

WEED RISK ASSESSMENT FORM

Botanical name:	<i>Poa annua</i> L.	
Common name:	annual bluegrass	
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
	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
Reviewers:	Roseann Densmore, Ph.D. Research Ecologist, US Geological Survey, Alaska Biological Science Center, 1101 East Tudor Road Anchorage, AK 99503 tel: (907) 786-3916, fax (907) 786-3636	Julie Riley Horticulture Agent, UAF Cooperative Extension Service 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6306
	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:

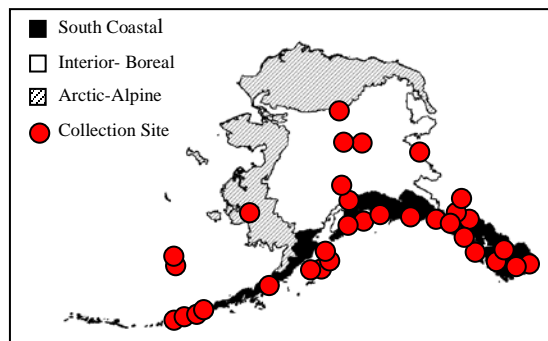
A. Climatic Comparison		
This species is present or may potentially establish in the following eco-geographic regions:		
1 South Coastal	Yes	
2 Interior-Boreal	Yes	
3 Arctic-Alpine	Yes	

B.	Invasiveness Ranking	Total (Total Answered*) Possible	Total
1	Ecological impact	40 (40)	8
2	Biological characteristic and dispersal ability	25 (25)	13
3	Ecological amplitude and distribution	25 (25)	18
4	Feasibility of control	10 (10)	7
	Outcome score	100 (100) ^b	46 ^a
	Relative maximum score†		0.46

* 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: *Poa annua* has been collected from all ecogeographic regions in Alaska (Hultén 1968).
 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. 2003.
<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

1

Documentation:

Identify ecosystem processes impacted:

Annual bluegrass is a pioneer species that is often dominate and may hinder colonization by native species by reducing available nutrients in the soil surface (Bergelson 1990).

Rational:

Sources of information:

Bergelson, J. 1990. Life after death: site pre-emption by the remains of *Poa annua*. *Ecology*. 71(6): 2157-2165.

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 **3**

Documentation:

Identify type of impact or alteration:

Annual bluegrass may form dense mats and dominate reducing the vigor of other plants (Hutchinson and Seymour 1982). Field experiments suggested that native seed germination and seedling survival is reduced in the presence of annual bluegrass litter

Rational:

Sources of information:

Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. The Journal of Ecology. 70 (3): 887-901.

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 **1**

Documentation:

Identify type of impact or alteration:

Litter of annual bluegrass may inhibit other species germination reducing the number of individuals in the community (Bergelson 1990).

Rational:

Sources of information:

Bergelson, J. 1990. Life after death: site pre-emption by the remains of *Poa annua*. Ecology. 71(6): 2157-2165.

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:

The seeds of annual bluegrass are eaten by various species of bird. The plants are probably eaten by deer. A wide range of invertebrates feed on annual bluegrass. It forms hybrids with *P. glauca* and *P. pratensis* in Britain. (Hutchinson and Seymour 1982). Annual bluegrass is an alternate host for number of viruses (Royer and Dickinson 1999).

Rational:

Sources of information:

Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. The Journal of Ecology. 70 (3): 887-901.

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

Total Possible	40
Total	8

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/m ²)) | 1 |
| C. Moderately aggressive (reproduces vegetatively and/or by a moderate amount of seed, <1,000/m ²) | 2 |
| D. Highly aggressive reproduction (extensive vegetative spread and/or many seeded, >1,000/m ²) | 3 |
| U. Unknown | |

Score

3

Documentation:

Describe key reproductive characteristics (including seeds per plant):

Annual bluegrass reproduces primarily by seed, which is produced rapidly in the season. Seed production rate may exceed 20,000 in a season under ideal conditions (Hutchinson and Seymour 1982, Rutledge and McLendon 1996).

Rational:

Sources of information:

Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. The Journal of Ecology. 70 (3): 887-901.

