

ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

Botanical name: *Sonchus asper* (L.) Hill

Common name: spiny sowthistle

Assessors:

Timm Nawrocki Research Technician Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2798	Lindsey A. Flagstad Research Technician Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2786
Matthew L. Carlson, Ph.D. Associate Professor Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2790	

Reviewers:

Ashley Grant Invasive Plant Program Instructor Cooperative Extension Service, University of Alaska Fairbanks 1675 C Street, Anchorage, Alaska 99501 (907) 786-6315	Bonnie M. Million. Alaska Exotic Plant Management Team Liaison Alaska Regional Office, National Park Service, U.S. Department of the Interior 240 West 5 th Avenue Anchorage, Alaska 99501 (907) 644-3452
Gino Graziano Natural Resource Specialist Plant Materials Center, Division of Agriculture, Department of Natural Resources, State of Alaska 5310 S. Bodenburg Spur, Palmer, Alaska 99645 (907) 745-4469	

Date: 10/8/2010

Date of previous ranking, if any: 4T

OUTCOME SCORE:

CLIMATIC COMPARISON

This species is present or may potentially establish in the following eco-geographic regions:

Pacific Maritime	<u>Yes</u>
Interior-Boreal	<u>Yes</u>
Arctic-Alpine	<u>Yes</u>

INVASIVENESS RANKING

	Total (total answered points possible ¹)	Total
Ecological impact	40 (<u>40</u>)	<u>13</u>
Biological characteristics and dispersal ability	25 (<u>25</u>)	<u>14</u>
Ecological amplitude and distribution	25 (<u>25</u>)	<u>14</u>
Feasibility of control	10 (10)	<u>5</u>
Outcome score	100 (<u>100</u>) ^b	<u>46</u> ^a
Relative maximum score ²		<u>46</u>

¹ For questions answered “unknown” do not include point value for the question in parentheses for “total answered points possible.”

² Calculated as $a/b \times 100$

A. CLIMATIC COMPARISON

1.1. Has this species ever been collected or documented in Alaska?

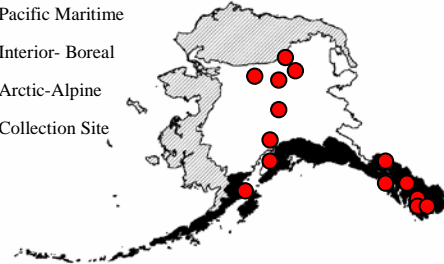
- Yes - continue to 1.2
 No - continue to 2.1

1.2. From which eco-geographic region has it been collected or documented (see inset map)?

Proceed to Section B. INVASIVENESS RANKING

- Pacific Maritime
 Interior-Boreal
 Arctic-Alpine

- Pacific Maritime
□ Interior- Boreal
▨ Arctic-Alpine
● Collection Site



Documentation: *Sonchus asper* has been collected from the Pacific Maritime and Interior-Boreal ecogeographic regions in Alaska (Hultén 1968, AKEPIC 2010, UAM 2010).

2.1. Is there a 40 percent or higher similarity (based on CLIMEX climate matching, see references) between climates where this species currently occurs and:

- a. Juneau (Pacific Maritime region)?
 Yes – record locations and percent similarity; proceed to Section B.
 No
- b. Fairbanks (Interior-Boreal region)?
 Yes – record locations and percent similarity; proceed to Section B.
 No
- c. Nome (Arctic-Alpine region)?
 Yes – record locations and percent similarity; proceed to Section B.
 No

If “No” is answered for all regions; reject species from consideration

Documentation: *Sonchus asper* is apparently restricted to coastal areas north of 64°N in Norway (Lid & Lid 1998) and is only very rarely encountered in northern Scandinavia (Lewin 1948). However, it has been documented from a site 5 km northwest of Lillehammer, Norway, and several locations near Lærdalsøyri, Norway, which have 49% and 45% climatic similarities with Nome, respectively (CLIMEX 1999, Vascular Plant Herbarium Oslo 2010). This species is also known to occur in several locations in Finland that have 40% or greater climatic similarities with Nome (CLIMEX 1999, NatureGate 2010).

