# ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

*Botanical name:* *Mentha spicata* L. and *Mentha ×piperita* L. (pro sp.) [*aquatica×spicata*]
*Common name*: spearmint and peppermint
*Assessors:*


| | |
|---|---|
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*Date:* 12/3/2010
*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 | Yes |
| Interior-Boreal | Yes |
| Arctic-Alpine | Yes |

| **INVASIVENESS RANKING** | **Total** (total answered points possible[1]) | **Total** |
|---|---|---|
| Ecological impact | 40 (40) | 8 |
| Biological characteristics and dispersal ability | 25 (22) | 14 |
| Ecological amplitude and distribution | 25 (25) | 13 |
| Feasibility of control | 10 (7) | 5 |
| Outcome score | 100 (94)[b] | 40[a] |
| Relative maximum score[2] | | **43** |

[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

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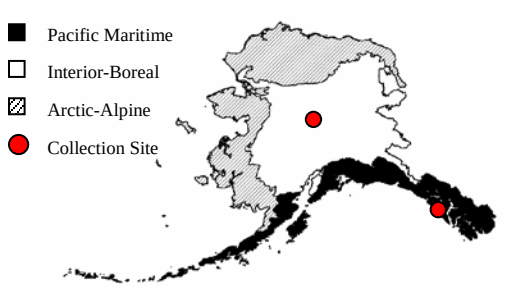
A. CLIMATIC COMPARISON

*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**: *Mentha spicata* has been documented from the Pacific Maritime and Interior-Boreal ecogeographic regions of Alaska (Hultén 1968, UAM 2010). *Mentha ×piperita* has escaped from cultivation in Alaska, but no specific locations are known (Hultén 1968).

*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:** *Mentha ×piperita* has been documented growing approximately 75 km from Yarmouth in coastal Nova Scotia (Canadian Museum of Nature Herbarium 2010). Yarmouth has a 50% climatic similarity with Juneau (CLIMEX 1999). *Mentha ×piperita* has not been documented from any regions that have a 40% or greater climatic similarity with Fairbanks or Nome. *Mentha spicata* has been documented from Uppsala, Sweden, and from a site approximately 12 km south of Jönköping, Sweden, which have 47% and 44% climatic similarities with Nome, respectively (CLIMEX 1999, Artdatabanken 2010, Herbarium of Oskarshamn 2010).

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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 **1**

**Documentation:** *Mentha spicata* and *Mentha ×piperita* are likely to reduce the nutrients available to native plant species, but only in moist to wet, disturbed sites (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 **1**

**Documentation:** These *Mentha* species establish mainly in moist to wet, disturbed areas (DiTomaso and Healy 2007, Klinkenberg 2010). They may increase the density of vegetation in these habitats by spreading extensively from rhizomes (DiTomaso and Healy 2007, Abbaszadeh et al. 2009). We are not aware of perceivable impacts to existing vegetation structure in Alaska.

*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:** *Mentha spicata* and *Mentha ×piperita* may limit the sizes of native plant populations in moist, disturbed areas through competition for nutrients and through the allelopathic action of their essential oils (Azirak and Karaman 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:** *Mentha spicata* and *Mentha ×piperita* generally repel pest insects and attract beneficial insects. These species are susceptible to herbivory from whiteflies and aphids (Abbaszadeh et al. 2009). They are pollinated by bees and other insects (Plants for a Future 2010); therefore, the presence of *Mentha spicata* and *Mentha ×piperita* may alter native plant-pollinator interactions. The impacts of these *Mentha* species on associated trophic levels are largely undocumented.

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| | |
|---|---|
| Total Possible | 40 |
| Total | **8** |

## 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:** *Mentha spicata* and *Mentha ×piperita* both reproduce vegetatively from wide-spreading rhizomes (DiTomaso and Healy 2007, Abbaszadeh et al. 2009). The shoot yield of both species ranges from approximately 1,800 to 2,100 kg per hectare in Iran. *Mentha ×piperita* is a sterile hybrid formed by crosses of *Mentha spicata* and *Mentha aquatica*; it produces no viable seeds (Abbaszadeh et al. 2009, Ling 2010). The seed production of *Mentha spicata* 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:** The long-distance dispersal of *Mentha ×piperita* is limited by its exclusively vegetative reproduction (Abbaszadeh et al. 2009). The fruits of *Mentha spicata*, which consist of four nutlets enclosed by the calyx, can be dispersed by water and can cling to animal fur (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 **2**

**Documentation:** *Mentha spicata* and *Mentha ×piperita* are commonly planted in gardens throughout the U.S. and escape from cultivation into disturbed, moist areas (Hultén 1968, DiTomaso and Healy 2007). Rhizome fragments and seeds can be spread on agricultural and construction equipment (DiTomaso and Healy 2007).