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.npwr.usgs.gov/resource/othrdata/explant/explant.html> (Version 15Dec98).

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:

Seeds have no special adaptation for long-distance dispersal, but are likely dispersed by rain, wind, and birds. Seeds remain viable after passing through the digestive tracts of some animals such as cows, horses, and deer (Hutchinson and Seymour 1982, Rutledge and McLendon 1996).

Rational:

Sources of information:

Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. The Journal of Ecology. 70 (3): 887-901.

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.npwr.usgs.gov/resource/othrdata/explant/explant.html> (Version 15Dec98).

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

Documentation:

Identify dispersal mechanisms:

Seeds can be carried in mud on boots and vehicles. It is commonly transported as an impurity of lawn grass seed (Hodkinson and Thompson 1997, Hutchinson and Seymour 1982, Rutledge and McLendon 1996, Whitson et al. 2000).

Rational:

Sources of information:

Hodkinson, D., K. Thompson. 1997. Plant dispersal: the role of man. *Journal of Applied Ecology*, 34: 1484-1496.

Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. *The Journal of Ecology*. 70 (3): 887-901.

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.npwr.usgs.gov/resource/othrdata/explant/explant.html> (Version 15Dec98).

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.

2.4. Allelopathic

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

Score

Documentation:

Describe effect on adjacent plants:

Annual bluegrass is not allelopathic (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

Documentation:

Evidence of competitive ability:

Annual bluegrass readily invades any available space. However, it generally does not compete strongly with established plants (Hutchinson and Seymour 1982, McNeilly

1981, Rutledge and McLendon 1996).

Rational:
Annual bluegrass is very adaptable species. It has been found in a variety of climatic conditions. It tolerates trampling, mowing, and poorly aerated soils. It can grow and produce seeds almost all seasons, and several generation may succeed one another in a single year

Sources of information:
Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. The Journal of Ecology. 70 (3): 887-901.
McNeilly, T. 1981. Ecotypic differentiation in *Poa annua*: interpopulation differences in response to competition and cutting. New Phytologist/ 88(3): 539-547.
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).

2.6. 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:
Since much of the seeds falls near the parent plant, it often forms continuous patches (Hutchinson and Seymour 1982, Royer and Dickinson 1999). However, the plants are very small and easily overtopped by other grasses and forbs.

Rational:

Sources of information:
Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. The Journal of Ecology. 70 (3): 887-901.
Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 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 1

Documentation:
Describe germination requirements:
Annual bluegrass is found in open habitats. It can grow in closed turf in lawns and pastures if trampling or other disturbance is severe (Hutchinson and Seymour 1982).

Rational:

Sources of information:
Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. The Journal of Ecology. 70 (3): 887-901.

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

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

Score 3

Documentation:

Species:

Poa pratensis L., *P. compressa* L., *P. trivialis* L. (Hultén 1968, Royer and Dickinson 1999, Whitson et al. 2000).

Sources of information:

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

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.

2.9. 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:

Annual bluegrass is usually inhabits lawns, gardens, cultivated fields, pastures, roadsides, and other open areas (Hutchinson and Seymour 1982).

Rational:

Sources of information:

Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. The Journal of Ecology. 70 (3): 887-901.

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.

Total Possible

25

Total

13

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:

Annual bluegrass is one of the most common weeds of cultivated land. It is also a weed of lawns, gardens, and golf courses (Hutchinson and Seymour 1982, Royer and Dickinson 1999, Whitson et al. 2000).

Rational:

Sources of information:

Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. The Journal of Ecology. 70 (3): 887-901.

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.

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:

Annual bluegrass has been recorded in sagebrush, oak maple, aspen fir, lodgepole pine, and meadow communities in Colorado (Ruttledge and McLendon 1996).

Sources of information:

Ruttledge, 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:

Annual bluegrass persists on sites that are kept open by trampling of livestock or by human activity (Hutchinson and Seymour 1982). This taxon readily establishes along introduced mineral substrates in south-central and southeast Alaska (M.L. Carlson & I. Lapina – pers. obs.).

