ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

Botanical name: *Hieracium pilosella* L.
Common name: mouse-ear hawkweed
Assessors:

Timm Nawrocki Research Technician Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2798	Helen I. Klein Research Technician Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2798
Lindsey A. Flagstad Research Technician Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2786	Matthew L. Carlson, Ph.D. Associate Professor Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2790

Reviewers:

Ashley Grant Invasive Plant Program Instructor Cooperative Extension Service, University of Alaska Fairbanks 1675 C Street, Anchorage, Alaska 99501 (907) 786-6315	Bonnie M. Million. Alaska Exotic Plant Management Team Liaison Alaska Regional Office, National Park Service, U.S. Department of the Interior 240 West 5th Avenue Anchorage, Alaska, 99501 (907) 644-3452
Gino Graziano Natural Resource Specialist Plant Materials Center, Division of Agriculture, Department of Natural Resources, State of Alaska 5310 S. Bodenburg Spur, Palmer, Alaska, 99645 (907) 745-4469	Jeff Conn, Ph. D. Research Agronomist Agricultural Research Service, U.S. Department of Agriculture 319 O'Neil Building, 905 Koyukuk St. – UAF Campus, Fairbanks, Alaska 99775 (907) 474-7652

Date: 1/17/2011
Date of previous ranking, if any: 6T

OUTCOME SCORE:

CLIMATIC COMPARISON

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

Pacific Maritime	Yes
Interior-Boreal	Yes
Arctic-Alpine	Yes

INVASIVENESS RANKING	**Total** (total answered points possible[1])	**Total**
Ecological impact	40 (40)	22
Biological characteristics and dispersal ability	25 (25)	15
Ecological amplitude and distribution	25 (25)	18
Feasibility of control	10 (10)	8
Outcome score	100 (100)[b]	63[a]
Relative maximum score[2]		**63**

[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

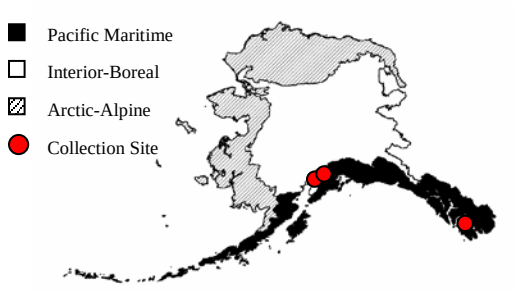
A. CLIMATIC COMPARISON

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: *Hieracium pilosella* has been documented from Girdwood and Prince of Wales Island in the Pacific Maritime ecogeographic region of Alaska and Kenai in the Interior-Boreal ecogeographic region (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: *Hieracium pilosella* has been documented from a site 15 km south of Røros, Norway, and a site 11 km south of Dombås, Norway, which have 76% and 63% climatic similarities with Nome, respectively (CLIMEX 1999, Vascular Plants Field Notes Oslo 2011).

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	10

substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species)

e. Unknown U

Score **5**

Documentation: In New Zealand, *Hieracium pilosella* reduces the nitrogen and phosphorus content of *Festuca novae-zelandiae* tussock, suggesting that this species limits the availability of nutrients (Makepeace et al. 1985). Infestations increase soil pH by up to 0.5 and increase the amount of organic carbon and soil exchangeable calcium, magnesium, and potassium in the soil (McIntosh et al. 1995).

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: *Hieracium pilosella* can form dense mats that significantly increase the density of forb/graminoid layers in grasslands while excluding native species (Makepeace 1985).

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 **7**

Documentation: Dense populations of *Hieracium pilosella* can displace native species (Piening and Russo 1988). In New Zealand, infestations spread extensively, displacing native vegetation in *Festuca novae-zelandiae* tussock grasslands and reaching up to 80% ground cover (Makepeace 1985).

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: *Hieracium* species hybridize with other native and non-native *Hieracium* species (Wilson 2006, Gaskin and Wilson 2007). *Hieracium pilosella* reduces the amount of vegetation available for grazing animals in grasslands in New Zealand (Makepeace 1985).

Total Possible 40
Total **22**

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: *Hieracium pilosella* reproduces sexually by seeds and vegetatively from stolons (Makepeace 1985, Piening and Russo 1988). Individual rosettes produce 23 to 108 seeds (Winkler and Stöcklin 2002). Most seedlings do not survive longer than several weeks (Piening and Russo 1988). Plants only produce stolons when initiating inflorescences. Parent plants die after flowering, and stolons decay after vegetative rosettes root. Pioneer plants arise from seeds, but the maintenance and expansion of populations primarily depend on vegetative reproduction (Makepeace 1985, Winkler and Stöcklin 2002).

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 **3**

Documentation: Each seed has a pappus composed of 30 or more bristles that are 4 to 5 mm long (Strother 2006). Seeds are dispersed by wind (Makepeace 1985).

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 **1**

Documentation: *Hieracium pilosella* was likely introduced to New Zealand in contaminated crop seed (Makepeace 1985).

