

WEED RISK ASSESSMENT FORM

| | | |
|-----------------|--|--|
| Botanical name: | <i>Tragopogon dubius</i> Scop. | |
| Common name: | yellow salsify, goat's beard | |
| Assessors: | Irina Lapina Botanist, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 tel: (907) 257-2710; fax (907) 257-2789 | Matthew L. Carlson, Ph.D. Assistant Professor, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 tel: (907) 257-2790; fax (907) 257-2789 |
| Reviewers: | Michael Shephard Vegetation Ecologist Forest Health Protection State & Private Forestry 3301 C Street, Suite 202, Anchorage, AK 99503 (907) 743-9454; fax 907 743-9479 | Jeff Conn, Ph.D. Weed Scientist, USDA Agricultural Research Service PO Box 757200 Fairbanks, Alaska 99775 tel: (907) 474-7652; fax (907) 474-6184 |
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| | Julie Riley Horticulture Agent, UAF Cooperative Extension Service 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6306 | |

Outcome score:

| A. Climatic Comparison | | |
|---|-----|----|
| This species is present or may potentially establish in the following eco-geographic regions: | | |
| 1 South Coastal | Yes | |
| 2 Interior-Boreal | Yes | |
| 3 Arctic-Alpine | | No |

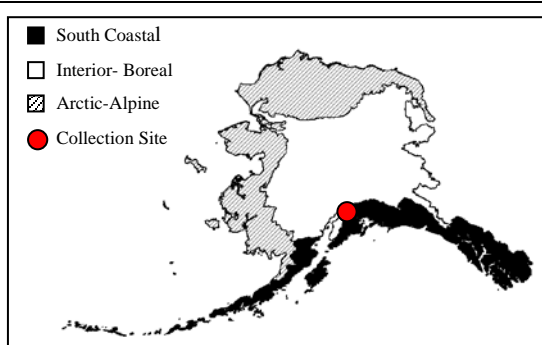
| B. | Invasiveness Ranking | Total (Total Answered*) Possible | Total |
|----|---|----------------------------------|-----------------|
| 1 | Ecological impact | 40 (40) | 20 |
| 2 | Biological characteristic and dispersal ability | 25 (25) | 11 |
| 3 | Ecological amplitude and distribution | 25 (25) | 16 |
| 4 | Feasibility of control | 10 (10) | 3 |
| | Outcome score | 100 (100) ^b | 50 ^a |
| | Relative maximum score [†] | | 0.50 |

* For questions answered "unknown" do not include point value for the question in parentheses for "Total Answered Points Possible."

[†] Calculated as ^a/_b.

A. CLIMATIC COMPARISON:

| | |
|-----|---|
| | 1.1 Has this species ever been collected or documented in Alaska? |
| Yes | Yes – continue to 1.2 |
| | No – continue to 2.1 |
| | 1.2. Which eco-geographic region has it been collected or documented (see inset map)? <i>Proceed to Section B. Invasiveness Ranking.</i> |
| | South Coastal |
| Yes | Interior-Boreal |
| | Arctic-Alpine |



Documentation: *Tragopogon dubius* has been collected along Turnagain Arm in Interior-Boreal ecogeographic region (AKWD 2004, UAM 2004).

Sources of information:

AK Weeds Database. 2004. Database of exotic vegetation collected in Alaska. University of Alaska, Alaska Natural Heritage Program – US Forest Service – National Park Service Database. Available: <http://akweeds.uaa.alaska.edu/>

University of Alaska Museum. University of Alaska Fairbanks. 2004. <http://hispidamuseum.uaf.edu:8080/home.cfm>

2.1. Is there a 40% or higher similarity (based on CLIMEX climate matching) between climates anywhere the species currently occurs and

- a. Juneau (South Coastal Region)?
Yes Yes – record locations and similarity; proceed to Section B.
Invasiveness Ranking
No
- b. Fairbanks (Interior-Boreal)?
Yes – record locations and similarity; proceed to Section B.
Invasiveness Ranking
No
- c. Nome (Arctic-Alpine)?
Yes – record locations and similarity; proceed to Section B.
Invasiveness Ranking
No No
– If “No” is answered for all regions, reject species from consideration

Documentation: Range of the species includes Portland, Oregon and Vancouver, British Columbia (Pojar and MacKinnon 1994), which have 41% and 40% climatic match with Juneau, respectively (CLIMEX 1999). It withstands winter temperatures to -28°F and requires 160 frost free days (USDA 2002). Juneau typically has 165 frost free days, and winter extreme temperatures reach -22°F (WRCC 2001). *Tragopogon dubius* is therefore likely to establish in South Coastal region of Alaska. Climatic similarity between Nome and areas where the species is documented is relatively low. This suggests that establishment in arctic and alpine Alaska may be not possible.

