

ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

Botanical name: *Ranunculus repens* L.

Common name: creeping buttercup

Date: 11/15/2018

Date of previous ranking: 4/8/2011

Assessors:

Anjanette Steer, Ecologist
Natalie Konig, Research Technician
Justin Fulkerson, Botanist
Alaska Center for Conservation Science
University of Alaska Anchorage
3211 Providence Dr
Anchorage, Alaska 99508

Reviewers:

Alaska Invasive Species Partnership members (formerly Committee for Noxious and Invasive Pests Management)
Alaska Invasive Species Workshop 2018, Homer, Alaska
This species was collectively ranked and reviewed in a group setting of 20 AISP members on 15Nov2018.

OUTCOME SCORE: 72

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>24</u>
Biological characteristics and dispersal ability	25 (<u>25</u>)	<u>20</u>
Ecological amplitude and distribution	25 (<u>25</u>)	<u>19</u>
Feasibility of control	10 (<u>10</u>)	<u>9</u>
Outcome score	100 (<u>100</u>) ^b	<u>72</u>
Relative maximum score ²		<u>72</u>

¹ For questions answered "unknown" do not include point value for the question in parentheses for "total answered points possible."

² Calculated as $a/b \times 100$

Previous ranking information:

Date of previous ranking, if any: 4/8/2011

*Previous score: 54 (*Ranunculus repens* was ranked with *R. acris* for a single rank for both species)*

Assessors:

Irina Lapina
Botanist, Alaska Natural Heritage
Program, University of Alaska
Anchorage, 707 A Street,
Anchorage, Alaska 99501

Matthew L. Carlson, Ph.D.
Assistant Professor, Alaska Natural Heritage
Program, University of Alaska Anchorage, 707
A Street,
Anchorage, Alaska 99501

Reviewers:	Jeff Conn, Ph.D. Weed Scientist, USDA Agricultural Research Service PO Box 757200 Fairbanks, Alaska 99775 tel: (907) 474-7652; fax (907) 474-6184	Jeff Heys Exotic Plant Management Program Coordinator, National Park Service, Alaska Region - Biological Resources Team, 240 W. 5th Ave, #114, Anchorage, AK 99501 tel: (907)644-3451, fax: 644-3809
	Jamie M. Snyder UAF Cooperative Extension Service 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6310 alt. tel: (907) 743-9448	Julie Riley Horticulture Agent, UAF Cooperative Extension Service 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6306
	Chris McKee Wildlife Biologist, USDI Geological Survey PO Box 74633 Fairbanks, AK 99707 tel: (907) 455-0636; fax (907) 455-0601	Page Spencer, Ph.D. Ecologist, National Park Service, Alaska Region - Biological Resources Team, 240 W. 5th Ave, #114, Anchorage, AK 99501 tel: (907) 644-3448
	Lindsey Flagstad Alaska Natural Heritage Program, University of Alaska Anchorage 707 A Street, Anchorage, Alaska 99501 tel: (907) 257-2786; fax (907) 257-2789	

A. CLIMATIC COMPARISON

1.1. Has this species ever been collected or documented in Alaska?

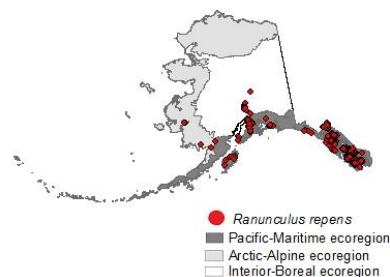
- ☒ Yes - continue to 1.2
☐ No - continue to 2.1

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

Documentation: *Ranunculus repens* has been reported from all ecogeographic regions in Alaska (Hultén 1968, AKEPIC 2018).



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. Eagle (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

5

Documentation: *Ranunculus repens* readily occupies open areas and may hinder colonization by native species (Lovett-Doust et al. 1990). Species is observed more frequently in wetlands but unknown how affects the wetland process in Alaska (AISP members).

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:

Ranunculus repens forms large, dense patches (Center for Lakes and Reservoirs at Portland State University, 2009) by producing large numbers of creeping stolons which root at the nodes. In Lovett-Doust’s study (1981) the density of *Ranunculus repens* ramets was 264/m² and 112/m² in woodland and grassland, respectively. Sarukhan and Harper (1973) reported up to 385 ramets/m² in intensely grazed grassland. In Alaska, *Ranunculus repens* has been observed at cover near 100% (T. Heutte – pers. obs.). Approximately 10% of AKEPIC records have >50% canopy cover (AKEPIC 2018).