*2.4. Allelopathic*

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

Score **2**

**Documentation:** The essential oils of *Mentha spicata* at low concentrations inhibit the germination of other plant species because they contain the monoterpene chemical, carvone (Azirak and Karaman 2008). It is likely that the essential oils of *Mentha ×piperita* have similar allelopathic effects.

*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 **U**

**Documentation:** The competitive abilities of *Mentha spicata* and *Mentha ×piperita* are unknown.

*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:** There are no known cases of *Mentha spicata* or *Mentha ×piperita* forming dense thickets and overtopping surrounding vegetation.

*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:** *Mentha spicata* escapes cultivation and grows in disturbed vegetation (DiTomaso and Healy 2007, Klinkenberg 2010, Western Australian Herbarium 2010).

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

| | | |
|---|---|---|
| a. | No | 0 |
| b. | Yes | 3 |
| c. | Unknown | U |
| | Score | **3** |

**Documentation:** *Mentha pulegium* and *M. suaveolens* are considered non-native weeds in California (DiTomaso and Healy 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 | **3** |

**Documentation:** *Mentha spicata* has been found growing extensively in a natural, marshy area in Tennessee (Drake et al. 2002). In North America, it grows in moist to wet disturbed areas, aquatic sites, stream banks, swamps, ditches, and meadows (Klinkenberg 2010, Ling 2010).

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| | |
|---|---|
| Total Possible | 22 |
| Total | **14** |

**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:** *Mentha spicata* and *Mentha ×piperita* are cultivated commercially for use in flavorings and medicines. They are also cultivated in gardens throughout much of the world as food herbs and medicinal herbs (Lawrence 2006, eFloras 2008, Abbaszadeh 2009).

*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:** *Mentha spicata* has been documented growing in a natural, marshy area in Tennessee, but no ecological impacts were documented (Drake et al. 2002). *Mentha spicata* and *Mentha ×piperita* were found growing around springs in southwestern Wisconsin, but, again, no ecological impacts were documented (Tenorio and Drezner 2006).

*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:** *Mentha spicata* establishes mainly in disturbed areas and is not likely to spread to natural areas (Drake et al. 2002). In California and British Columbia, *Mentha spicata* grows in moist, disturbed areas (DiTomaso and Healy 2007, Klinkenberg 2010).

*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 **3**

**Documentation:** *Mentha spicata* is native to the Balkan Peninsula and Turkey, and it has been naturalized throughout much of Europe, the Mediterranean region, and Southwest Asia (Kokkini and Vokou 1989, eFloras 2008). It has been introduced to North America, Japan, Australia, and New Zealand (Mito and Uesugi 2004, GBIF New Zealand 2010, USDA 2010, Western Australian Herbarium 2010). Neither *Mentha spicata* nor *Mentha ×piperita* has been documented from arctic regions.

*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:** *Mentha spicata* grows in all states of the U.S. except North Dakota, and it is present throughout much of Canada. *Mentha ×piperita* grows in 44 states of the U.S. (USDA 2010). Neither *Mentha spicata* nor *Mentha ×piperita* is considered a noxious weed in any state of the U.S. or province of Canada (Invaders 2010, USDA 2010).

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Total Possible 25
Total **13**

**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:** *Mentha ×piperita* does not produce viable seeds (Abbaszadeh 2009, Ling 2010). The amount of time *Mentha spicata* seeds remain viable has not been documented.

*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:** *Mentha spicata* and *Mentha ×piperita* can resprout from rhizomes following the removal of the aboveground growth. Rhizome fragments can form new plants (DiTomaso and Healy 2007).

*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 vegetative spread of *Mentha spicata* and *Mentha ×piperita* in gardens can be controlled by planting these species in plastic containers sunk into the ground (Abbaszadeh et al. 2009). Small infestations and individual plants can be removed manually as long as all rhizomes are dug out (DiTomaso and Healy 2007). Control efforts may need to be repeated to remove plants that regenerate from rhizome fragments.