Sources of information:

CLIMEX for Windows, Version 1.1a. 1999. CISRO Publishing, Australia.

Pojar, J., and A. MacKinnon. 1994. Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia, and Alaska. B.C. Ministry of Forests and Lone Pine Publishing. Redmond, Washington. 527 pp.

USDA, NRCS. 2006. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

WRCC - Western Regional Climate Center 2001. Desert Research Institute. <http://www.wrcc.dri.edu> [16 April 2001].

B. INVASIVENESS RANKING

1. ECOLOGICAL IMPACT

1.1. Impact on Natural Ecosystem Processes

- A. No perceivable impact on ecosystem processes 0
- B. Influences ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability) 3
- C. Significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, reduces open water that are important to waterfowl) 7
- D. Major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology; hydrology; or affects fire frequency, 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
- U. Unknown

Score

| |
|---|
| 3 |
|---|

Documentation:

Identify ecosystem processes impacted:

Yellow salsify has been observed only along disturbed and partially modified habitats in south central Alaska. It likely competes with native species for moisture and nutrients. However, It does not appear to cause measurable impact to ecosystem processes (Rutledge and McLendon 1996). New stabilized hybrid species have been formed in western North America from *T. dubius* and *T. pratensis* and *T. porrifolius* (Owenby 1950) and become widespread.

Rational:

Sources of information:

Owenby, M. 1950. Natural hybridization and amphiploidy in *Tragopogon*. *American Journal of Botany* 37: 487-499.

Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center Home Page.

<http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).

1.2. Impact on Natural Community Structure

- A. No perceived impact; establishes in an existing layer without influencing its structure 0
- B. Influences structure in one layer (e.g., changes the density of one layer) 3
- C. Significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer) 7
- D. Major alteration of structure (e.g., covers canopy, eradicating most or all layers below) 10
- U. Unknown

Score

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|---|
| 7 |
|---|

Documentation:

Identify type of impact or alteration:

Yellow salsify creates a new layer in herbaceous communities (M. Shephard – pers. com.).

Rational:

Sources of information:

Shephard, M., Vegetation Ecologist, USDA, Forest Service, Forest Health Protection, State and Private Forestry, 3301 C Street, Suite 202, Anchorage, Alaska 99503. Tel: (907) 743-9454 - Pers. com.

1.3. Impact on Natural Community Composition

- A. No perceived impact; causes no apparent change in native populations 0
- B. Influences community composition (e.g., reduces the number of individuals in one or more native species in the community) 3
- C. Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community) 7
- D. Causes major alteration in community composition (e.g., results in the extirpation of one or several native species, reducing biodiversity or change the community composition towards species exotic to the natural community) 10
- U. Unknown

Score

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|---|
| 3 |
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Documentation:

Identify type of impact or alteration:

Yellow salsify has been increased in abundance along slopes in Turnagain Arm. High densities of plants likely inhibit growth and recruitment of native forbs and grasses (M. Shephard – pers. com.).

Rational:

Sources of information:

Shephard, M., Vegetation Ecologist, USDA, Forest Service, Forest Health Protection, State and Private Forestry, 3301 C Street, Suite 202, Anchorage, Alaska 99503 Tel: (907) 743-9454 - Pers. com.

1.4. Impact on higher 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. Minor alteration 3
- C. Moderate alteration (minor reduction in nesting/foraging sites, reduction in habitat connectivity, interference with native pollinators, injurious components such as spines, toxins) 7
- D. Severe alteration of higher trophic populations (extirpation or endangerment of an existing native species/population, or significant reduction in nesting or foraging sites) 10
- U. Unknown

Score

| |
|---|
| 7 |
|---|

Documentation:

Identify type of impact or alteration:

Yellow salsify is unpalatable to grazing animals. It is attractive to native pollinators in the continental US, and may therefore alter pollination ecology of native species in Alaska (M.L. Carlson – pers. obs.)