B. INVASIVENESS RANKING

1. Ecological Impact

1.1. Impact on Natural Ecosystem Processes

- a. No perceivable impact on ecosystem processes 0
- b. Has the potential to influence ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability) 3

- c. Has the potential to cause significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, degrades habitat important to waterfowl) 7
 - d. Has the potential to cause major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology, hydrology, or affects fire frequency thereby altering community composition; species fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species) 10
 - e. Unknown U
- Score 3

Documentation: *Sonchus asper* is a colonizer of waste places, disturbed sites, roadsides, and cultivated areas (Hutchinson et al. 1984, DiTomaso and Healy 2007, AKEPIC 2010). While it may delay natural successional processes or impede the establishment of native species in disturbed areas, it is unlikely to significantly alter any ecosystem processes.

1.2. Impact on Natural Community Structure

- a. No perceived impact; establishes in an existing layer without influencing its structure 0
 - b. Has the potential to influence structure in one layer (e.g., changes the density of one layer) 3
 - c. Has the potential to cause significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer) 7
 - d. Likely to cause major alteration of structure (e.g., covers canopy, eliminating most or all lower layers) 10
 - e. Unknown U
- Score 3

Documentation: *Sonchus asper* is a colonizer of disturbed sites and may increase the density of colonizers in disturbed areas (Hutchinson et al. 1984).

1.3. Impact on Natural Community Composition

- a. No perceived impact; causes no apparent change in native populations 0
 - b. Has the potential to influence community composition (e.g., reduces the population size of one or more native species in the community) 3
 - c. Has the potential to significantly alter community composition (e.g., significantly reduces the population size of one or more native species in the community) 7
 - d. Likely to cause major alteration in community composition (e.g., results in the extirpation of one or more native species, thereby reducing local biodiversity and/or shifting the community composition towards exotic species) 10
 - e. Unknown U
- Score 2

Documentation: *Sonchus asper* may decrease the number of native plants establishing in disturbed areas because of its rapid maturation and production of many, far-dispersing seeds. In undisturbed areas, it will have no impact (Hutchinson et al. 1984).

1.4. Impact on associated trophic levels (cumulative impact of this species on the animals, fungi, microbes, and other organisms in the community it invades)

- a. Negligible perceived impact 0
- b. Has the potential to cause minor alteration (e.g., causes a minor reduction in nesting or foraging sites) 3
- c. Has the potential to cause moderate alteration (e.g., causes a moderate reduction in habitat connectivity, interferes with native pollinators, or introduces injurious components such as spines, toxins) 7
- d. Likely to cause severe alteration of associated trophic populations (e.g., extirpation or endangerment of an existing native species or population, or significant reduction in nesting or foraging sites) 10
- e. Unknown U

Score

5

Documentation: *Sonchus asper* is a host for several nematode and aphid species and supports several major plant viruses (Hutchinson et al. 1984). The plant is edible and may be grazed by herbivores (Lewin 1948). Because *Sonchus asper* is insect pollinated, its presence could alter plant-pollinator interactions. The leaves have prickly, spiny margins (DiTomaso and Healy 2007).

Total Possible

40

Total

13

2. Biological Characteristics and Dispersal Ability

2.1. Mode of reproduction

- a. Not aggressive (produces few seeds per plant [0-10/m²] and not able to reproduce vegetatively). 0
- b. Somewhat aggressive (reproduces by seed only [11-1,000/m²]) 1
- c. Moderately aggressive (reproduces vegetatively and/or by a moderate amount of seed [<1,000/m²]) 2
- d. Highly aggressive (extensive vegetative spread and/or many seeded [>1,000/m²]) 3
- e. Unknown U

Score

3

Documentation: *Sonchus asper* reproduces by seed only (DiTomaso and Healy 2007). Each plant can produce 20,000 to 26,000 seeds (Hutchinson et al. 1984, Royer and Dickinson 1999).