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 <table border="1"><tr><td>7</td></tr></table> | 7 |
| 7 | | | |

Documentation:

Ranunculus repens reduces a number of individuals of native plants in invaded communities (J. Heys – pers. obs., C. McKee – pers. obs.). Locally, *R. repens* has been observed to reduce biodiversity and displaces native forbs e.g. *Claytonia* and wetland species are most vulnerable (AISP members). Observed to outcompete other non-native species and cow parsnip in Juneau (AISP members).

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>5</td></tr></table> | 5 |
| 5 | | | |

Documentation:

The protoanemonin released in the sap of *Ranunculus repens* is poisonous and can cause salivation, diarrhea, and abdominal pain in cattle and sheep that can last up to 14 days; however, the concentration of this cardiac glycoside is thought to be less than in related *Ranunculus acris* (Lovett-Doust et al. 1990). Leaves and seeds are eaten by a variety of birds, including the red-legged partridge (*Alectoris rufa*), Hungarian partridge (*Perdix perdix*), pheasant (*Phasianus colchicus*), species of woodpigeon (*Columba palumbus palumbus*), chickens, and geese (Lovett-Doust et al. 1990). Most or all seeds are digested (Harper 1957). The flowers are visited by honey bees, butterflies, moths, bugs, and beetles for pollen or nectar (Steinbach and Gottsberger 1994). Local pollinators observed to visit *R. repens* (AISP members). Buttercups host microorganisms and viruses, insects, and nematodes (Lovett-Doust et al. 1990, Royer and Dickinson 1999).

Total Possible	<table border="1"><tr><td>40</td></tr></table>	40
40		
Total	<table border="1"><tr><td>24</td></tr></table>	24
24		

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 | 0 |
|----|---|---|

- reproduce vegetatively).
- | | | |
|----|--|---|
| 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:

Flowers require pollination by insects. One study found that only one quarter of flowering plants set seed (Sarukhan 1974). Seed bank studies show wide variation depending on land use and habitat type, ranging from 32 to 11,400 seeds/m² (Chippendale & Milton 1934, Sarukhan 1974, Lovett-Doust et al. 1990). Production of stolons and ramets is the major mechanism of population increase for creeping buttercup. Stolon internodes breakdown after ramets form independent leaves and root systems, leaving the daughter plants independent from the parent plant. Fragments of stolons or caudex are capable of regeneration (Lovett-Doust et al. 1990).

- 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 3

Documentation:

Although most seeds are dropped near the parent plant, some seeds are dispersed farther by wind, or in the dung of birds, farm animals, and small rodents (Harper 1957, Lovett-Doust et al. 1990). Seeds have been observed to float down creeks and ditches in Kodiak and other regions of Alaska (AISP members). Additionally, *R. repens* has hooked fruits and common to attach to fabrics (AISP members).

- 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 3

Documentation:

Seeds can be dispersed by attachment to clothes and tires. *Ranunculus repens* may have been introduced as an ornamental plant into North America (Lovett-Doust et al. 1990). Garden varieties are available in garden stores and it escaped from gardens in Alaska (J. Riley, J. Fulkerson – pers. obs.).

2.4. Allelopathic

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

Documentation:

There is an unconfirmed hypothesis that buttercups' toxic root secretions are detrimental to neighboring plants (Lovett-Doust et al. 1990). Whitehead et al. (1982) found high quantities of p-hydroxybenzoic acid concentrations under *R. repens*. Toxicity from compounds extracted from *R. repens* were found to be anti-bacterial and detrimental to aquatic life (Noor et al. 2006), these compounds like affect neighboring plants growing in the vicinity of *R. repens*.

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 2 |

Documentation:

Ranunculus repens is capable of withstanding competition from tall-growing grasses (Harper 1957) and can withstand flooding (Lovett-Doust et al. 1990). Some studies have found evidence of *Ranunculus repens* sequestering nutrients and minerals in the soil, causing dieback, as well as potassium and other nutrient deficiencies of neighboring vegetation (Schipstra 1957, Hatfield 1970).

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 1 |

Documentation:

Creeping buttercup can form dense patches with large numbers of creeping stolons (Lovett-Doust 1990). Not documented to having a smothering climbing habit.

