ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

Botanical name: *Galeopsis tetrahit* s. l. (*G. bifida* Boenn. and *G. tetrahit* L.)
Common name: brittlestem hempnettle and splitlip hempnettle
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Date: 3/16/2011
Date of previous ranking, if any: 8/1/2008

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)	16
Biological characteristics and dispersal ability	25 (25)	11
Ecological amplitude and distribution	25 (25)	17
Feasibility of control	10 (10)	6
Outcome score	100 (100)[b]	50[a]
Relative maximum score[2]		**50**

[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

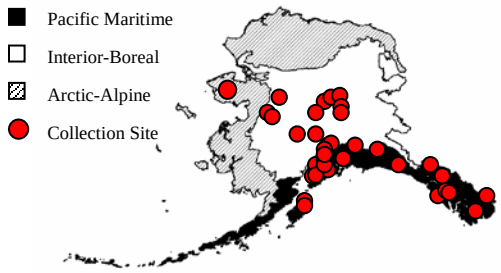
☐ No - continue to 2.1

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: *Galeopsis tetrahit* s. l. has been documented from all three ecogeographic regions 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:

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 **3**

Documentation: *Galeopsis tetrahit* reduces the availability of soil moisture and nutrients (Royer and Dickinson 1999). It likely delays the establishment of native species in disturbed sites (Lapina pers. obs.).

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: In Alaska, *Galeopsis tetrahit* establishes in disturbed areas, where it creates a dense mid-forb layer and reduces the cover of graminoids and low forbs (Lapina pers obs.). Even under low light intensities, plants can develop large leaves and outshade underlying vegetation. Infestations in agricultural fields can occur at densities over 400 plants per square meter (O'Donovan and Sharma 1987).

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 populations of *Galeopsis tetrahit* likely inhibit numerous species of native grasses and forbs from establishing in disturbed areas (Carlson pers. obs.). In Juneau, this species is highly competitive in open woodlands (Shephard pers. comm.).

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: The bristly hairs along the stems and the spiny calyxes are strong enough to penetrate animal skin (Pojar and MacKinnon 1999) and may discourage herbivory (O'Donovan and Sharma 1987). *Galeopsis tetrahit* is associated with several harmful plant pests and diseases (O'Donovan and Sharma 1987).

Total Possible 40
Total **16**

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: *Galeopsis tetrahit* reproduces by seed only. Plants produce an average of 387 seeds each (O'Donovan and Sharma 1987) but are capable of producing up to 2,800 seeds (NAPPO 2003). *Galeopsis bifida* can produce up to 10,000 seeds per plant in some circumstances (Sokolova 2009a).

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 **0**

Documentation: Seeds are ovoid and 3 to 4 mm long (Klinkenberg 2010) and weigh 5 mg each (Sokolova 2009b). They do not have any apparent adaptations for long-distance dispersal (Lapina pers. obs.). However, seeds can be dispersed by wind and water (O'Donovan and Sharma 1987). Seeds can be transported on animal fur and are spread in excrement after being ingested (NatureGate 2011).

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 are known to contaminate crop seed and can be spread by farm machinery (O'Donovan and Sharma 1987).

2.4. Allelopathic

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

Score **0**

Documentation: No evidence suggests that *Galeopsis tetrahit* 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 **1**

Documentation: *Galeopsis tetrahit* is a serious competitor with crops for soil moisture and nutrients (Royer and Dickinson 1999). Infestations occurring in agricultural fields can significantly reduce crop yields (O'Donovan and Sharma 1987). In Alaska, 10% of recorded infestations have been noted for high aggressiveness (AKEPIC 2011). In the absence of soil disturbance, however, this species does not appear to compete strongly with native grasses and forbs (Lapina pers. obs.).

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: *Galeopsis tetrahit* does not usually grow taller than 80 cm and does not form dense thickets (Klinkenberg 2010).

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: *Galeopsis bifida* grows abundantly in sparsely vegetated areas and has been documented from undisturbed spruce-birch forests and trailsides in Southcentral Alaska (Carlson et al. 2006, Cortes-Burns and Flagstad 2009.). It does not grow well in established vegetation in ….(Sokolova 2009a).

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

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

Score **3**

Documentation: *Galeopsis speciosa* occurs as a non-native weed in Alberta and parts of Quebec (O'Donovan and Sharma 1987).

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: *Galeopsis tetrahit* and *Galeopsis bifida* have been documented growing in riparian areas, lakeshores, sloughs (AKEPIC 2011), and the upper portions of a coastal marsh in Alaska (UAM 2011).

Total Possible	25
Total	**11**

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: *Galeopsis tetrahit* and *Galeopsis bifida* are serious agricultural weeds in Canada and Russia (O'Donovan and Sharma 1987, Sokolova 2009a, Sokolova 2009b).

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 **0**

Documentation: No impacts on natural areas outside of Alaska have been documented for *Galeopsis tetrahit* and *Galeopsis bifida*. Establishment in natural areas has been documented in Alaska including white spruce birch forest (Flagstad 2010), along Anchorage trails (Cortés-Burns and Flagstad 2009), and on beach fringes.

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 **3**

Documentation: *Galeopsis tetrahit* and *Galeopsis bifida* are often associated with anthropogenic disturbances (Lapina pers. obs., AKEPIC 2011, UAM 2011); however, they also can establish in areas disturbed naturally by river action, coastal processes, or animal activities (AKEPIC 2011, UAM 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: *Galeopsis tetrahit* and *Galeopsis bifida* are native to Europe and Asia (eFloras 2008, Klinkenberg 2010). They have been introduced to North America and New Zealand (O'Donovan and Sharma 1987, Landcare Research 2011). *Galeopsis tetrahit* is known to grow as far north as 78.9°N in Svalbard (Vascular Plant Herbarium Oslo 2011). *Galeopsis bifida* occurs in arctic regions in western and central Russia (Sokolova and Budrevskaya 2004).

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: *Galeopsis bifida* grows in 21 states in the northern half of the U.S. and much of Canada. *Galeopsis tetrahit* grows in 28 states of the U.S., mostly in the northern half, and most of Canada (USDA 2011). *Galeopsis tetrahit* is considered a noxious weed in Alberta, Manitoba, and Quebec (Invaders 2011). It is a prohibited noxious weed in Alaska (Alaska Administrative Code 1987).

Total Possible	25
Total	**17**

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: No seeds of *Galeopsis tetrahit* germinated after being buried in soil for 2.7, 3.7, or 4.7 years, but some did germinate after 6.7 years of burial (Conn and Werdin-Pfisterer 2010). Seeds have remained viable for up to 15 years in Russia (Sokolova 2009b). In Norway, seeds of *Galeopsis bifida* remained viable in the seed bank for more than five years (Rosef 2008), and they have remained viable for up to 14 years in Russia (Sokolova 2009a).

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 **0**

Documentation: *Galeopsis tetrahit* does not resprout following the removal of the aboveground growth (O'Donovan and Sharma 1987).

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: Control methods outside of agricultural areas are largely undocumented. Hand-pulling is likely effective as *Galeopsis bifida* and *G. tetrahit* are annual plants, and roots pull out easily. However, hand pulling in Portage Valley has been ineffective in reducing population size with 5 years of treatment (Charnon pers. obs.). *Galeopsis tetrahit* can be controlled by chlorsulfuron at 10 grams per hectare when applied to plants in the two-leaf stage of growth (O'Donovan and Sharma 1987). Controlled areas should be monitored for several years following treatment.

Total Possible	10
Total	**6**
Total for four sections possible	100
Total for four sections	**50**

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