2.2. Innate potential for long-distance dispersal (wind-, water- or animal-dispersal)

- a. Does not occur (no long-distance dispersal mechanisms) 0
- b. Infrequent or inefficient long-distance dispersal (occurs occasionally despite lack of adaptations) 2
- c. Numerous opportunities for long-distance dispersal (species has adaptations such as pappus, hooked fruit coats, etc.) 3
- d. Unknown U

Score

3

Documentation: Each seed has a pappus. Seeds are primarily dispersed by wind but can also be carried by water or spread after being ingested by birds or small mammals (Hutchinson et al. 1984, DiTomaso and Healy 2007).

2.3. *Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sale of species, use as forage or for revegetation, dispersal along highways, transport on boats, common contaminant of landscape materials, etc.).*

- a. Does not occur 0
- b. Low (human dispersal is infrequent or inefficient) 1
- c. Moderate (human dispersal occurs regularly) 2
- d. High (there are numerous opportunities for dispersal to new areas) 3
- e. Unknown U

Score

Documentation: The pappus becomes sticky when wet. Seeds can be transported by animals on feathers and fur and by humans on clothing, shoes, vehicles, and machinery (Hutchinson et al. 1984, DiTomaso and Healy 2007). *Sonchus asper* has been documented as a contaminant in some commercial grass seed (DiTomaso and Healy 2007). Some seeds remain viable after passing through the digestive systems of livestock animals (Lewin 1948).

2.4. *Allelopathic*

- a. No 0
- b. Yes 2
- c. Unknown U

Score

Documentation: *Sonchus asper* is not allelopathic (Hutchinson et al. 1984, Royer and Dickinson 1999, DiTomaso and Healy 2007).

2.5. *Competitive ability*

- a. Poor competitor for limiting factors 0
- b. Moderately competitive for limiting factors 1
- c. Highly competitive for limiting factors and/or able to fix nitrogen 3
- d. Unknown U

Score

Documentation: *Sonchus asper* is able to compete with native species but only in disturbed areas (Hutchinson et al. 1984).

2.6. *Forms dense thickets, has a climbing or smothering growth habit, or is otherwise taller than the surrounding vegetation.*

- a. Does not grow densely or above surrounding vegetation 0
- b. Forms dense thickets 1
- c. Has a climbing or smothering growth habit, or is otherwise taller than the surrounding vegetation 2
- d. Unknown U

Score

Documentation: *Sonchus asper* does not form thickets, nor does it climb or smother surrounding vegetation (DiTomaso and Healy 2007, AKEPIC 2010).

2.7. Germination requirements

- a. Requires sparsely vegetated soil and disturbance to germinate 0
- b. Can germinate in vegetated areas, but in a narrow range of or in special conditions 2
- c. Can germinate in existing vegetation in a wide range of conditions 3
- d. Unknown U

Score

0

Documentation: *Sonchus asper* only germinates in disturbed areas (Hutchinson et al. 1997) and it has only been observed in disturbed areas in Alaska (AKEPIC 2010).

2.8. Other species in the genus invasive in Alaska or elsewhere

- a. No 0
- b. Yes 3
- c. Unknown U

Score

3

Documentation: *Sonchus arvensis* ssp. *uliginosus* is a ranked invasive species in Alaska with an invasiveness rank of 73. *Sonchus arvensis* and *S. oleraceus* are both known to occur as invasive species in Alaska (AKEPIC 2010). *Sonchus arvensis* is recognized as a noxious weed in 14 U.S. states: AK, AZ, CA, CO, HI, IA, ID, IL, MI, MN, NV, SD, WA, and WY (USDA 2010).

2.9. Aquatic, wetland, or riparian species

- a. Not invasive in wetland communities 0
- b. Invasive in riparian communities 1
- c. Invasive in wetland communities 3
- d. Unknown U

Score

1

Documentation: *Sonchus asper* has been documented growing in riparian communities in California (DiTomaso and Healy 2007).