Rational:

Sources of information:

Carlson, M.L., Assistant Professor, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.

Total Possible

| |
|----|
| 40 |
|----|

Total

| |
|----|
| 20 |
|----|

2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

2.1. Mode of reproduction

- A. Not aggressive reproduction (few [0-10] seeds per plant and no vegetative reproduction) 0
- B. Somewhat aggressive (reproduces only by seeds (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 reproduction (extensive vegetative spread and/or many seeded, >1,000/m²) 3
- U. Unknown

Score

| |
|---|
| 1 |
|---|

Documentation:

Describe key reproductive characteristics (including seeds per plant):

Yellow salsify reproduces by seed only. Plants may produce as many as 500 seeds (Royer and Dickinson 1999).

Rational:

Sources of information:

Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

2.2. Innate potential for long-distance dispersal (bird dispersal, sticks to animal hair, buoyant fruits, wind-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
- U. Unknown

Score

| |
|---|
| 3 |
|---|

Documentation:

Identify dispersal mechanisms:

Seeds are wind dispersed with a pappus of hairs that promote long-distance dispersal (Royer and Dickinson 1999).
 Rational:
 Sources of information:
 Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

2.3. Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sales, use as forage/revegetation, spread along highways, transport on boats, contamination, etc.)

- A. Does not occur 0
- B. Low (human dispersal is infrequent or inefficient) 1
- C. Moderate (human dispersal occurs) 2
- D. High (there are numerous opportunities for dispersal to new areas) 3
- U. Unknown

Score 2

Documentation:
 Identify dispersal mechanisms:
 Yellow salsify is a potential seed contaminant (USDA, ARS 2004).
 Rational:
 Sources of information:
 USDA, ARS, National Genetic Resources Program. *Germplasm Resources Information Network - (GRIN)* [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <http://www.ars-grin.gov/var/apache/cgi-bin/npgs/html/taxon.pl?300618> (7 October, 2004).

2.4. Allelopathic

- A. No 0
- B. Yes 2
- U. Unknown

Score 0

Documentation:
 Describe effect on adjacent plants:
 It is not listed as allelopathic (USDA 2002).
 Rational:
 Sources of information:
 USDA, NRCS. 2006. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

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 nitrogen fixing ability 3
- U. Unknown

Score 1

Documentation:
 Evidence of competitive ability:
 Yellow salsify is not an aggressive weed (Rutledge and McLendon 1996); however it likely competes moderately with native species for moisture and nutrient.
 Rational:
 Sources of information:
 Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center

Home Page.

<http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).

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

- A. No 0
- B. Forms dense thickets 1
- C. Has climbing or smothering growth habit, or otherwise taller than the surrounding vegetation 2
- U. Unknown

Score

Documentation:

Describe grow form:

Although yellow salsify can grow to 3 feet tall (Royer and Dickinson 1999, Whitson et al. 2000), it does not form dense stands or thickets (I. Lapina – pers. obs.).

Rational:

Sources of information:

Lapina, I., Botanist, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2710 – Pers. obs.

Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

Whitson, T.D., L.C. Burrill, S.A. Dewey, D.W. Cudney, B.E. Nelson, R.D. Lee, R. Parker. 2000. Weeds of the West. The Western Society of Weed Science in cooperation with the Western United States Land Grant Universities, Cooperative Extension Services. University of Wyoming. Laramie, Wyoming. 630 pp.

2.7. Germination requirements

- A. Requires open soil and disturbance to germinate 0
- B. Can germinate in vegetated areas but in a narrow range or in special conditions 2
- C. Can germinate in existing vegetation in a wide range of conditions 3
- U. Unknown

Score

Documentation:

Describe germination requirements:

Seedlings of yellow salsify emerge and survive in different type of vegetative cover, including thick stands (Gross and Werner 1982).

Rational:

Sources of information:

Gross, K.L. and P.A. Werner. 1982. Colonizing abilities of “biennial” plant species in relation to ground cover: implications for their distributions in a successional sere. *Ecology* 63: 921-931.

