

WEED RISK ASSESSMENT FORM

Botanical and common name:	<i>Lepidium densiflorum</i> var. <i>densiflorum</i> Schrad. common pepperweed	
	<i>L. densiflorum</i> var. <i>elongatum</i> (Rydb.) Thellung. tall pepperweed	
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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

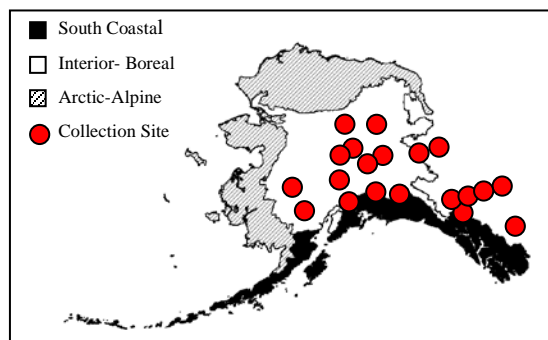
B.	Invasiveness Ranking	Total (Total Answered*) Possible	Total
1	Ecological impact	40 (30)	1
2	Biological characteristic and dispersal ability	25 (23)	9
3	Ecological amplitude and distribution	25 (25)	8
4	Feasibility of control	10 (10)	4
	Outcome score	100 (88) ^b	22 ^a
	Relative maximum score†		0.25

* 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: *Lepidium densiflorum* has been documented in the Interior-Boreal ecogeographic region in Alaska (Weeds of Alaska Database 2005, 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. 2005.

<http://hispidamuseum.uaf.edu:8080/home.cfm>

Weeds of Alaska Database. 2006. 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/>

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 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 Yes – record locations and similarity; proceed to Section B. Invasiveness Ranking
No

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

Documentation: The CLIMEX computer matching program indicates the climatic similarity between Arctic Alpine and South Coastal ecogeographic regions of Alaska and areas where common pepperweed has been introduced is moderately high. This species’ range includes Dombås, Norway, Sarna and Ostersund, Sweden (Natur Historiska Riksmuseet Database 2005), which have a 63%, 61% and 57% climatic match with Nome respectively. The introduced range of this species also includes Bergen, Kristiansand, and Stavanger, Norway, which have 73%, 60%, and 52% climatic match with Juneau, Alaska respectively. Thus establishment of common pepperweed in Arctic-Alpine and South Coastal ecogeographic regions is likely.

Sources of information: CLIMEX for Windows, Version 1.1a. 1999. CISRO Publishing, Australia. Natur Historiska Riksmuseet Database. 2005. Available from: <http://www.nrm.se/wise/>

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

0

Documentation:

Identify ecosystem processes impacted:

Common pepperweed does not occur in natural areas in Alaska (UAM 2005, Weeds of Alaska Database 2006). This species can have little or no effect on natural ecosystem processes (Densmore et al. 2001).

Rational:

Sources of information:

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.

University of Alaska Museum. University of Alaska Fairbanks. 2005.

<http://hispidamuseum.uaf.edu:8080/home.cfm>

Weeds of Alaska Database. 2006. Database of exotic vegetation collected in Alaska. University of Alaska, Alaska Natural Heritage Program – US Forest Service –

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

1

Documentation:

Identify type of impact or alteration:

Common pepperweed establishes in an existing layer and increases total percent cover in open, disturbed sites (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.

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

0

Documentation:

Identify type of impact or alteration:

Common pepperweed has not been observed in undisturbed areas in Alaska (Densmore et al. 2001, UAM 2005, Weeds of Alaska Database 2006) and no perceived impacts on native populations have been documented.

Rational:

Sources of information:

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.

University of Alaska Museum. University of Alaska Fairbanks. 2005.

<http://hispidamuseum.uaf.edu:8080/home.cfm>

Weeds of Alaska Database. 2006. 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/>

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

U

Documentation:

Identify type of impact or alteration:
 Impact on higher trophic levels has not been documented.
 Rational:
 Sources of information:

Total Possible	30
Total	1

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

3

Documentation:

Describe key reproductive characteristics (including seeds per plant):
 Common pepperweed reproduces by seeds only. Each plant is capable of producing up to 5,000 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

1

Documentation:

Identify dispersal mechanisms:
 At maturity, the plant can break off at the base and tumble in the wind, spreading seeds (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).

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:

Common pepperweed is a weed of cultivated crops and can be spread as a commercial seed contaminant (USDA, ARS 2006).