Rational:

Sources of information:

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

Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. The Journal of Ecology. 70 (3): 887-901.

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

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:

Annual bluegrass is a native of Europe but is now distributed worldwide. It was introduced to North Africa, Mexico, Central and South America, New Zealand, Australia. It is also found above the Arctic circle (Hultén 1968, Hutchinson and Seymour 1982).

Rational:

Sources of information:

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

Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. *The Journal of Ecology*. 70 (3): 887-901.

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:

Annual bluegrass has been found in nearly all states of the United States (USDA 2002). It is declared noxious weeds in Alaska, Connecticut, Kentucky, Massachusetts, New Jersey, New York, Texas, Virginia (Alaska Administrative Code 1987, Invaders Database System 2003).

Rational:

Sources of information:

Alaska Administrative Code. Title 11, Chapter 34. 1987. Alaska Department of Natural Resources. Division of Agriculture.

Invaders Database System. The University of Montana. 2003. Montana Noxious Weed Trust Fund. Department of Agricultural. <http://invader.dbs.umt.edu/>

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

Total 18

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 3

Documentation:

Identify longevity of seed bank:

Longevity of seeds varies from about a year to about 6 years (Chippendale and Milton 1934, Hutchinson and Seymour 1982, Roberts and Feast 1973).

Rational:

Sources of information:

Chippendale, H.G. and W.E.J. Milton. 1934. On the viable seeds present in the soil beneath pastures. *The Journal of Ecology*. 22(2): 508-531.

Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. *The Journal of Ecology*. 70 (3): 887-901.

Roberts, H. A. and P.M. Feast. 1973. Emergence and longevity of seeds of annual weeds in cultivated and undisturbed soil. *The Journal of Applied Ecology*. 10(1): 133-143.

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

2

Documentation:
 Describe vegetative response:
 Annual bluegrass can resprout after cutting or grazing (Hutchinson and Seymour 1982).
 Rational:

Sources of information:
 Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. *The Journal of Ecology*. 70 (3): 887-901.

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

2

Documentation:
 Identify types of control methods and time-term required:
 Manual control of annual bluegrass is very expensive and inefficient. A number of herbicides are available, but they are not specific to annual bluegrass (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).

Total Possible	10
Total	7

Total for 4 sections Possible	100
Total for 4 sections	46

References:

- Alaska Administrative Code. Title 11, Chapter 34. 1987. Alaska Department of Natural Resources. Division of Agriculture.
- Bergelson, J. 1990. Life after death: site pre-emption by the remains of *Poa annua*. *Ecology*. 71(6): 2157-2165.
- Carlson, M.L., Assistant Research Professor - Botany, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790
Pers. obs.
- Chippindale, H.G. and W.E.J. Milton. 1934. On the viable seeds present in the soil beneath pasture. *The Journal of Ecology* 22(2): 508-531.
- Hodkinson, D., K. Thompson. 1997. Plant dispersal: the role of man. *Journal of Applied Ecology*, 34: 1484-1496.
- Hultén, E. 1968. *Flora of Alaska and Neighboring Territories*. Stanford University Press, Stanford, CA. 1008 pp.
- Hutchinson, C.S. and G.B. Seymour. 1982. Biological flora of the British Isles. *Poa annua* L. *The Journal of Ecology*. 70 (3): 887-901.
- Invaders Database System. The University of Montana. 2003. Montana Noxious Weed Trust Fund. Department of Agriculture. <http://invader.dbs.umt.edu/>
- Lapina I., Botanist, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2710 – Pers. obs.
- McNeilly, T. 1981. Ecotypic differentiation in *Poa annua*: interpopulation differences in response to competition and cutting. *New Phytologist*/ 88(3): 539-547.
- Roberts, H.A. and P.M. Feast. 1973. Emergence and longevity of seeds of annual weeds in cultivated and undisturbed soil. *The Journal of Applied Ecology*. 10(1): 133-143.
- 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. 97pp. Northern Prairie Wildlife Research Center Home Page. <http://www.npwrc.usgs.gov/resource/othrdata/explant/explant.html> (Version 15Dec98).
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