p>Parker (1972) states <i>S. asper</i> is widespread through out the state especially in the southern counties. Guertin and Halvorson (2003) and Kearney and Peebles (1960) do not document <i>S. oleraceus</i> as present in all Arizona counties.</p> <p><b>Sources of information:</b> See cited literature cited. Also considered personal communication with by L. Makarick (Below the Rim Vegetation Program Manager, National Park Service, Grand Canyon National Park Science Center Flagstaff, Arizona, 2004). Score based on Working Group member observations.</p>
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**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 type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	1 pt.
Fragments easily and fragments can become established elsewhere	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	2 pt.
Resprouts readily when cut, grazed, or burned	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	1 pt.
<b>Total pts: 8</b>			<b>Total unknowns: 0</b>
<b>Score : A</b>			

<p><b>Note any related traits:</b> In Zollinger and Parker (1999): annual sowthistles germinate each spring, bolt, flower, set seed and complete their life cycle each summer (Boulos 1960). Mowing annually once per season will control only annual sowthistles. Broken roots activates new shoot growth, repeated soil disturbance killed plants by causing a relative exhaustion of the vegetation system (various authors).</p> <p>In Parker (1972): reproduces only from seeds. Flowers nearly throughout the year in Arizona, though primarily November to May (<i>S. asper</i>) and from November to February (<i>S. oleraceus</i>).</p> <p>In Guertin and Halvorson (2003): Hutchinson and others (1984) note that both species are self-compatible, and seeds are produced through self-pollination as well as by insect pollinators (bees and flies). <i>Sonchus asper</i> was observed to average 198 achenes/capitulum with the mean number of capitula per plant being 105; the plants produced 23,000±2600 achenes/plant (Salisbury 1942). <i>Sonchus oleraceus</i> was observed to average 140 achenes/capitulum with the mean number of capitula per plant being 44; the plants produced 6100±750 achenes/plant (Salisbury 1942).</p> <p>Seeds remain viable in the soil for more than 5 years (Makarick 1999). <i>S. oleraceus</i>- seeds remain viable for 8 years or more (Holm et al. 1991).</p>
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**Worksheet B. Arizona Ecological Types**

(sensu Brown 1994 and Brown et al. 1998)

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