

WEED RISK ASSESSMENT FORM

Botanical name:	<i>Trifolium hybridum</i> L.	
Common name:	Alsike clover	
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 Research Professor, Botany Alaska Natural Heritage Program, University of Alaska Anchorage 707 A Street Anchorage, Alaska 99501
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	Julie Riley Horticulture Agent, UAF Cooperative Extension Service 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6306
	Jeff Conn, Ph.D. Weed Scientist, USDA Agricultural Research Service PO Box 757200 Fairbanks, Alaska 99775 tel: (907) 474-7652; fax (907) 474-6184	Jamie M. Snyder UAF Cooperative Extension Service 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6310 alt.tel: (907) 743-9448
	Page Spencer, Ph.D. Ecologist, National Park Service, Alaska Region - Biological Resources Team, 240 W. 5th Ave, #114, Anchorage, AK 99501 tel: (907) 644-3448	

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	Yes
This species is unlikely to establish in any region in Alaska		

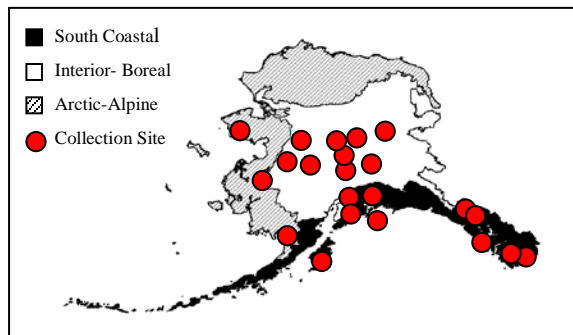
B. Invasiveness Ranking	Total (Total Answered*)	Total
	Possible	
1	Ecological impact	40 (40)
2	Biological characteristic and dispersal ability	25 (25)
3	Ecological amplitude and distribution	25 (25)
4	Feasibility of control	10 (10)
	Outcome score	100 (100) ^b
	Relative maximum score [†]	0.57

* 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>	
Yes	South Coastal
Yes	Interior-Boreal
Yes	Arctic-Alpine



Documentation: Alsike clover has been collected in South Coastal, Interior-Boreal, and Arctic-Alpine ecoregions in Alaska (Hultén 1968, UAM 2004).
 Sources of information:
 Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, CA. 1008 p.
 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 any where the species currently occurs and
- a. Juneau (South Coastal Region)?
 - 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
 - If “No” is answered for all regions, reject species from consideration

Documentation:
 Sources of information:

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 7

Documentation:
 Identify ecosystem processes impacted:
 Alsike clover alters edaphic conditions due to nitrogen fixation (USDA 2002) and may retard natural succession (Rutledge and McLendon 1996).
 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. 97pp. Northern Prairie Wildlife Research Center Home Page.
 USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

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 7

Documentation:

Identify type of impact or alteration:

Alsike clover establishes in an existing layer, increases the density of the layer, and reduces the cover of graminoids and low forbs (I. Lapina – pers obs.).

Rational:

Sources of information:

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

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 5

Documentation:

Identify type of impact or alteration:

Alsike clover forms dominant stands and may delay establishment of native species (Rutledge and McLendon 1996).

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. 97pp. Northern Prairie Wildlife Research Center Home Page.
<http://www.npwrc.usgs.gov/resource/othrdata/explant/explant.html> (Version 15Dec98).

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 3

Documentation:

Identify type of impact or alteration:

Alsike clover is highly palatable to grazing animals (USDA 2002). This species serves as a host for multiple crop diseases (USDA, ARS 2004).

Rational:

Sources of information:

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

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> (30 April 2004).

Total Possible	40
Total	22

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):
Alsike clover reproduces only by abundant seed (USDA, NRCS 2001).
Rational:

Sources of information:

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

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

2

Documentation:

Identify dispersal mechanisms:
Alsike clover has no innate adaptations for long-distance dispersal; however, it does appear to move long-distances occasionally (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.

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 3

Documentation:

Identify dispersal mechanisms:

It is a widely cultivated forage and cover crop. Additionally, it is seeded along roadsides and banks for erosion control in Alaska (Densmore et al. 2001, Kubanis 1982).

Rational:

Sources of information:

Densmore, R.V., P.C. McKee, and C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.

Kubanis, S.A. 1982. Revegetation techniques in arctic and subarctic environments. Office of the Federal Inspector Alaska Natural Gas Transportation System, Office of Environment, Biological Programs. 40 pp.

2.4. Allelopathic

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

Score 0

Documentation:

Describe effect on adjacent plants:

None (USDA 2002)

Rational:

Sources of information:

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). 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:

Alsike clover is moderately competitive for limiting factors. It persists in disturbed areas even when overtopped and shaded by native species (Densmore et al. 2001).

Rational:

Sources of information:

Densmore, R.V., P.C. McKee, and C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.

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 **0**

Documentation:

Describe grow form:

The plant is 6 to 20 inches tall and usually does not shade other vegetation (Welsh 1974).

Rational:

Sources of information:

Welsh, S.L. 1974. Anderson's flora of Alaska and adjacent parts of Canada. Brigham University Press. 724 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 **2**

Documentation:

Describe germination requirements:

The seeds of alsike clover do not germinate until the seed coat is sufficiently scarified. They germinate readily when temperature rises to 25° C (Rutledge and McLendon 1996). Alsike clover can germinate in vegetated areas (Densmore et al. 2001).

