

ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

Botanical name: *Lolium perenne* L.

Common name: perennial ryegrass

Assessors:

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Date: 2/14/2011

Date of previous ranking, if any: 5T

OUTCOME SCORE:

CLIMATIC COMPARISON

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

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

INVASIVENESS RANKING

	Total (total answered points possible ¹)	Total
Ecological impact	40 (<u>40</u>)	<u>16</u>
Biological characteristics and dispersal ability	25 (<u>25</u>)	<u>15</u>
Ecological amplitude and distribution	25 (<u>25</u>)	<u>18</u>
Feasibility of control	10 (10)	<u>3</u>
Outcome score	100 (<u>100</u>) ^b	<u>52</u> ^a
Relative maximum score ²		<u>52</u>

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

² Calculated as $a/b \times 100$

A. CLIMATIC COMPARISON

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

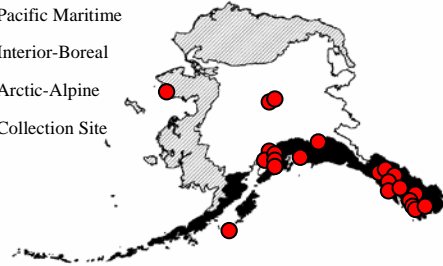
- Yes - continue to 1.2
 No - continue to 2.1

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

Proceed to Section B. INVASIVENESS RANKING

- Pacific Maritime
 Interior-Boreal
 Arctic-Alpine

- Pacific Maritime
 Interior-Boreal
 Arctic-Alpine
 Collection Site



Documentation: *Lolium perenne* has been documented from all three ecogeographic regions of Alaska (Hultén 1968, AKEPIC 2011, UAM 2011).

Note on Taxonomy: Some botanists treat *Lolium perenne* and *Lolium multiflorum* as two subspecies of *Lolium perenne* because these taxa can form highly fertile hybrids and *Lolium multiflorum* may have originated from *Lolium perenne* as an early agricultural cultivar (Sullivan 1992, DiTomaso and Healy 2007). However, because *Lolium perenne* is a perennial grass while *Lolium multiflorum* is an annual or biennial grass, we adopt the view of recent treatments that recognize these taxa as separate species (Terrell 2007, Dzyubenko and Dzyubenko 2009, Klinkenberg 2010, ITIS 2011).

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

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

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

Documentation:

B. INVASIVENESS RANKING

1. Ecological Impact

1.1. Impact on Natural Ecosystem Processes

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

- c. Has the potential to cause significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, degrades habitat important to waterfowl) 7
 - d. Has the potential to cause major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology, hydrology, or affects fire frequency thereby altering community composition; species fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species) 10
 - e. Unknown U
- Score 5

Documentation: As a tufted grass, *Lolium perenne* binds soil, thereby decreasing erosion (eFloras 2008). This species decreases soil moisture and nutrient availability (Mattner and Parbery 2001, GOERT 2009). Dry litter accumulation increases fire hazards (GOERT 2009).

1.2. Impact on Natural Community Structure

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

Documentation: *Lolium perenne* forms tufts (Beddows 1967, Klinkenberg 2010) that may increase the density of graminoid layers. In Alaska, 25% of infestations occur at or above 30% ground cover (AKEPIC 2011).

1.3. Impact on Natural Community Composition

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

Documentation: When seeded at high densities, *Lolium perenne* can reduce the growth of surrounding vegetation (Sullivan 1992). In Alaska, 25% of infestations occur at or above 30% ground cover (AKEPIC 2011), suggesting that this species may have the potential to reduce native plant populations. However, most infestations occur in anthropogenically disturbed areas (AKEPIC 2011).

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

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

Score

5

Documentation: *Lolium perenne* hybridizes with other *Lolium* species as well as occasionally with some *Festuca* species (eFloras 2008). It is palatable to large mammals, upland game birds, and waterfowl (Sullivan 1992, Wright 2008). In northern California, this species has been associated with a fungus that causes trembling, staggering, and seizures in cattle and sheep (DiTomaso and Healy 2007). *Lolium perenne* is affected by many fungal diseases, including ergot (*Claviceps purpurea*) (Sullivan 1992).

Total Possible	<table border="1" style="display: inline-table;"><tr><td>40</td></tr></table>	40
40		
Total	<table border="1" style="display: inline-table;"><tr><td>16</td></tr></table>	16
16		

2. Biological Characteristics and Dispersal Ability

2.1. Mode of reproduction

- | | | |
|----|--|---|
| a. | Not aggressive (produces few seeds per plant [0-10/m ²] and not able to reproduce vegetatively). | 0 |
| b. | Somewhat aggressive (reproduces by seed only [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 (extensive vegetative spread and/or many seeded [>1,000/m ²]) | 3 |
| e. | Unknown | U |

Score

2

Documentation: *Lolium perenne* reproduces sexually by seeds and vegetatively from short rhizomes and tillers (Beddows 1967, Klinkenberg 2010). Individual inflorescences produce between 45 and 333 seeds (Beddows 1967, Terrell 2007).

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

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

Score

Documentation: Seeds are relatively heavy and compact (Beddows 1967). Most seeds land near the parent plant (DiTomaso and Healy 2007).

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

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

Score

Documentation: *Lolium perenne* is cultivated as a forage and lawn grass (Sullivan 1992, eFloras 2008). It is recommended as a commercially available grass for revegetation work (Wright 2008) and has been seeded for revegetation in multiple locations in Alaska (Rapp 2009, AKEPIC 2011). This species has been identified as a contaminant in ryegrass straw and wheat straw imported from Washington and Oregon (Conn et al. 2010).

