ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

Botanical name: *Holcus lanatus* L.
Common name: common velvetgrass
Assessors:

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Date: 2/28/2011
Date of previous ranking, if any: 4T

OUTCOME SCORE:

CLIMATIC COMPARISON

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

Pacific Maritime	Yes
Interior-Boreal	No
Arctic-Alpine	No

INVASIVENESS RANKING	**Total** (total answered points possible[1])	**Total**
Ecological impact	40 (40)	18
Biological characteristics and dispersal ability	25 (23)	15
Ecological amplitude and distribution	25 (25)	15
Feasibility of control	10 (10)	7
Outcome score	100 (98)[b]	55[a]
Relative maximum score[2]		**56**

[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 × 100

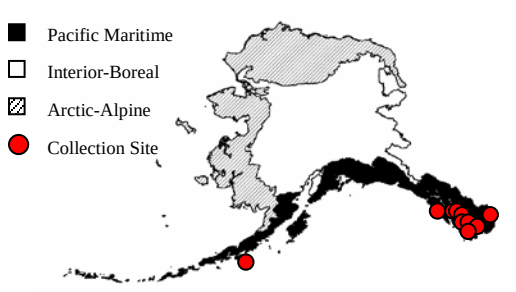
A. CLIMATIC COMPARISON

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. INVASIVNESS RANKING

☒ Pacific Maritime
☐ Interior-Boreal
☐ Arctic-Alpine



Documentation: *Holcus lanatus* has been documented from the Pacific Maritime ecogeographic region of Alaska (Hultén 1968, AKEPIC 2011, UAM 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: *Holcus lanatus* has been documented from sites near Lillehammer, Norway, and Vaasa and Kuopio, Finland, which have 44%, 45%, and 47% climatic similarities with Fairbanks, respectively, and 49%, 54%, and 54% climatic similarities with Nome, respectively (CLIMEX 1999, Jyväskylä University Museum 2011, Vascular Plant Herbarium Oslo 2011). It has also been documented from Lærdalsøyri, Norway, which has a 45% climatic similarity with Nome (CLIMEX 1999, Vascular Plant Herbarium Oslo 2011). However, in Europe, this species does not grow in regions where the average January temperature is colder than -2°C (Beddows 1961), and it mainly grows in the milder coastal regions of Nova Scotia and British Columbia in Canada (Thompson and Turkington 1988), suggesting that the establishment of *Holcus lanatus* in the Interior-Boreal and Arctic-Alpine ecogeographic regions is unlikely.

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: Litter accumulation from *Holcus lanatus* can increase risk of fires (Gucker 2008). This species rapidly colonizes disturbed areas, where it outcompetes native species for soil moisture and nutrients (Gucker 2008, GOERT 2009). Its long, fast-growing roots, long root hairs, and rapid rate of establishment enable it to aggressively compete for nutrients, especially in nutrient-limited substrates (Thompson and Turkington 1988, DiTomaso and Healy 2007).

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 **5**

Documentation: Dense populations of *Holcus lanatus* have been shown to reduce the growth of tree seedlings (Willoughby et al. 2006). This species has occurred at up to 80% ground cover in Alaska (AKEPIC 2011) and can likely significantly increase the density of vegetation in disturbed areas.

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 **5**

Documentation: Dense patches of *Holcus lanatus* reduce the establishment of native species. The accumulation of litter from *Holcus lanatus* can prevent the germination of native grasses (Gucker 2008).

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 **3**

Documentation: *Holcus lanatus* provides food for game birds, deer, elk, and insects (Beddows 1961, Gucker 2008). It is associated with many detrimental microorganisms and viruses (Thompson and Turkington 1988).

Total Possible	40
Total	**18**

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 **3**

Documentation: *Holcus lanatus* reproduces sexually by seeds and vegetatively by tillering. A single panicle can produce from 100 to 380 seeds. A single plant can produce up to 240,000 seeds. The average seed production for a dense stand of common velvetgrass in Britain was 19,000 seeds per square meter (Thompson and Turkington 1988, Gucker 2008). A population that occurred at 91% ground cover in California produced 82,300 seeds per square meter (Peart 1989). The contribution of vegetative reproduction is relatively unimportant compared to sexual reproduction (Beddows 1961).

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 **2**

Documentation: Seeds are light, weighing 0.3 to 0.5 mg each, and have large surface areas, enabling them to be dispersed by wind (Thompson and Turkington 1988, Gucker 2008). However, studies show that 90% of seeds land within 5.2 m of the parent plant (Gucker 2008). Seeds are likely dispersed by water; 10% of seeds remain floating for 72 days in stagnant water and 77 days in moving water (van den Broek et al. 2005). Dispersal by animals, including rabbits, cattle, and some birds, also likely occurs (Gucker 2008).