2.4. Allelopathic

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

Score **2**

Documentation: Leaves contain the allelopathic chemical umbelliferone. The chemical can be leached from dead leaves into the soil when sufficient moisture is present, and it interferes with the root development of surrounding seedlings but not of mature plants. In New Zealand, *Trifolium* seedlings were observed in the field near mouse-ear hawkweed with root damage similar to the root damage produced by umbelliferone under laboratory conditions (Makepeace et al. 1985). However, in New Zealand and France, soil in proximity to *Hieracium pilosella* was not found to contain allelopathic chemicals, suggesting that umbelliferone remains in the soil for a short time or that *Hieracium pilosella* is only allelopathic under certain conditions (Makepeace et al. 1985, Henn et al. 1988).

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: *Festuca novae-zelandiae* tussock had reduced levels of nitrogen and phosphorus when growing in close proximity to dense infestations of *Hieracium pilosella* in New Zealand. Because no allelopathic chemicals were found in the soil, the nutrient reduction is likely a result of competition (Makepeace et al. 1985).

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: *Hieracium pilosella* produces dense patches that radiate outward from a center by stolons (Makepeace 1985). Populations can grow densely enough to exclude other vegetation (Piening and Russo 1988).

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: *Hieracium pilosella* grows in disturbed areas, sand, gravel, fields, lawns, and roadsides (Strother 2006, Klinkenberg 2010). Although *Hieracium* species do not readily germinate in heavily vegetated areas, populations may spread vegetatively into undisturbed areas once established (Giroday and Baker 2006).

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

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

Score **3**

Documentation: All *Hieracium* species are considered noxious weeds in Washington. *Hieracium atratum*, *H. aurantiacum*, *H. caespitosum*, *H.* × *floribundum*, *H. piloselloides*, and *H. vulgatum* are each considered a noxious weed in one or more states of the U.S. or provinces of Canada (Invaders 2011, USDA 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 **0**

Documentation: *Hieracium pilosella* has not been documented invading riparian or wetland communities in North America or New Zealand (Makepeace 1985, Strother 2006, Klinkenberg 2010).

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 **2**

Documentation: *Hieracium pilosella* is a weed of pastures in North America and New Zealand (Davy and Bishop 1984, Piening and Russo 1988, Scott et al. 1990).

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: *Hieracium pilosella* invades *Festuca novae-zelandiae* tussock grasslands in dry inter-montane basins in New Zealand, where it displaces inter-tussock vegetation first and then displaces *Festuca novae-zelandiae*. Infestations spread extensively, reaching up to 80% ground cover (Makepeace 1985) and altering soil conditions (McIntosh et al. 1995). Dense mats of rosettes reduce the quality of pastures for sheep in New Zealand (Scott et al. 1990). This species also grows in dense mats and excludes desirable species in meadows and pastures in the eastern U.S. (Washington NWCB 2008). Thus, moderate to high impacts are documented from habitats dissimilar from those in Alaska.

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 **5**

Documentation: *Hieracium pilosella* establishes on open soil or in sparsely vegetated areas (Piening and Russo 1988). It grows in anthropogenically disturbed areas in North America (Strother 2006, Klinkenberg 2010). In New Zealand, it has established in extensively grazed short tussock grassland (Makepeace 1985). Although *Hieracium* species do not readily germinate in heavily vegetated areas, populations may spread vegetatively into undisturbed areas once established (Giroday and Baker 2006).

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: *Hieracium pilosella* is native to Europe (Piening and Russo 1988, Strother 2006). It was introduced to North America and New Zealand in the early 20th century (Piening and Russo 1988). It has also been introduced to South America (Cipriotti et al. 2010). This species has been documented as far north as 67.9°N in Norway (Norwegian Species Observation Service 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: *Hieracium pilosella* grows in 23 states of the U.S. in the Pacific Northwest and eastern U.S. (Strother 2006, USDA 2011). It is considered a noxious weed in Oregon, Quebec, and Washington (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 **3**

Documentation: The amount of time seeds remain viable for this species is unknown, but *Hieracium* species often maintain seed viability for seven years (Rinella and Sheley 2002).

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 **2**

Documentation: *Hieracium pilosella* can resprout from root and stolon fragments (King County 2010); for this reason, tilling is not recommended.

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: The addition of nitrogen, potassium, and phosphorus to grasslands increases populations of native grasses and reduces or eliminates populations of *Hieracium pilosella*. Increased nutrient levels stimulate flowering, which increases the turnover of rosettes since parent plants die after flowering (Davy and Bishop 1984). *Hieracium pilosella* can be controlled by the application of 2, 4-D ester at 1,000 g/ha combined with clopyralid at 400 g/ha (Piening and Russo 1988). Aminopyralid at 105 grams per hectare and clopyralid at 420 grams per hectare consistently controlled *Hieracium aurantiacum* infestations in southern Alaska and may provide effective control of *Hieracium pilosella* as well. Aminopyralid is better suited to pasture habitats as it controls a broader spectrum of forbs than clopyralid, while clopyralid is better suited to natural habitats as it will remove less of the native vegetation (Seefeldt and Conn 2010). Mechanical control efforts have not been investigated; however, similar to *Hieracium aurantiacum*, mechanical control efforts are likely ineffective.

Total Possible	10
Total	**8**
Total for four sections possible	100
Total for four sections	**63**

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