Total Possible

25

Total

14

3. Ecological Amplitude and Distribution

3.1. Is the species highly domesticated or a weed of agriculture?

- a. Is not associated with agriculture 0
- b. Is occasionally an agricultural pest 2
- c. Has been grown deliberately, bred, or is known as a significant agricultural pest 4
- d. Unknown U

Score

3

Documentation: *Sonchus asper* is a common annual weed in agricultural fields in Canada (Hutchinson et al. 1984) and Europe (Lewin 1948). Historically, it has been grown as a potherb in Europe and as a food source for edible snails (Lewin 1948).

3.2. *Known level of ecological impact in natural areas*

- a. Not known to impact other natural areas 0
- b. Known to impact other natural areas, but in habitats and climate zones dissimilar to those in Alaska 1
- c. Known to cause low impact in natural areas in habitats and climate zones similar to those in Alaska 3
- d. Known to cause moderate impact in natural areas in habitat and climate zones similar to those in Alaska 4
- e. Known to cause high impact in natural areas in habitat and climate zones similar to those in Alaska 6
- f. Unknown U

Score

Documentation: In Canada *Sonchus asper* grows in coastal habitats if they are naturally or anthropogenically disturbed, and in California it grows in some riparian communities and coastal salt marshes. No ecological impacts have been documented (Lewin 1948, Hutchinson et al. 1984, DiTomaso and Healy 2007).

3.3. *Role of anthropogenic and natural disturbance in establishment*

- a. Requires anthropogenic disturbance to establish 0
- b. May occasionally establish in undisturbed areas, readily establishes in naturally disturbed areas 3
- c. Can establish independently of natural or anthropogenic disturbances 5
- e. Unknown U

Score

Documentation: In the U.S., Canada, and much of Europe, *Sonchus asper* primarily grows in disturbed areas, roadsides, waste places, and cultivated fields (Lewin 1948, Hutchinson et al. 1984, DiTomaso and Healy 2007). It can also grow in riparian and coastal habitats and areas that have been naturally disturbed by grazing, digging, or fire (Lewin 1948). *Sonchus asper* has not been documented growing in undisturbed areas in Alaska (AKEPIC 2010).

3.4. *Current global distribution*

- a. Occurs in one or two continents or regions (e.g., Mediterranean region) 0
- b. Extends over three or more continents 3
- c. Extends over three or more continents, including successful introductions in arctic or subarctic regions 5
- e. Unknown U

Score

Documentation: *Sonchus asper* is native to Europe, West Asia, and North Africa. Populations have also been introduced to North America, South America, East Asia, South Africa, Australia, and New Zealand (Hyatt 2006). It has been collected from arctic Scandinavia (University Museums Norway 2010, Vascular Plant Herbarium Oslo 2010).

3.5. *Extent of the species' U.S. range and/or occurrence of formal state or provincial listing*

- a. Occurs in 0-5 percent of the states 0
- b. Occurs in 6-20 percent of the states 2

- c. Occurs in 21-50 percent of the states and/or listed as a problem weed (e.g., “Noxious,” or “Invasive”) in one state or Canadian province 4
 - d. Occurs in more than 50 percent of the states and/or listed as a problem weed in two or more states or Canadian provinces 5
 - e. Unknown U
- Score 5

Documentation: *Sonchus asper* is present in all 50 U.S. states (USDA 2010). All *Sonchus* species are listed as noxious weeds in Ontario (Invaders 2010).

Total Possible 25
 Total 14

4. Feasibility of Control

4.1. Seed banks

- a. Seeds remain viable in the soil for less than three years 0
 - b. Seeds remain viable in the soil for three to five years 2
 - c. Seeds remain viable in the soil for five years or longer 3
 - e. Unknown U
- Score 3

Documentation: Seeds of *Sonchus asper* can survive between 2 and 8 years in the soil in field conditions (DiTomaso and Healy 2007).

4.2. Vegetative regeneration

- a. No resprouting following removal of aboveground growth 0
 - b. Resprouting from ground-level meristems 1
 - c. Resprouting from extensive underground system 2
 - d. Any plant part is a viable propagule 3
 - e. Unknown U
- Score 0

Documentation: *Sonchus asper* does not resprout after the removal of the aboveground portion (Lewin 1948).