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

- A. No 0
- B. Yes 3
- U. Unknown

Score

Documentation:

Species:

Number of *Tragopogon* species has been introduced to North America. *Tragopogon porrifolius* and *T. pratensis* are considered to be weedy (Stebbins 1993). *T. pratensis* hybridizes with other species creating aggressive weedy hybrids *T. ×crantzii* Dichlt. [*dubius* × *pratensis*] and *T. ×neohybridus* Farw. [*porrifolius* × *pratensis*] (USDA, NRCS 2006, Owenby 1950).

Sources of information:

Stebbins, L.G. 1993. *Tragopogon*: Goat’s Beard. In Hickman, J. C. (ed.) *The Jepson*

Manual: Higher Plants of California. pp. 354-355.
 Owenby, M. 1950. Natural hybridization and amphiploidy in *Tragopogon*. *American Journal of Botany* 37: 487-499.
 USDA, NRCS. 2006. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>).
 Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

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
- U. Unknown

Score

| |
|---|
| 0 |
|---|

Documentation:

Describe type of habitat:

Yellow salsify is a common weed of cultivated crops, roadsides, and waste areas (Royer and Dickinson 1999, Rutledge and McLendon 1996) and not of riparian areas or wetlands.

Rational:

Sources of information:

Royer, F. and R. Dickinson. 1999. *Weeds of the Northern U.S. and Canada*. The University of Alberta press. 434 pp.

Rutledge, C.R. and T. McLendon. 1996. *An Assessment of Exotic Plant Species of Rocky Mountain National Park*. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center Home Page.

<http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).

Total Possible

| |
|----|
| 25 |
|----|

Total

| |
|----|
| 11 |
|----|

3. DISTRIBUTION

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

- A. No 0
- B. Is occasionally an agricultural pest 2
- C. Has been grown deliberately, bred, or is known as a significant agricultural pest 4
- U. Unknown

Score

| |
|---|
| 2 |
|---|

Documentation:

Identify reason for selection, or evidence of weedy history:

Yellow salsify is a weed of cultivated crop (Rutledge and McLendon 1999).

Rational:

Sources of information:

Rutledge, C.R. and T. McLendon. 1996. *An Assessment of Exotic Plant Species of Rocky Mountain National Park*. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center Home Page.

<http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).

3.2. Known level of impact in natural areas

- A. Not known to cause impact in any other natural area 0
- B. Known to cause impacts in natural areas, but in dissimilar habitats and climate zones than exist in regions of Alaska 1
- C. Known to cause low impact in natural areas in similar habitats and climate zones to those present in Alaska 3

- D. Known to cause moderate impact in natural areas in similar habitat and climate zones 4
- E. Known to cause high impact in natural areas in similar habitat and climate zones 6
- U. Unknown

Score 3

Documentation:
 Identify type of habitat and states or provinces where it occurs:
 Yellow salsify has been found in areas disturbed in the last decade. It does not appear to have a perceivable impact on natural plant communities (Rutledge and McLendon 1996). It can establish to relatively high population densities in intact to moderately grazed prairies in Oregon (M.L. Carlson – pers. obs.).
Sources of information:
 Carlson, M. L., Assistant Research Professor, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.
 Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center Home Page.
<http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).

3.3. Role of anthropogenic and natural disturbance in establishment

- A. Requires anthropogenic disturbances to establish 0
- B. May occasionally establish in undisturbed areas but can readily establish in areas with natural disturbances 3
- C. Can establish independent of any known natural or anthropogenic disturbances 5
- U. Unknown

Score 3

Documentation:
 Identify type of disturbance:
 Yellos salsify is generally occurs on disturbed sites (Rutledge and McLendon 1996). It readily established in grazed prairies. Steep slopes and slides are also susceptible to invasion (M.L. Carlson – pers. obs.).
Rational:
Sources of information:
 Carlson, M.L., Assistant Research Professor, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.
 Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center Home Page.
<http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).

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
- U. Unknown

Score 3

Documentation:
 Describe distribution:
 Native range of yellow saslify includes mid and southern Europe and temperate Asia. It is now established over much of temperate North America (USDA, ARS 2004).
Rational:

Sources of information:

USDA, ARS, National Genetic Resources Program. *Germplasm Resources Information Network - (GRIN)* [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <http://www.ars-grin.gov/var/apache/cgi-bin/npgs/html/taxon.pl?300618> (7 October, 2004).

