

**WEED RISK ASSESSMENT FORM**

**Botanical name:** Trifolium repens L.

**Common name:** white clover, ladino clover, Dutch clover

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**Outcome score:**

<b>A. Climatic Comparison</b>		
This species is present or may potentially establish in the following eco-geographic regions:		
1	South Coastal	Yes
2	Interior-Boreal	Yes
3	Arctic-Alpine	Yes
This species is unlikely to establish in any region in Alaska		

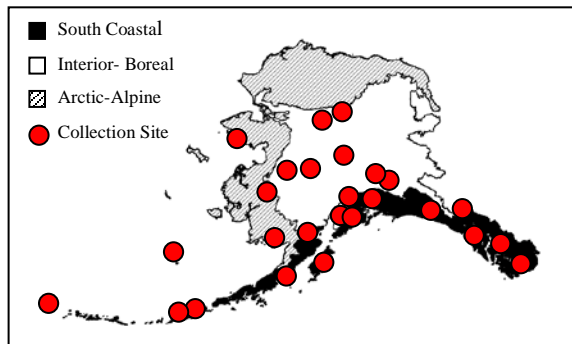
B.	Invasiveness Ranking	Total (Total Answered*) Possible	Total
1	Ecological impact	40 (40)	22
2	Biological characteristic and dispersal ability	25 (25)	15
3	Ecological amplitude and distribution	25 (25)	14
4	Feasibility of control	10 (10)	8
	Outcome score	100 (100) <sup>b</sup>	59
	Relative maximum score <sup>†</sup>		0.59

\* For questions answered "unknown" do not include point value for the question in parentheses for "Total Answered Points Possible."

<sup>†</sup> Calculated as <sup>a</sup>/<sub>b</sub>.

**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)? <i>Proceed to Section B. Invasiveness Ranking.</i>	
Yes	South Coastal
Yes	Interior-Boreal
Yes	Arctic-Alpine



Documentation: Has been collected in South Coastal, Interior-Boreal, and Arctic-Alpine eco regions in Alaska (AK Weeds Database 2004, Hultén 1968, UAM 2004).

Sources of information:

AK Weeds Database. 2004. Database of exotic vegetation collected in Alaska. University of Alaska, Alaska Natural Heritage Program – US Forest Service – National Park Service Database.

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

UAM - University of Alaska Museum. University of Alaska Fairbanks. 2004.

<http://hispidamuseum.uaf.edu:8080/home.cfm>.

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:

Sources of information:

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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. | 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   |    |

Score 

7
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Documentation:

Identify ecosystem processes impacted:

White clover alters edaphic conditions due to nitrogen fixation (USDA 2002). This plant may alter succession by delaying the establishment of native species (Rutledge and McLendon 1996). However, it is primarily associated with anthropogenically altered communities in Alaska (M. L. Carlson – pers. obs.).

Rational:

Sources of information:

Carlson, M.L., Assistant Research Professor – Botany, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.

Rutledge, C.R., and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center Home Page. <http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

### 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 an existing layer) 7
- D. Major alteration of structure (e.g., covers canopy, eradicating most or all layers below) 10
- U. Unknown

Score 7

#### Documentation:

Identify type of impact or alteration:

White clover creates a nearly monospecific low herbaceous forb layer, eliminating graminoids and other low herbaceous species (I. Lapina – pers. obs.). *Trifolium repens* occupies the same fundamental niche space as many grasses and dicotyledonous herbs and is in direct competition with these species (Turkington et al. 1979)

Rational:

Sources of information:

Lapina, I., Botanist, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2710 – Pers. obs.  
 Turkington, R., M.A. Cahn, A. Vardy, and J.L. Harper. 1979. The growth, distribution and neighbour relationships of *Trifolium repens* in a permanent pasture. *Journal of Ecology* 67:231-243.

