**PLANT INVASIVENESS ASSESSMENT FORM**

Botanical name: *Alliaria petiolata* (Bieb.) Cavara & Grande  
Common name: garlic mustard  
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**Outcome score:**

### A. Climatic Comparison

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

<table>
<thead>
<tr>
<th>Region</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Coastal</td>
<td>Yes</td>
</tr>
<tr>
<td>Interior-Boreal</td>
<td>No</td>
</tr>
<tr>
<td>Arctic-Alpine</td>
<td>No</td>
</tr>
</tbody>
</table>

This species is unlikely to establish in any region in Alaska

### B. Invasiveness Ranking

<table>
<thead>
<tr>
<th>Factor</th>
<th>Total (Total Answered*) Possible</th>
<th>Total</th>
<th>Relative maximum score†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological impact</td>
<td>40 (30)</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Biological characteristic and dispersal ability</td>
<td>25 (25)</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Ecological amplitude and distribution</td>
<td>25 (25)</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Feasibility of control</td>
<td>10 (10)</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Outcome score</td>
<td>100 (90)</td>
<td>63</td>
<td>0.70</td>
</tr>
</tbody>
</table>

* 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)?  
*Proceed to Section B. Invasiveness Ranking.*

<table>
<thead>
<tr>
<th>Region</th>
<th>Collection Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Coastal</td>
<td></td>
</tr>
<tr>
<td>Interior-Boreal</td>
<td></td>
</tr>
<tr>
<td>Arctic-Alpine</td>
<td></td>
</tr>
</tbody>
</table>

1
2. Documentation: Garlic mustard has been collected in South Coastal Region, in downtown Juneau, (AK Weeds Database, 2004).
Sources of information:

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 – 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 – record locations and similarity; proceed to Section B.
      Invasiveness Ranking
   No
   – If “No” is answered for all regions, reject species from consideration

Documentation: Using CLIMEX matching program, climatic similarity between Fairbanks and areas where the species is documented is very low. This is true for Nome as well. However, this taxon has been collected from Stockholm, Sweden (Natur Historiska Riksmuseet Database, 2004), which has a moderate climate match (57% similarity) with Anchorage, suggesting that establishment in south central Alaska may be possible.
Sources of information:

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

   Documentation:
   Identify ecosystem processes impacted:
   No information was found identifying impacts to ecosystem processes.
   Rational:
   Sources of information:

   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 7

   Score U
### 1.3. Impact on Natural Community Composition

<table>
<thead>
<tr>
<th>Impact Type</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. No perceived impact</td>
<td>0</td>
</tr>
<tr>
<td>B. Influences community composition (e.g., reduces the number of individuals in one or more native species in the community)</td>
<td>3</td>
</tr>
<tr>
<td>C. Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community)</td>
<td>7</td>
</tr>
<tr>
<td>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)</td>
<td>10</td>
</tr>
</tbody>
</table>

**Documentation:**

Garlic mustard can completely dominate and displace native plants in the rich herbaceous understory layer (Nuzzo 2000).

**Rational:**

**Sources of information:**


### 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)

<table>
<thead>
<tr>
<th>Impact Type</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Negligible perceived impact</td>
<td>0</td>
</tr>
<tr>
<td>B. Minor alteration</td>
<td>3</td>
</tr>
<tr>
<td>C. Moderate alteration (minor reduction in nesting/foraging sites, reduction in habitat connectivity, interference with native pollinators, injurious components such as spines, toxins)</td>
<td>7</td>
</tr>
<tr>
<td>D. Severe alteration of higher trophic populations (extirpation or endangerment of an existing native species/population, or significant reduction in nesting or foraging sites)</td>
<td>10</td>
</tr>
</tbody>
</table>

**Documentation:**

Garlic mustard appears to alter habitat suitability for native birds, mammals, and amphibians, and may affect populations of these species. Phytotoxic chemicals produced by *Alliaria petiolata* may interfere with growth of native species (Nuzzo 2000).

**Rational:**
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):
Plant produces an average of 136-295 seeds (Byers and Quinn 1998), and up to 2421 seeds under lab conditions (Nuzzo 2000). Maximum production per plant is estimated at 7,900 seeds on a plant with 12 stems (Nuzzo 2000).

Rational:
Sources of information:

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 2

Documentation:
Identify dispersal mechanisms:
Seeds typically fall within a few meters radius of the plant. Wind dispersal is limited, and seeds do not float well, although seeds readily attach to moist surfaces. It may be dispersed by rodents, birds, and deer (Nuzzo 2000).

Rational:
Sources of information:

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
Identify dispersal mechanisms:
Anthropogenic distribution appears to be the primary dispersal mechanism of *Alliaria petiolata*. Seeds are transported on boots, clothes, and hair, and by roadside mowing, automobiles and trains (Nuzzo 2000). The species has medicinal properties (McGuffin 1997). This plant is an ingredient in several ‘gourmet’ recipes. At least one U.S. seed company (Canterbury Farms) offers *Alliaria petiolata* seeds for sale ($1.00/package) (Nuzzo 2000).