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

- A. 0-5% of the states 0
- B. 6-20% of the states 2
- C. 21-50%, and/or state listed as a problem weed (e.g., “Noxious,” or “Invasive”) in 1 state or Canadian province 4
- D. Greater than 50%, and/or identified as “Noxious” in 2 or more states or Canadian provinces 5
- U. Unknown

Score

| |
|---|
| 5 |
|---|

Documentation:

Identify states invaded:

Yellow salsify occurs in nearly all states of the United States (USDA 2002). This species is considered invasive weed in Tennessee, Manitoba and Ontario (Royer and Dickinson 1999).

Rational:

Sources of information:

Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

USDA, NRCS. 2006. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Total Possible

| |
|----|
| 25 |
|----|

Total

| |
|----|
| 16 |
|----|

4. FEASIBILITY OF CONTROL

4.1. Seed banks

- A. Seeds remain viable in the soil for less than 3 years 0
- B. Seeds remain viable in the soil for between 3 and 5 years 2
- C. Seeds remain viable in the soil for 5 years and more 3
- U. Unknown

Score

| |
|---|
| 0 |
|---|

Documentation:

Identify longevity of seed bank:

Seeds longevity for yellow salsify is very short. Generally seeds germinate next year after shading (Chepil 1946).

Rational:

Sources of information:

Chepil, W.S. 1946. Germination of weed seeds. I. Longevity, periodicity of germination, and vitality of seeds in cultivated soil. *Scientific agriculture* 26: 307-346.

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
- U. Unknown

Score

| |
|---|
| 0 |
|---|

Documentation:

Describe vegetative response:

Yellow salsify does not resprout after removal of aboveground growth (USDA 2002).

Rational:

Sources of information:

USDA, NRCS. 2006. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>).

Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

4.3. Level of effort required

- A. Management is not required (e.g., species does not persist without repeated anthropogenic disturbance) 0
- B. Management is relatively easy and inexpensive; requires a minor investment in human and financial resources 2
- C. Management requires a major short-term investment of human and financial resources, or a moderate long-term investment 3
- D. Management requires a major, long-term investment of human and financial resources 4
- U. Unknown

Score

| |
|---|
| 3 |
|---|

Documentation:

Identify types of control methods and time-term required:

Multiple years of management (hand pulling) of infestation along Turnagaing Arm have been unsuccessful (M. Shephard – pers. com., J. Snyder – pers. com.).

Rational:

Sources of information:

Shephard, M., Vegetation Ecologist, USDA, Forest Service, Forest Health Protection, State and Private Forestry, 3301 C Street, Suite 202, Anchorage, Alaska 99503 Tel: (907) 743-9454 - Pers. com.

Snyder, J., UAF Cooperative Extension Service. 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6310 alt.tel: (907) 743-9448 – Pers. com.

Total Possible

| |
|----|
| 10 |
|----|

Total

| |
|---|
| 3 |
|---|

Total for 4 sections Possible

| |
|-----|
| 100 |
|-----|

Total for 4 sections

| |
|----|
| 50 |
|----|

References:

AK Weeds Database. 2004. Database of exotic vegetation collected in Alaska. University of Alaska, Alaska Natural Heritage Program – US Forest Service – National Park Service Database. Available: <http://akweeds.uaa.alaska.edu/>

Carlson, M.L., Assistant Research Professor, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.

Chepil, W.S. 1946. Germination of weed seeds. I. Longevity, periodicity of germination, and vitality of seeds in cultivated soil. Scientific agriculture 26: 307-346.

CLIMEX for Windows, Version 1.1a. 1999. CISRO Publishing, Australia.

Gross, K.L. and P.A. Werner. 1982. Colonizing abilities of “biennial” plant species in relation to ground cover: implications for their distributions in a successional sere. Ecology 63: 921-931.

Lapina, I., Botanist, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2710 – Pers. obs

- Owenby, M. 1950. Natural hybridization and amphiploidy in *Tragopogon*. *American Journal of Botany* 37: 487-499.
- Pojar, J. and A. MacKinnon. 1994. *Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia, and Alaska*. B.C. Ministry of Forests and Lone Pine Publishing. Redmond, Washington. 527 pp.
- Royer, F. and R. Dickinson. 1999. *Weeds of the Northern U.S. and Canada*. The University of Alberta press. 434 pp.
- Rutledge, C.R. and T. McLendon. 1996. *An Assessment of Exotic Plant Species of Rocky Mountain National Park*. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center Home Page. <http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).
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