2.4. *Allelopathic*

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

Score

Documentation: Leachate from *Lolium perenne* is known to suppress the growth of *Trifolium repens*, but the effect is greatest when the *Lolium perenne* is young or is infected with *Puccinia coronata*, a fungal pathogen that causes crown rust (Mattner and Parbery 2001).

2.5. *Competitive ability*

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

Score

Documentation: High density populations of *Lolium perenne* can slow the growth of surrounding vegetation in pastures (Sullivan 1992). This species can outcompete native species for moisture and light in Garry Oak ecosystems in British Columbia (GOERT 2009).

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

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

Score

0

Documentation: *Lolium perenne* has a tufted growth form but does not form mats or significantly overtop surrounding vegetation (Terrell 2007, Dzyubenko and Dzyubenko 2009, Klinkenberg 2010).

2.7. *Germination requirements*

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

Score

0

Documentation: *Lolium perenne* is not known to germinate in undisturbed areas (AKEPIC 2011). It is shade intolerant (Sullivan 1992) and is not likely to establish under closed canopies.

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

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

Score

3

Documentation: *Lolium persicum* is considered a noxious weed in Alberta, Manitoba, Saskatchewan, and Texas, and *L. temulentum* is considered a noxious weed in Alabama, Louisiana, Mississippi, Oklahoma, and Texas (Invaders 2011). *L. multiflorum* is known to occur as a non-native weed in Alaska with an invasiveness rank of 41 (AKEPIC 2011).

2.9. *Aquatic, wetland, or riparian species*

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

Score

3

Documentation: *Lolium perenne* has been documented growing in continuously grazed riparian corridors in Wisconsin (Paine and Ribic 2002) and is known to grow in riparian pastures in the Pacific Northwest (Griffiths et al. 1997). It grows in wetlands in California (Sullivan 1992).

Total Possible

25

Total

15

3. Ecological Amplitude and Distribution

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

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

Score

Documentation: *Lolium perenne* is extensively cultivated in much of the world as a forage or pasture grass. Seeds are included in some lawn seed mixtures. This species is also planted to stabilize soils and reduce erosion (Sullivan 1992, Terrell 2007, eFloras 2008, Dzyubenko and Dzyubenko 2009). In Tennessee and Virginia, it has been planted on eroded mine spoils, and in Utah, it has been planted to stabilize streambanks (Sullivan 1992). This species has been used for revegetation work in Alaska (Wright 2008, Rapp 2009, AKEPIC 2011).

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

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

Score

Documentation: Most documented impacts of *Lolium perenne* are associated with agriculture. However, this species can outcompete native species for moisture and light in Garry Oak ecosystems in British Columbia (GOERT 2009).

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

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

Score

Documentation: In Alaska, *Lolium perenne* primarily establishes in anthropogenically disturbed sites but can also establish in naturally disturbed sites, such as areas disturbed by coastal processes or glaciation (AKEPIC 2011).

3.4. *Current global distribution*

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

Score

Documentation: *Lolium perenne* is native to Europe, temperate Asia, and North Africa (Beddows 1967, Terrell 2007, eFloras 2008). It has been introduced to North America, South America, Australia, southern Africa, and New Zealand (Beddows 1967, Terrell 2007, GOERT

2009). This species is known to grow in arctic regions of Europe and western Russia (Dzyubenko et al. 2004, Elven 2007).

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

- a. Occurs in 0-5 percent of the states 0
- b. Occurs in 6-20 percent of the states 2
- c. Occurs in 21-50 percent of the states and/or listed as a problem weed (e.g., "Noxious," or "Invasive") in one state or Canadian province 4
- d. Occurs in more than 50 percent of the states and/or listed as a problem weed in two or more states or Canadian provinces 5
- e. Unknown U

Score

5

Documentation: *Lolium perenne* grows in all states of the U.S. and most of Canada (USDA 2011). It is not considered a noxious weed in any states of the U.S. or provinces of Canada (Invaders 2011, USDA 2011).

Total Possible	25
Total	18

4. Feasibility of Control

4.1. *Seed banks*

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

Score

0

Documentation: Seed banks are generally transient (DiTomaso and Healy 2007, GOERT 2009) with minimal germination after one year (Roberts 1986).

4.2. *Vegetative regeneration*

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

Score

1

Documentation: Plants regenerate from the roots after the removal of the aboveground growth (Sullivan 1992).

4.3. *Level of effort required*

- a. Management is not required (e.g., species does not persist in the absence of repeated anthropogenic disturbance) 0
- b. Management is relatively easy and inexpensive; requires a minor investment of human and financial resources 2

- c. Management requires a major short-term or moderate long-term investment of human and financial resources 3
- d. Management requires a major, long-term investment of human and financial resources 4
- e. Unknown U

Score

2

Documentation: An infestation of *Lolium perenne* at Bartlett Cove, Glacier Bay National Park, did not persist more than three years (Rapp 2009), suggesting that this species may naturally be replaced by native species in some cases. *Lolium perenne* has low tolerance to cold conditions (Beddows 1967), which suggests that populations may not persist in the colder regions of Alaska. Small patches can be removed by hand-pulling in spring or early summer before seed set (GOERT 2009).

Total Possible	10
Total	3

Total for four sections possible	100
Total for four sections	52

References:

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