2.4. Allelopathic

A. No 0
B. Yes 2
C. Unknown 2

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

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
C. Unknown
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 3

Documentation:
Describe germination requirements:
Seeds can remain dormant for 20 months (Blossey 2003). Cold stratification is necessary for germination. Germinates well in intact woodland communities (Wisconsin DNR 2004). Can germinate in both light and dark after dormancy is broken (Byers 1988, Bloom et al. 1990). Exposed soil caused by deer trampling has been suggested to facilitate spread of the species (Blossey 2003), but garlic mustard is capable of germinating in the absence of exposed soil.

Rational:

Sources of information:

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

A. No 0

B. Yes 3

U. Unknown

Score 0

Documentation:
Describe species:
Alliaria petiolata is the only species of the genus Alliaria in North America. (Blossey et al. 2002, USDA 2002).

Sources of information:

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
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**

**Documentation:**
Identify reason for selection, or evidence of weedy history:

*Alliaria petiolata* is a weed of natural areas (Blossey et al. 2002).

**Rational:**
Although used in cooking and medicines, this taxon in not domesticated or associated with agriculture.

**Sources of information:**


3.2. Known level of 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**

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

Garlic mustard is common in low-quality forests in central Pennsylvania (Nuzzo 2000) and less frequent in isolated woodlots in central Indiana (Brothers and Springarn 1992). It is rarely found under coniferous trees in the Midwest, but has been reported from under seven species of coniferous trees in Ontario. Garlic mustard is most frequently recorded from moist, usually riverine, habitat and waste ground in Kansas and Oklahoma (Nuzzo 2000).

**Sources of information:**

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

<table>
<thead>
<tr>
<th>Score</th>
<th>Documentation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A. Requires anthropogenic disturbances to establish</td>
</tr>
<tr>
<td>3</td>
<td>B. May occasionally establish in undisturbed areas but can readily establish in areas with natural disturbances</td>
</tr>
<tr>
<td>5</td>
<td>C. Can establish independent of any known natural or anthropogenic disturbances</td>
</tr>
<tr>
<td></td>
<td>U. Unknown</td>
</tr>
</tbody>
</table>

**Rational:**

*Alliaria petiolata* is disturbance adapted, and is frequent in sites subjected to continued or repeated disturbance (Luken et al. 1997, Pyle 1995). Byers and Quinn (1998) found that garlic mustard resource allocation was greatest in the most disturbed site. Continued disturbance promotes greater seed production which in turn promotes larger populations. In the absence of disturbance, garlic mustard gradually declines to a low stable level (Nuzzo 2000).

**Sources of information:**


### 3.4. Current global distribution

<table>
<thead>
<tr>
<th>Score</th>
<th>Documentation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A. Occurs in one or two continents or regions (e.g., Mediterranean region)</td>
</tr>
<tr>
<td>3</td>
<td>B. Extends over three or more continents</td>
</tr>
<tr>
<td>5</td>
<td>C. Extends over three or more continents, including successful introductions in arctic or subarctic regions</td>
</tr>
<tr>
<td></td>
<td>U. Unknown</td>
</tr>
</tbody>
</table>

**Rational:**

*Native to Europe, Alliaria petiolata also occurs in North Africa, India, Sri Lanka, New Zealand, and North America.*

**Sources of information:**


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

<table>
<thead>
<tr>
<th>Score</th>
<th>Documentation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A. 0-5% of the states</td>
</tr>
<tr>
<td>2</td>
<td>B. 6-20% of the states</td>
</tr>
<tr>
<td>4</td>
<td>C. 21-50%, and/or state listed as a problem weed (e.g., “Noxious,” or “Invasive”) in 1 state or Canadian province</td>
</tr>
<tr>
<td>5</td>
<td>D. Greater than 50%, and/or identified as “Noxious” in 2 or more states or Canadian provinces</td>
</tr>
<tr>
<td></td>
<td>U. Unknown</td>
</tr>
</tbody>
</table>

**Rational:**

4. FEASIBILITY OF CONTROL

4.1. Seed banks

A. Seeds remain viable in the soil for less than 3 years
   Score 0

B. Seeds remain viable in the soil for between 3 and 5 years
   Score 2

C. Seeds remain viable in the soil for 5 years and more
   Score 3

U. Unknown
   Score 2

4.2. Vegetative regeneration

A. No resprouting following removal of aboveground growth
   Score 0

B. Resprouting from ground-level meristems
   Score 1

C. Resprouting from extensive underground system
   Score 2

D. Any plant part is a viable propagule
   Score 3

U. Unknown
   Score 2

4.3. Level of effort required

A. Management is not required (e.g., species does not persist without repeated anthropogenic disturbance)
   Score 0

B. Management is relatively easy and inexpensive; requires a minor investment in human and financial resources
   Score 2

C. Management requires a major short-term investment of human and financial resources, or a moderate long-term investment
   Score 3

D. Management requires a major, long-term investment of human and financial resources
   Score 4

U. Unknown
   Score 3
Documentation:
Identify types of control methods and time-term required:
Once garlic mustard is established, the management goal is to prevent seed production until the seed bank is exhausted. This requires post removal management over several growing seasons. Many successful control regimes involve a combination of spring burning, hand pulling, and herbicide treatment. Monitoring once or twice annually for garlic mustard presence is required.

Rational:

Sources of information:

References:

