

ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

Botanical name: *Alchemilla mollis* (Buser) Rothm., *Alchemilla monticola* Opiz

Common name: lady's mantle, hairy lady's mantle

Assessors:

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Date: 1/10/2011

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	<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>20</u>)	<u>12</u>
Biological characteristics and dispersal ability	25 (<u>25</u>)	<u>13</u>
Ecological amplitude and distribution	25 (<u>25</u>)	<u>14</u>
Feasibility of control	10 (<u>3</u>)	<u>2</u>
Outcome score	100 (<u>73</u>) ^b	<u>41</u> ^a
Relative maximum score ²		<u>56</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?

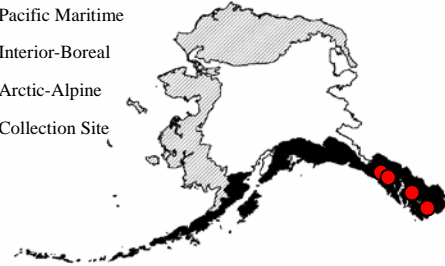
- Yes - continue to 1.2
 No - continue to 2.1

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: *Alchemilla mollis* has been documented from the Pacific Maritime eco-geographic region of Alaska (AKEPIC 2010). *Alchemilla monticola* has not been documented from Alaska.

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: *Alchemilla monticola* has been documented from a site approximately 10 km from Brønnøysund, Norway, which has a 60% climatic similarity with Juneau (CLIMEX 1999, Vascular Plant Herbarium Oslo 2010). It is known to grow north of Chirka-Kem’, Russia, and has been documented from a site approximately 15 km from Røros, Norway, which have 56% and 55% climatic similarities with Fairbanks and 77% and 76% climatic similarities with Nome, respectively (CLIMEX 1999, Real Jardin Botanico 2010, Vascular Plant Herbarium Oslo 2010). Both *Alchemilla mollis* and *Alchemilla monticola* have been documented from Uppsala, Sweden, which has a 42% climatic similarity with Fairbanks and a 47% climatic similarity with Nome (CLIMEX 1999, Artdatabanken 2010).

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 U

Documentation: *Alchemilla mollis* can form dense patches (Eom et al. 2005) and likely reduces the availability of soil nutrients and moisture. However, the impacts of this species on natural ecosystem processes are largely undocumented.

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 7

Documentation: *Alchemilla mollis* can form dense monocultures in leaf litter under alder canopies (Kriekhaus pers. comm.), suggesting that it has the potential to increase the density of herbaceous ground layers.

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: Infestations of *Alchemilla mollis* can reduce the amount of light that reaches the ground by more than 80%, preventing the establishment of native plant species (Eom et al. 2005).

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		U

Documentation: The impacts of *Alchemilla mollis* and *Alchemilla monticola* on associated trophic levels are unknown.

Total Possible	20
Total	12

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: *Alchemilla mollis* reproduces asexually by unfertilized seeds and can be propagated from root fragments (Eom et al. 2005, NatureGate 2011). Seed production is prolific (Stace et al. 2005, Mahr 2010), but the number of seeds produced per plant has not been quantified.

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 ovoid, 1.1 to 1.4 mm long, and 0.7 to 1 mm wide. They lack specific adaptations for dispersal (Bojňanský and Fargašová 2007). During a two year experiment in which *Alchemilla mollis* was grown outside in New York, this species did not invade new areas

(Eom et al. 2005). However, this species has spread from a roadside to at least 6 m into a dense stand of *Alnus viridis* ssp. *sinuata* in Hoonah, AK (Kriekhaus pers. comm.).

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: *Alchemilla mollis* and *Alchemilla monticola* are cultivated as ornamental plants in gardens and as ground covers (Perry 1999, Eom et al. 2005, Mahr 2010, Robert W. Freckmann Herbarium 2011). *Alchemilla mollis* has been observed spreading from a planted container into surrounding lawn in Gustavus, Alaska (Rapp 2009). *Alchemilla monticola* rarely escapes cultivation (Robert W. Freckmann Herbarium 2011).