### 1.3. Impact on Natural Community Composition

- A. No perceived impact; causes no apparent change in native populations 0
- B. Influences community composition (e.g., reduces the number of individuals in one or more native species in the community) 3
- C. Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community) 7
- 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) 10
- U. Unknown

Score 3

#### Documentation:

Identify type of impact or alteration:

White clover may delay establishment of native species (Rutledge and McLendon 1996). It appears to reduce diversity of native species along roadsides and trail edges in Alaska (M. L. Carlson – pers. obs.)

Rational:

Sources of information:

Carlson, M.L., Assistant Research Professor – Botany, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.  
 Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97pp. Northern Prairie Wildlife Research Center Home Page.  
<http://www.npwrc.usgs.gov/resource/othrdata/explant/explant.htm> (Version

## 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)

- A. Negligible perceived impact 0
- B. Minor alteration 3
- C. Moderate alteration (minor reduction in nesting/foraging sites, reduction in habitat connectivity, interference with native pollinators, injurious components such as spines, toxins) 7
- D. Severe alteration of higher trophic populations (extirpation or endangerment of an existing native species/population, or significant reduction in nesting or foraging sites) 10
- U. Unknown

Score 

5
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**Documentation:**

Identify type of impact or alteration:

White clover produces cyanogenic glycosides that are poisonous to cattle and other herbivores (Ennos 1981). It is an alternate host for alfalfa mosaic and pea mottle viruses (Royer and Dickinson 1999). White clover potentially altering pollination ecology (M. Carlson – pers. obs., J. Snyder – prs. obs.).

Rational:

Sources of information:

Carlson, M.L., Assistant Research Professor – Botany, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.

Ennos, R.A. 1981. Detection of selection in populations of white clover (*Trifolium repens* L.). *Biological Journal of the Linnean Society* 15:75-82.

Royer, F., and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

Snyder, J.M., UAF Cooperative Extension Service, 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6310 alt.tel: (907) 743-9448. Pers.obs.

Total Possible 

40
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Total 

22
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**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/m<sup>2</sup>)) 1
- C. Moderately aggressive (reproduces vegetatively and/or by a moderate amount of seed, <1,000/m<sup>2</sup>) 2
- D. Highly aggressive reproduction (extensive vegetative spread and/or many seeded, >1,000/m<sup>2</sup>) 3
- U. Unknown

Score 

3
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**Documentation:**

Describe key reproductive characteristics (including seeds per plant):

White clover reproduces by seeds and creeping stems that root at nodes (Royer and Dickinson 1999). It is an extremely mobile species by spreading rhizomes (Thórhallsdóttir 1999). It has high seeds abundance (Rutledge and McLendon 1996).

Rational:

Sources of information:

Royer, F., R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem

Science, Colorado State University. 97pp. Northern Prairie Wildlife Research Center Home Page.

<http://www.npwrc.usgs.gov/resource/othrdata/explant/explant.htm> (Version 15DEC98)

Thórhallsdóttir, T.E. 1999. The dynamics of five grasses and white clover in a simulated mosaic sward. *Journal of Ecology* 78:909-923.

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:

Most seed is likely spread incidentally by the movement of animals and humans (Rutledge and McLendon 1996). However, the plant does not have any adaptations for long-distance dispersal.

Rational:

Sources of information:

Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97pp. Northern Prairie Wildlife Research Center Home Page.

<http://www.npwrc.usgs.gov/resource/othrdata/explant/explant.htm> (Version 15DEC98).

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
- U. Unknown

Score 3

**Documentation:**

Identify dispersal mechanisms:

White clover is seeded for revegetation on roadsides and other disturbed areas (Densmore et al. 2001). It has been found carried on motor vehicles (Hodkinson and Thompson 1997).

Rational:

Sources of information:

Densmore, R.V., P.C. McKee, C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.

Hodkinson, D. and K. Thompson. 1997. Plant dispersal: the role of man. *Journal of Applied Ecology*, 34: 1484-1496.