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 **2**

Documentation: Seeds can be dispersed on mowing equipment (Gucker 2008). They are a known contaminant of grass seed (Thompson and Turkington 1988) and commercial seed sold in Alaska (Conn pers. obs.). *Holcus lanatus* is sometimes cultivated as a meadow grass in British Columbia (Thompson and Turkington 1988), and it was cultivated in southeast Alaska (Gucker 2008). This species has also been planted for soil stabilization and forage (Thompson and Turkington 1988, DiTomaso and Healy 2007).

2.4. Allelopathic

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

Score **U**

Documentation: Substrate removed from a monoculture of *Holcus lanatus* reduced the growth of both *Rumex acetosa* and other *Holcus lanatus* seedlings (Watt 1978), suggesting that *Holcus lanatus* may exude allelopathic chemicals.

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 **3**

Documentation: Seedlings of *Holcus lanatus* grow very rapidly (Gucker 2008). The long, fast-growing roots, long root hairs, and rapid rate of establishment enable this species to aggressively compete for nutrients, especially in nutrient-limited substrate (Thompson and Turkington 1988,

DiTomaso and Healy 2007). Dense populations can significantly reduce the growth of tree seedlings (Willoughby et al. 2006).

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 **1**

Documentation: *Holcus lanatus* can form dense stands that reduce the establishment of native species (Beddows 1961, Gucker 2008, GOERT 2009). This species has grown at up to 80% ground cover in Alaska (AKEPIC 2011).

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: *Holcus lanatus* readily colonizes bare soil (Beddows 1961). While a few seeds may germinate in established vegetation, seeds primarily germinate when gaps are created by disturbance (Thompson and Turkington 1988, Gucker 2008). In Washington and Oregon, *Holcus lanatus* is common under canopies of *Alnus rubra*, but it does not typically grow in later successional forests (Gucker 2008). All infestations recorded in Alaska occur in disturbed areas (AKEPIC 2011).

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

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

Score **3**

Documentation: *Holcus mollis* is known to occur as a non-native weed in North America (Standley 2007).

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 **1**

Documentation: *Holcus lanatus* grows along the Salmon River in Oregon and the Hoh River in Washington (Gucker 2009).

Total Possible	23
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 **4**

Documentation: *Holcus lanatus* is sometimes cultivated as a meadow grass in British Columbia (Thompson and Turkington 1988). It was cultivated in southeast Alaska and established outside of cultivation by 1959 (Gucker 2008). This species has also been planted for soil stabilization and forage (Thompson and Turkington 1988, DiTomaso and Healy 2007).

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 **1**

Documentation: In Hawaii, *Holcus lanatus* invades high elevation bog communities, where it can dominate the local vegetation and reduce the establishment of native species (Daehler 2005). In coastal prairies in California, patches reduced the establishment of native species (Gucker 2008). *Holcus lanatus* restricts the growth of *Betula pendula* seedlings in the United Kingdom (Willoughby et al. 2006). It invades Garry oak (*Quercus garryana*) ecosystems in British Columbia where it outshades native species and reduces the availability of soil moisture and nutrients (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 **0**

Documentation: Moderate disturbances generally increase the establishment and survival of seedlings (Gucker 2008), but intensive grazing and trampling can reduce populations of *Holcus lanatus* (Beddows 1961, DiTomaso and Healy 2007). In British Columbia, *Holcus lanatus*

commonly grows on exposed mineral soils (Klinkenberg 2010). All infestations recorded in Alaska occur in anthropogenically disturbed areas (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 **5**

Documentation: *Holcus lanatus* is native to Europe, western Asia, and North Africa (Standley 2007, Gucker 2008). It has been introduced to Asia, Africa, North America, South America, Australia, and New Zealand (Beddows 1961, Standley 2007, eFloras 2008, Landcare Research 2011, Western Australian Herbarium 2011). This species is known to grow in coastal Norway as far north as 69.7°N (Vascular Plant Herbarium Oslo 2011).

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: *Holcus lanatus* grows in 45 states of the U.S. and much of Canada (USDA 2011). It is considered a restricted noxious weed seed in Virginia (Invaders 2011).

Total Possible 25
Total **15**

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 **3**

Documentation: Seeds can remain viable in the soil for more than 12 years. Germination from seed banks following disturbance is common (Gucker 2008).

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: *Holcus lanatus* can resprout from basal shoots following the removal of the above-ground growth (Gucker 2008).

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 **3**

Documentation: Hand pulling of plants can reduce populations, and removing inflorescences can contain population expansion (Pitcher and Russo 1988). Long-term flooding can eradicate *Holcus lanatus*. Mowing and cutting can increase the reproductive potential of *Holcus lanatus*, and seeds are easily spread by mowing equipment (Gucker 2008). Fluazifop and sethoxydim kill broad-leaved grasses, including *Holcus lanatus*, but do not harm other plants (GOERT 2009). Atrazine, bromacil, dalapon, diuron, glyphosate, paraquat, and simazine can be used to control this species with few plants recovering (Thompson and Turkington 1988).

Total Possible	10
Total	**7**

Total for four sections possible	98
Total for four sections	**55**

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