2.4. Allelopathic

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

Score

Documentation: Although *Alchemilla mollis* suppresses the growth of surrounding vegetation, it does not produce volatile allelopathic compounds (Eom et al. 2006). No evidence suggests that *Alchemilla monticola* is allelopathic.

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: *Alchemilla mollis* prevented the growth of other weed species when grown for two years in New York (Eom et al. 2005), suggesting that this species competes well for limiting factors.

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

Documentation: *Alchemilla mollis* forms dense thickets that reduce the amount of light that reaches the ground by over 80%, preventing the establishment of native plant species (Eom et al. 2005).

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

2

Documentation: In Finland, *Alchemilla* species grow in open or semi-open, often human-influenced habitats (NatureGate 2011). In Britain, *Alchemilla monticola* frequently grows in road edges (PlantNetwork 2011). Most infestations of *Alchemilla mollis* recorded in Alaska are associated with disturbed areas (AKEPIC 2011), suggesting that disturbances favor the establishment of this species. However, *Alchemilla mollis* has been observed spreading into leaf litter under a dense canopy of *Alnus viridis* ssp. *sinuata* in Hoonah, AK (Kriekhaus pers. comm.).

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

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

Score

0

Documentation: *Alchemilla glabra*, *A. subcrenata*, and *A. venosa* are known to occur as non-native species in North America but are not considered weeds (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: In the Carpathian Mountains, neither *Alchemilla mollis* nor *Alchemilla monticola* grow in riparian or wetland communities (Bojňanský and Fargašová 2007) and we find no evidence that these species are associated with riparian or wetland habitats.

Total Possible

25

Total

13

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: *Alchemilla mollis* and *Alchemilla monticola* are cultivated as ground covers and ornamental plants in gardens (Perry 1999, Eom et al. 2005, Mahr 2010, Robert W. Freckmann Herbarium 2011). *Alchemilla mollis* has also been grown as a medicinal herb (Perry 1999, Mahr 2010).

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: No ecological impacts of *Alchemilla mollis* or *Alchemilla monticola* have been documented from natural areas.

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: Most infestations of *Alchemilla mollis* in Alaska are associated with anthropogenically disturbed sites, and 90% are associated specifically with fill importation (AKEPIC 2011). However, this species has been observed spreading from a roadside to at least 6 m into a dense stand of *Alnus viridis* ssp. *sinuata* in Hoonah, AK (Kriechhaus pers. comm.).

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: *Alchemilla mollis* is native to Turkey and the Carpathian mountains (Perry 1999, Bojňanský and Fargašová 2007). It has been introduced to Europe, Asia Minor, North Africa, and North America (Gardner 1998, Staatliche Naturwissenschaftliche Sammlungen Bayerns 2010, USDA 2011). It has not been documented from arctic regions. *Alchemilla monticola* is native to Europe and Siberia (Bojňanský and Fargašová 2007). It also grows in

North America (USDA 2011). This species has been documented from arctic regions in Norway and in the Province of Murmansk, Russia (Real Jardin Botanico 2010, Vascular Plant Herbarium Oslo 2010).

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

2

Documentation: *Alchemilla monticola* grows in Alaska, Connecticut, Massachusetts, Maine, New York, Vermont, and Wisconsin. It also grows in eastern Canada (USDA 2011). Range information is not available for *Alchemilla mollis* in North America. Neither *Alchemilla monticola* nor *Alchemilla mollis* are considered noxious weeds in any states of the U.S. or provinces of Canada.

Total Possible

25

Total

14

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

U

Documentation: The amount of time seeds remain viable in the soil is unknown.

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: *Alchemilla mollis* and *Alchemilla monticola* can be propagated from root fragments (Eom et al. 2005).

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

U

Documentation: Plants can be removed from gardens manually (Mahr 2010), taking care to remove all root fragments (Eom et al. 2005). However, control methods for *Alchemilla mollis* and *Alchemilla monticola* are largely undocumented.