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:

Ranunculus repens is an early successional species, able to take advantage of disturbed sites. It commonly establishes in gardens, croplands, lawns, and sandy or gravelly areas with adequate water. It also tolerates grazing and trampling, saturated soils, and has a wide tolerance for weather

conditions. It can also establish in forest clearings, margins, and along paths with adequate sunlight (Lovett Doust et al. 1990). Seeds rarely germinate in established woodlands or grasslands, even if there is a large seedbank, but vegetative spread can take place. *Ranunculus repens* prefers calcareous soils (Lovett-Doust 1981, Lovett-Doust et al. 1990). This plant does not tolerate prolonged dry periods, and is infrequent on well-drained, light soils, or acidic soils (Lovett-Doust et al. 1990).

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

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

Score

3

Documentation:

Ranunculus acris is also invasive in Alaska (AKEPIC 2018). *Ranunculus abortivus*, *R. arvensis*, *R. bulbosus*, and *R. sardous* are invasive in other areas of the United States (USDA, NRCS 2018).

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:

Buttercups occur on disturbed soils including lawns, gardens, croplands, grasslands, woodlands, and semi-aquatic communities, such as swamps, margins of ponds, rivers, and ditches. Plants are able to tolerate some salinity and are found on beaches, in salt marshes, and on the margins of tidal estuaries (Harper 1957, Lovett-Doust et al. 1990). In Southeast Alaska it is a weed of wet areas, but not flooded sites along the road (T. Heutte – pers. obs.). Sometimes found adjacent to wetlands (AISP members).

Total Possible	<table border="1" style="display: inline-table;"><tr><td>25</td></tr></table>	25
25		
Total	<table border="1" style="display: inline-table;"><tr><td>20</td></tr></table>	20
20		

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:

Ranunculus repens is a serious agricultural weed, especially in strawberry cultivation (Harper 1957, Lovett-Doust et al. 1990). Creeping buttercup may have been introduced into North America as an ornamental plant (Lovett-Doust et al. 1990).

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

2

Documentation:

Ranunculus repens has become widespread in marshes, meadows, and woodlands of Montana, Ohio, and Minnesota (Lovett-Doust et al. 1990). Seeds rarely germinate in established woodlands or grasslands, even if there is a large seedbank, but vegetative spread can take place (Lovett-Doust 1981, Lovett-Doust et al. 1990).

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:

It is favored by regular mowing and thrives on lawn (T. Heutte – pers. obs.). Found in anthropogenic habitats, including pastures, cropland, and waste places, but can also grow in forest and wetland habitats (Lovett-Doust et al. 1990).

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:

Ranunculus repens originates in Europe and extends northward to 78° N in Svalbard, Norway. It is now naturalized in many temperate regions of the globe including North, Central, and South America, Asia, Africa, Australia, and New Zealand (Harper 1957, Hultén 1968, GBIF 2018).

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:

Ranunculus repens is introduced in Canada (reported as early as 1821 in Quebec) and the US, and is found from about 38-50 degrees north (Lovett-Doust et al. 1990, GBIF 2016). This species is considered a weed in the western United States and occurs in all but 7 U.S. states (Whitson et al. 2000, USDA, NRCS 2018). In Canada, it occurs in all provinces except the Northwest Territories and Saskatchewan (USDA, NRCS 2018).

Total Possible

25

Total

19

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:

Harper (1957) reports that *Ranunculus repens* seeds remain viable for at least three years. Lewis (1973) documents a 16 year seed viability period. Viable seeds of *R. repens* were also extracted from 68-year old soil samples (Chippindale and Milton 1934). Viability is preserved better in water-soaked or acidic soils (Lovett-Doust et al. 1990). Little seed mortality after one year in *R. repens* (Sarukhan 1974).

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:

Buttercup are able to regrow after cutting or heavy grazing (Harper 1957). *Ranunculus repens* readily regenerates from root fragments (Lovett-Doust et al. 1990). Stolon internodes breakdown after ramets form independent leaves and root systems, leaving the daughter plants independent from the parent plant. Fragments of stolons or caudex are capable of regeneration (Lovett-Doust et al. 1990).

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

4

Documentation:

Literature suggests that herbicides are generally recommended to control buttercups. However, in Southeast Alaska, *Ranunculus repens* control efforts have shown that this weed is very resistant to herbicides (T. Heutte – pers. obs.). Plants may be weakened by cultivation, but parts of stolons may regenerate and cause population increase. Plowing provides ideal conditions for germination of seed and is therefore not recommended as an eradication technique (Harper 1957, Lovett-Doust et al. 1990). Applying fertilizer may stimulate grass growth, giving grasses a competitive advantage over *Ranunculus repens*, which shows little response to fertilizer (Fryer and Makepeace 1977).

Total Possible	10
Total	9

Total for four sections possible	100
Total for four sections	72

References:

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