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> [May 1, 2006].

2.4. Allelopathic

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

Score U

Documentation:

Describe effect on adjacent plants:

No data on allelopathic potential of common peppergrass were found during this review.

Rational:

Sources of information:

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 0

Documentation:

Evidence of competitive ability:

Although common peppergrass is a frequent crop weed, it competes poorly with vigorous plants (Chepil 1946, Densmore et al. 2001).

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.

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.

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:

Common pepperweed is a branched plant up to 1 ½ feet tall, however it does not possess a climbing or smothering growth habit (Douglas et al. 1998, Royer and Dickinson 1999).

Rational:

Sources of information:

Douglas, G.W., G.B. Straley, D. Meidinger, J. Pojar. 1998. Illustrated flora of British Columbia. V. 2. Ministry of Environment, Lands and Parks Ministry of Forests. British Columbia. 401 pp.

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

Documentation:

Describe germination requirements:

Common pepperweed requires disturbance and open soil for germination (Densmore et al. 2001).

Rational:

Sources of information:

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.

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

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

Score

Documentation:

Species:

Lepidium campestre (L.) Ait. f. is Noxious weed in several American states. *Lepidium latifolium* L. and *L. perfoliatum* L. are listed as Invasive plants (USDA, NRCS 2006).

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.

2.9. 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

Documentation:

Describe type of habitat:

Common pepperweed is a plant of disturbed soils: roadsides, waste areas, farmyards, and cultivated fields (Welsh 1974, 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.

Welsh, S.L. 1974. Anderson's flora of Alaska and adjacent parts of Canada. Brigham

Total Possible	23
Total	9

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

3

Documentation:

Identify reason for selection, or evidence of weedy history:

Common pepperweed is a serious weed of cultivated fields and can substantially reduce crop yield (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.

3.2. Known level of ecological 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

0

Documentation:

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

Common pepperweed has not been documented in natural habitats in Alaska, and its impact on natural communities has not been documented. It is not listed as an invader in any other natural areas (Rutledge and McLendon 1996, Densmore et al. 2001).

Sources of information:

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.

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

0

Documentation:

Identify type of disturbance:

Common pepperweed occurrence is especially associated with human disturbances.

Plants may appear on sites of previous human use, particularly when the soil is disturbed by construction or trampling (Densmore et al. 2001).

Rational:

Sources of information:

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.

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

0

Documentation:

Describe distribution:

Today distribution includes Canada, United States, and countries of North and Middle Europe (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:

Common pepperweed is widely distributed in nearly all American States and Canadian provinces (Hulten 1968, USDA, NRCS 2006). *Lepidium densiflorum* is not listed as a weed (Rice 2006, USDA, NRCS 2002).

Rational:

Sources of information:

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

Rice, P.M. 2006. INVADERS Database System (<http://invader.dbs.umt.edu>). Division of Biological Sciences, University of Montana, Missoula, MT 59812-4824.

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

8

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:

The majority of seeds germinate in the first four years, but some viable seeds remain in the soil for more than six years (Chepil 1948).

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:

Common pepperweed has no resprout potential (Densmore et al. 2001).

Rational:

Sources of information:

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.

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

1

Documentation:

Identify types of control methods and time-term required:

Common peppergrass can be easily control by hand pulling or herbicide applications. Due to the large long lived seed bank, several treatments may be necessary (Densmore et al. 2001).

Rational:

Sources of information:

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.

Total Possible

10

Total

4

Total for 4 sections Possible

88

Total for 4 sections

22

References:

- 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.
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- Douglas, G.W., G.B. Straley, D. Meidinger, J. Pojar. 1998. Illustrated flora of British Columbia. V. 2. Ministry of Environment, Lands and Parks Ministry of Forests. British Columbia. 401 pp.
- Hultén, E. 1968. *Flora of Alaska and Neighboring Territories*. Stanford University Press, Stanford, CA. 1008 p.
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- Rice, P.M. 2006. INVADERS Database System (<http://invader.dbs.umt.edu>). Division of Biological Sciences, University of Montana, Missoula, MT 59812-4824.
- 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.npwr.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).
- University of Alaska Museum. University of Alaska Fairbanks. 2003. <http://hispidamuseum.uaf.edu:8080/home.cfm>
- 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> [May 1, 2006].
- 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.
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- Welsh, S.L. 1974. *Anderson's flora of Alaska and adjacent parts of Canada*. Brigham University Press. 724 pp.