Total Possible

3

Total

2

Total for four sections possible

73

Total for four sections

41

References:

- AKEPIC database. Alaska Exotic Plant Information Clearinghouse Database. 2011. Available: <http://akweeds.uaa.alaska.edu/>
- Artdatabanken. 2010. Accessed through GBIF (Global Biodiversity Information Facility) data portal (<http://data.gbif.org/datasets/resource/1034>, 2011-01-21). Species Gate (Artportalen).
- Bojňanský, V., and A. Fargašová. 2007. Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region. Springer. Dordrecht, The Netherlands. 1046 p.
- CLIMEX. 1999. CLIMEX for Windows, Predicting the effects of climate on plants and animals. Version 1.1a. CISRO Publishing. Collingwood, Australia.
- Eom, S., A. Senesac, I. Tsontakis-Bradley, and L. Weston. 2005. Evaluation of Herbaceous Perennials as Weed Suppressive Groundcovers for Use Along Roadsides or in Landscapes. *Journal of Environmental Horticulture*. 23(4). 198-203 p.
- Eom, S., H. Yang, and L. Weston. 2006. An evaluation of the allelopathic potential of selected perennial groundcovers: foliar volatiles of catmint (*Nepeta x faassenii*) inhibit seedling growth. *Journal of Chemical Ecology*. 32(8). 1835-1848 p.
- Gardner, J. 1998. Herbs in Bloom: A Guide to Growing Herbs as Ornamental Plants. Timber Press, Inc. Portland, OR. 395 p.
- Kriekhaus, B., Biologist, Tongass National Forest, Forest Service, U.S. Department of Agriculture, 204 Siginaka Way, Sitka, Alaska, 99835. Tel: (907) 747-4242 – pers. comm.
- Mahr, S. 2010. Lady's Mantle, *Alchemilla mollis*. The Wisconsin Master Gardeners Program, University of Wisconsin Cooperative Extension. Madison, WI. [12 January 2011] http://wimastergardener.org/?q=Alchemilla_mollis
- NatureGate. 2011. Finland Nature and Species. Helsinki, Finland. [12 January 2011] Available: <http://www.luontoportti.com/suomi/en/>
- Perry, L. 1999. Perennial Plant of the Month. *Alchemilla mollis*. Department of Plant and Soil Science, University of Vermont Extension. [12 January 2011] <http://www.uvm.edu/pss/ppp/jan99per.html>
- PlantNetwork. 2011. *Alchemilla monticola* Opiz. The Plant Collections Network of Britain and Ireland. Cambridge, England. [12 January 2011] <http://www.plantnetwork.org/projects/datasheets/alchmont.pdf>
- Rapp, W. 2009. Invasive Plant Management in Glacier Bay National Park and Preserve. Summer 2009 Field Season Report. Invasive Species Program, Glacier Bay National Park and Preserve, National Park Service, U.S. Department of the Interior. Gustavus, AK. 164 p.
- Real Jardín Botánico. 2010. Accessed through GBIF (Global Biodiversity Information Facility) data portal (<http://data.gbif.org/datasets/resource/240>, 2011-01-12) Vascular Plant Herbarium, Real Jardín Botánico. Madrid, Spain.
- Robert W. Freckmann Herbarium. 2011. *Alchemilla monticola* Opiz. University of Wisconsin. Stevens Point, WI. [12 January 2011] <http://wisplants.uwsp.edu/index.html>
- Staatliche Naturwissenschaftliche Sammlungen Bayerns. 2010. Accessed through GBIF (Global Biodiversity Information Facility) data portal (<http://data.gbif.org/datasets/resource/11998>, 2011-01-12). The Vascular Plant Collection at the Herbarium MSB, Universität München. München, Germany.

- Stace, C., R. van der Meijden, and I. de Kort. 2005. Interactive Flora of NW Europe. World Biodiversity Database. <http://nlbif.eti.uva.nl/bis/flora.php>
- USDA. 2011. The PLANTS Database. National Plant Data Center, Natural Resources Conservation Service, United States Department of Agriculture. Baton Rouge, LA. <http://plants.usda.gov>
- Vascular Plant Herbarium, Oslo. 2010. Accessed through GBIF (Global Biodiversity Information Facility) data portal (<http://data.gbif.org/datasets/resource/1078>, 2011-01-12). Natural History Museum, University of Oslo. Oslo, Norway.