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| | |
|---|---|
| Total Possible | 7 |
| Total | **5** |
| Total for four sections possible | 94 |
| Total for four sections | **40** |

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**References:**


Abbaszadeh, B., H. Farahani, S. Valadabadi, and P. Moaveni. 2009. Investigations of variations of the morphological values and flowering shoot yield in different mint species at Iran. Journal of Horticulture and Forestry. 1(7). 109-112 p.

Artdatabanken. 2010. Accessed through GBIF (Global Biodiversity Information Facility) data portal (http://data.gbif.org/datasets/resource/1034, 2011-01-21). Species Gate (Artportalen).

Azirak, S., and S. Karaman. 2008. Allelopathic effect of some essential oils and components on germination of weed species. Acta Agriculturae Scandinavica Section B – Soil and Plant Science. 58(1). 88-92 p.

Canadian Museum of Nature Herbarium. 2010. Accessed through GBIF (Global Biodiversity Information Facility) data portal (http://data.gbif.org/datasets/resource/123, 2010-12-03). The National Herbarium of Canada.

CLIMEX. 1999. CLIMEX for Windows, Predicting the effects of climate on plants and animals. Version 1.1a. CISRO Publishing. Collingwood, Australia.

DiTomaso, J., and E. Healy. 2007. Weeds of California and Other Western States. Vol. 2. University of California Agriculture and Natural Resources Communication Services, Oakland, CA. 974 p.

Drake, S., J. Weltzin, and P. Parr. 2002. Assessment of non-native invasive plants in the DOE Oak Ridge National Environmental Research Park. ORNL/TM-2001/113. Environmental Sciences Division, Oak Ridge National Laboratory, Department of Energy. Oak Ridge, TN.

eFloras. 2008. Published on the Internet http://www.efloras.org [accessed 6 December 2010]. Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, Cambridge, MA.

GBIF New Zealand, New Zealand National Plant Herbarium (CHR). 2010. Accessed through GBIF (Global Biodiversity Information Facility) data portal (http://data.gbif.org/datasets/resource/474, 2010-12-06).

Herbarium of Oskarshamn. 2010. Accessed through GBIF (Global Biodiversity Information Facility) data portal (http://data.gbif.org/datasets/resource/1024, 2011-01-21). Oskarshamn, Sweden.

Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, CA. 1008 pp.

Invaders Database System. 2010. University of Montana. Missoula, MT. http://invader.dbs.umt.edu/

Klinkenberg, B. (Editor). 2010. *Mentha spicata* L. In: E-Flora BC: Electronic Atlas of the Plants of British Columbia**.** Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia. Vancouver, BC. [6 December 2010] Available: http://www.geog.ubc.ca/biodiversity/eflora/index.shtml

Kokkini, S., and D. Vokou. 1989. *Mentha spicata* (Lamiaceae) Chemotypes Growing Wild in Greece. Economic Botany. 43(2). 192-202 p.

Lawrence, B. 2006. Mint: The genus *Mentha*. CRC Press, Taylor and Francis Group. Boca Raton, FL. 576 p.

Ling, C. 2010. *Mentha spicata*. USGS Nonindigenous Aquatic Species Database, Gainesville, FL. [6 December 2010] http://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=2671

Mito, T. and T. Uesugi. 2004. Invasive Alien Species in Japan: The Status Quo and the New Regulation for Prevention of their

Adverse Effects. Global Environmental Research. 8(2). 171-191 p.

Plants for a Future. 2010. [8 December 2010] Available: http://www.pfaf.org/user/default.aspx

Tenorio, R., and T. Drezner. 2006. Native and invasive vegetation of karst springs in Wisconsin's Driftless area. Hydrobiologia. 568(1). 499-505 p.

UAM. 2010. University of Alaska Museum, University of Alaska Fairbanks. Available: http://arctos.database.museum/home.cfm

USDA. 2010. The PLANTS Database. National Plant Data Center, Natural Resources Conservation Service, United States Department of Agriculture. Baton Rouge, LA. http://plants.usda.gov

Western Australian Herbarium. 2010. FloraBase — The Western Australian Flora. Department of Environment and Conservation. http://florabase.dec.wa.gov.au/