4.3. Level of effort required

- a. Management is not required (e.g., species does not persist in the absence of repeated anthropogenic disturbance) 0
 - b. Management is relatively easy and inexpensive; requires a minor investment of human and financial resources 2
 - c. Management requires a major short-term or moderate long-term investment of human and financial resources 3
 - d. Management requires a major, long-term investment of human and financial resources 4
 - e. Unknown U
- Score 2

Documentation: Manually removing plants before they release seeds is an effective control measure for *Sonchus asper* (DiTomaso and Healy 2007). *Sonchus asper* is susceptible to a broad selection of herbicides, although some biotypes may be resistant to herbicides (Hutchinson et al. 1984, Rashid et al. 2003).

Total Possible	10
Total	5

Total for four sections possible	100
Total for four sections	46

References:

- AKEPIC database. Alaska Exotic Plant Information Clearinghouse Database. 2010. Available: <http://akweeds.uaa.alaska.edu/>
- CLIMEX. 1999. CLIMEX for Windows, Predicting the effects of climate on plants and animals, Version 1.1a. CISRO Publishing. Collingwood, Australia.
- DiTomaso, J., and E. Healy. 2007. Weeds of California and Other Western States. Vol. 1. University of California Agriculture and Natural Resources Communication Services, Oakland, CA. 834 p.
- Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, CA. 1008 pp.
- Hutchinson, I., J. Colosi, and R. Lewin. 1984. The Biology of Canadian Weeds. 63. *Sonchus asper* (L.) Hill and *S. oleraceus* L. Canadian Journal of Plant Science. 64(3). 731-744 p.
- Hyatt, P. 2006. *Sonchus asper* (L.) Hill. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 12+ vols. New York and Oxford. Vol. 19, p. 275.
- Invaders Database System. 2010. University of Montana. Missoula, MT. <http://invader.dbs.umt.edu/>
- ITIS. 2010. Integrated Taxonomic Information System. <http://www.itis.gov/>
- Klinkenberg, B. (Editor) 2010. *Sonchus asper* (L.) Hill. In: E-Flora BC: Electronic Atlas of the Plants of British Columbia. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia. Vancouver, BC. [10 September 2010] Available: <http://www.geog.ubc.ca/biodiversity/eflora/index.shtml>
- Lewin, R. 1948. The Biological Flora of the British Isles *Sonchus* L. Journal of Ecology. 36(1). 203-223 p.
- Lid, J. and D. T. Lid. 1998. Flora of Norway. Det Norske Samlaget, Oslo. Pp. 1014.
- NatureGate. 2010. Finland Nature and Species. Helsinki, Finland. [4 October 2010] Available: <http://www.luontoportti.com/suomi/en/>
- Rashid, A., J. Newman, J. O'Donovan, D. Robinson, D. Maurice, D. Poisson, L. Hall. 2003. Sulfonylurea herbicide resistance in *Sonchus asper* biotypes in Alberta, Canada. Weed Research. 43(3). 214-220 p.
- Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta Press. Edmonton, AB. 434 p.
- UAM. 2010. University of Alaska Museum, University of Alaska Fairbanks. Available: <http://arctos.database.museum/home.cfm>
- University Museums of Norway. 2010. Accessed through GBIF (Global Biodiversity Information Facility) data portal (<http://data.gbif.org/datasets/resource/1996>, 2010-09-15). Oslo, Norway.
- USDA. 2010. The PLANTS Database. National Plant Data Center, Natural Resources Conservation Service, United States Department of Agriculture. Baton Rouge, LA. <http://plants.usda.gov>
- Vascular Plant Herbarium, Oslo. 2010. Accessed through GBIF (Global Biodiversity Information Facility) data portal (<http://data.gbif.org/datasets/resource/1078>, 2010-09-15). Natural History Museum, University of Oslo. Oslo, Norway.