Rational:

Sources of information:

Densmore, R.V., P.C. McKee, and C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 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. 97pp. Northern Prairie Wildlife Research Center Home Page.

<http://www.npwrc.usgs.gov/resource/othrdata/explant/explant.html> (Version 15Dec98).

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

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

Score **3**

Documentation:

Species:

Trifolium repens L. *Trifolium angustifolium* L., *T. arvense* L., *T. aureum* L., *T. campestre* Schreb., *T. dubium* Sibth., *T. hirtum* All., *T. incarnatum* L., *T. pratense* L., and *T. subterraneum*.

Sources of information:

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

2.9. Aquatic or wetland 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:

Alsike clover is a weed of lawns, roadsides, and disturbed sites (Hultén 1968).

Rational:

Sources of information:

Hultén, E. 1968. *Flora of Alaska and Neighboring Territories*. Stanford University Press, Stanford, CA. 1008 p.

Total Possible	25
Total	12

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

4

Documentation:

Identify reason for selection, or evidence of weedy history:

Alsike clover has been planted for lawns and revegetation on disturbed areas (Kubanis 1982). It has often escaped from cultivation (Hultén 1968, Welsh 1974).

Rational:

Sources of information:

Hultén, E. 1968. *Flora of Alaska and Neighboring Territories*. Stanford University Press, Stanford, CA. 1008 p.

Kubanis, S.A. 1982. *Revegetation techniques in arctic and subarctic environments*. Office of the Federal Inspector Alaska Natural Gas Transportation System, Office of Environment, Biological Programs. 40 pp.

Welsh, S.L. 1974. *Anderson's flora of Alaska and adjacent parts of Canada*. Brigham University Press. 724 pp.

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

1

Documentation:

Identify type of habitat and states or provinces where it occurs:

Alsike clover is found only on disturbed sites in Alaska (Densmore et al. 2001). In Colorado it is found in degraded native habitats, disturbed in the last 11 -50 years (Rutledge and McLendon 1996).

Sources of information:

Densmore, R.V., P.C. McKee, and C. Roland. 2001. *Exotic plants in Alaskan National Park Units*. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 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. 97pp. Northern Prairie Wildlife Research Center Home Page.

<http://www.npwrc.usgs.gov/resource/othrdata/explant/explant.html> (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:

In Alaska alsike clover is observed only in disturbed sites (Densmore et al. 2001). It has been found in areas with natural disturbances, such as terraces and banks along glacial rivers and streams (M. Shephard – pers. com.).

Rational:

Sources of information:

Densmore, R.V., P.C. McKee, and C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.

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

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 5

Documentation:

Describe distribution:

Alsike clover is native to Europe, western Asia, and northern Africa. It has been introduced and naturalized throughout the temperate and subarctic regions of both hemispheres (Hultén 1968).

Rational:

Sources of information:

Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, CA. 1008 p.

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:

Alsike clover is known from all continental states, except Texas (USDA 2002).

Rational:

Sources of information:

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Total Possible 25

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

2

Documentation:

Identify longevity of seed bank:

Some seeds of alsike clover are viable after three years of burial in the soil (Rutledge and McLendon 1996).

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).

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:

Alsike clover has no resprouting ability (USDA 2002).

Rational:

Sources of information:

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). 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:

Eradication of Alsike clover is nearly impossible from sites (Densmore et al. 2002). However, it is quite sensitive to herbicides and seed viability is not particularly long (J. Conn – pers. comm.).

Rational:

Sources of information:

Conn, J.S. Weed Scientist, USDA Agricultural Research Service PO Box 757200 Fairbanks, Alaska 99775 tel: (907) 474-7652; fax (907) 474-6184. – Pers. comm.

Densmore, R.V., P.C. McKee, and C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.

Total Possible	10
Total	5

Total for 4 sections Possible	100
Total for 4 sections	57

References:

- Conn, J.S. Weed Scientist, USDA Agricultural Research Service PO Box 757200 Fairbanks, Alaska 99775 tel: (907) 474-7652; fax (907) 474-6184. – Pers. comm.
- Densmore, R.V., P.C. McKee, C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.
- Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, CA. 1008 pp.
- Lapina, I., Botanist, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2710 – Pers. obs.
- Kubanis, S.A. 1982. Revegetation techniques in arctic and subarctic environments. Office of the Federal Inspector Alaska Natural Gas Transportation System, Office of Environment, Biological Programs. 40 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. 97pp. Northern Prairie Wildlife Research Center Home Page. <http://www.npwrc.usgs.gov/resource/othrdata/explant/explant.html> (Version 15Dec98).
- Shephard, M., Vegetation Ecologist, USDA, Forest Service, Forest Health Protection, State and Private Forestry, 3301 C Street, Suite 202, Anchorage, Alaska 99503 Division. Tel: (907) 743-9454 - Pers. comm.
- University of Alaska Museum. University of Alaska Fairbanks. 2003. <http://hispidamuseum.uaf.edu:8080/home.cfm>
- USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
- 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> (30 April 2004).
- Welsh, S.L. 1974. Anderson's flora of Alaska and adjacent parts of Canada. Brigham University Press. 724 pp.