

ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

Botanical name: *Trifolium dubium* Sibth.

Common name: suckling clover

Assessors:

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Date: 1/19/2011

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	<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>40</u>)	<u>14</u>
Biological characteristics and dispersal ability	25 (<u>25</u>)	<u>13</u>
Ecological amplitude and distribution	25 (<u>25</u>)	<u>18</u>
Feasibility of control	10 (10)	<u>5</u>
Outcome score	100 (<u>100</u>) ^b	<u>50</u> ^a
Relative maximum score ²		<u>50</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?

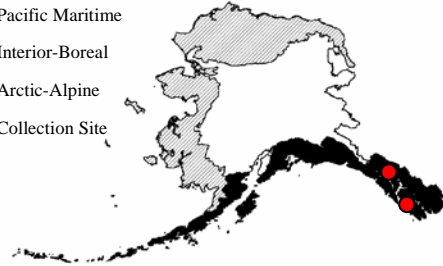
- Yes - continue to 1.2
 No - continue to 2.1

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: *Trifolium dubium* has been documented from Juneau and Kosciusko Island in the Pacific Maritime ecogeographic region 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: *Trifolium dubium* has been documented from Jönköping, Sweden, which has a 44% climatic similarity with Nome (CLIMEX 1999, Herbarium of Oskarshamn 2010). It is known to occur near Vaasa, Finland, and Helsinki, Finland, which have 54% and 43% climatic similarities with Nome, respectively (CLIMEX 1999, NatureGate 2011). Vaasa also has a 45% climatic similarity with Fairbanks (CLIMEX 1999). However, most populations in Finland are casual, possibly because the climate is too harsh (NatureGate 2011). This species is known to occur in many locations in western Russia that have 40% or greater climatic similarities with both Fairbanks and Nome (CLIMEX 1999, Dzyubenko et al. 2007).

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 7

Documentation: Roots are associated with *Rhizobium* bacteria that have the ability to fix atmospheric nitrogen, and infestations of *Trifolium dubium* therefore significantly alter soil nutrient levels (DiTomaso and Healy 2007). The alteration of soil conditions may favor the establishment of other non-native species.

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: *Trifolium dubium* has low productivity as a forage crop (Frame 2011), but it may increase the density of vegetation in disturbed areas.

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: *Trifolium dubium* is a component of the non-native species that threaten uncommon and endangered ephemeral wetland plant species in New Zealand (Champion and Reeves 2009). However, in Alaska and the Pacific Northwest this species appears rarely grows in high enough densities in natural communities to significantly alter composition (M. L. Carlson pers. obs.).

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 | <table border="1"><tr><td>3</td></tr></table> | 3 |
| 3 | | | |

Documentation: *Trifolium dubium* is a forage crop (Global Invasive Species Database 2010) and is likely grazed by wild herbivores. Flowers are insect pollinated (Dzyubenko and Dzyubenko 2009), and their presence may alter native plant-pollinator interactions.

Total Possible	<table border="1"><tr><td>40</td></tr></table>	40
40		
Total	<table border="1"><tr><td>14</td></tr></table>	14
14		

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 | <table border="1"><tr><td>2</td></tr></table> | 2 |
| 2 | | | |

Documentation: *Trifolium dubium* reproduces by seeds only. A seed bank in a pasture in New Zealand had a density of 2,500 seeds per square meter (Pavone and Reader 1982).

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 | <table border="1"><tr><td>2</td></tr></table> | 2 |
| 2 | | | |

Documentation: Seeds of *Trifolium* species usually land near the parent plant. They can be transported by animals (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

Documentation: Seeds can be transported on shoes, clothing, vehicles, and agricultural equipment. They sometimes contaminate commercial seed (DiTomaso and Healy 2007).

2.4. Allelopathic

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

Score

Documentation: No evidence has been documented to suggest that *Trifolium dubium* or other *Trifolium* species are 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: Roots are associated with bacteria that have the ability to fix atmospheric nitrogen (DiTomaso and Healy 2007). *Trifolium dubium* is most competitive when growing in dry, infertile soils (Frame 2011).

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: *Trifolium dubium* does not form dense thickets. It grows from 10 to 40 cm tall (eFloras 2008) and is therefore not likely to outshade 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 2

- c. conditions 3
 - c. Can germinate in existing vegetation in a wide range of conditions 3
 - d. Unknown U
- Score 0

Documentation: In North America, *Trifolium dubium* grows in lawns, fields, roadsides, open slopes, cultivated lands, vernal pool margins, clearings, and disturbed areas (DiTomaso and Healy 2007, Klinkenberg 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: *Trifolium hybridum*, *T. pratense*, and *T. repens* are known to occur as non-native weeds in Alaska with invasiveness ranks of 57, 53, and 59, respectively (AKEPIC 2011). *T. aureum*, *T. campestre*, *T. lupinaster*, *T. microcephalum*, and *T. variegatum* are also known to occur as non-native species in Alaska (Hultén 1968).

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 2

Documentation: *Trifolium dubium* grows in riparian communities in Japan (Miyawaki and Washitani 2004). It is known to grow in ephemeral wetlands on the margins of vernal pools in California (DiTomaso and Healy 2007, Champion and Reeves 2009). It also invaded seasonally wet turf near the edge of a lagoon in New Zealand, but did not grow at or below the water line (Champion and Reeves 2009).

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 4

Documentation: *Trifolium dubium* is cultivated as a soil improver and a forage crop, and it sometimes escapes cultivation (DiTomaso and Healy 2007, eFloras 2008, Global Invasive Species Database 2010). It is sometimes included in turf seed mixes (DiTomaso and Healy 2007).

- 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: *Trifolium dubium*, in combination with other non-native species, threatens uncommon and endangered ephemeral wetland plant species in New Zealand (Champion and Reeves 2009).

- 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: *Trifolium dubium* establishes readily in many anthropogenically disturbed sites, including lawns, roadsides, and agricultural fields (DiTomaso and Healy 2007, Klinkenberg 2010). It also establishes in areas disturbed by seasonal changes in water level, such as the edges of vernal pools or lagoons (DiTomaso and Healy 2007, Champion and Reeves 2009).

- 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: *Trifolium dubium* is native throughout much of Europe to the Caucasus Mountains (eFloras 2008). It has been introduced to North America, Scandinavia, Pakistan, China, Japan, Australia, and New Zealand (Mito and Uesugi 2004, eFloras 2008, Western Australian Herbarium 2010, Landcare Research 2011, NatureGate 2011, USDA 2011). This species is known to grow in subarctic regions in Iceland and Finland (Icelandic Institute of Natural History 2009, NatureGate 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: *Trifolium dubium* grows in 44 states of the U.S. and much of Canada (USDA 2011). It is not considered a noxious weed in any state of the U.S. or province of Canada.

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: Seeds of *Trifolium dubium* are known to persist in soil for 5 years or more (Thompson et al. 1993). They can dominate the deep-soil seed bank, allowing populations to significantly increase following new disturbances (MacDougall et al. 2006).

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: *Trifolium dubium* is not known to resprout following the removal of aboveground growth (Walsh and McDougall 2004).

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 2

Documentation: Manual removal of *Trifolium dubium* is effective when repeated regularly before seed set (DiTomaso and Healy 2007).

Total Possible	10
Total	5

Total for four sections possible	100
Total for four sections	50

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