2.4. Allelopathic

- A. No 0
- B. Yes 2
- U. Unknown

Score 0

**Documentation:**

Describe effect on adjacent plants:

None

Rational:

Sources of information:

No records about allelopathy potential.

**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 |
| U. Unknown  |   |

Score 

2
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**Documentation:**

Evidence of competitive ability:

Its establishment by seed and rhizome fragments is significantly reduced by the presence of graminoid and forb competitors (Turkington et al. 1979), but it is able to invade particular graminoid stands (Thórhallsdóttir 1999). The species has an intermediate level of nitrogen fixing ability (USDA 2002).

Rational:

Sources of information:

Thórhallsdóttir, T.E. 1999. The dynamics of five grasses and white clover in a simulated mosaic sward. *Journal of Ecology* 78:909-923.

Turkington, R., M.A. Cahn, A. Vardy and J.L. Harper. 1979. The growth, distribution and neighbour relationships of *Trifolium repens* in a permanent pasture. *Journal of Ecology* 67:231-243.

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

**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 |
| U. Unknown  |   |

Score 

1
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**Documentation:**

Describe grow form:

White clover forms dense stands due to its rhizomatous growth, but does not overtop taller vegetation (I. Lapina – pers. obs.).

Rational:

Sources of information:

Lapina, I., Botanist, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2710 – Pers. obs.

**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 

0
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**Documentation:**

Describe germination requirements:

Seedlings are rare and only established in disturbed areas, including molehills (Turkington et al. 1979). Soil temperatures of at least 50°F are required for germination (Royer and Dickinson 1999). The seeds do not germinate until the seed coat is sufficiently broken down (by decay or abrasion) to admit water (Densmore et al. 2001).

Rational:

Sources of information:

Densmore, R.V., P.C. McKee, C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.

Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

Turkington, R., M.A. Cahn, A. Vardy, and J.L. Harper. 1979. The growth, distribution and neighbour relationships of *Trifolium repens* in a permanent pasture. *Journal of Ecology* 67:231-243.

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

- A. No 0
- B. Yes 3
- U. Unknown

Score 

3
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Documentation:

Species:

*Trifolium angustifolium* L., *T. arvense* L., *T. aureum* L., *T. campestre* Schreb., *T. dubium* Sibth., *T. hirtum* All., *T. hybridum* L., *T. incarnatum* L., *T. pratense* L., and *T. subterraneum* L. (USDA 2002).

Sources of information:

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

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

Score 

1
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Documentation:

Describe type of habitat:

White clover is a serious weed of lawns, roadsides, and disturbed areas (Hultén 1968; Royer and Dickinson 1999).

Rational:

Sources of information:

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

Royer, F. and R. Dickinson. 1999. *Weeds of the Northern U.S. and Canada*. The University of Alberta press. 434 pp.

Total Possible	25
Total	15

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

Score 

4
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**Documentation:**

Identify reason for selection, or evidence of weedy history:

White clover was common as a forage crop in Canada (Royer and Dickinson 1999) It has been widely planted for lawns and revegetation on roadsides and other disturbed areas in Alaska (Densmore et al. 2001).

Rational:

Sources of information:

Densmore, R.V., P.C. McKee, C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.

Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

**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   |   |

Score 

1
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**Documentation:**

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

White clover invades prairies in Wisconsin (WDNR 2004).

Sources of information:

Wisconsin Department of Natural Resources. Invasive species.

<http://www.dnr.state.wi.us> [April 21, 2004].

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

- |   |   |
|---|---|
| A. Requires anthropogenic disturbances to establish   | 0 |
| B. May occasionally establish in undisturbed areas but can readily establish in areas with natural disturbances | 3 |
| C. Can establish independent of any known natural or anthropogenic disturbances                                 | 5 |
| U. Unknown  |   |

Score 

0
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**Documentation:**

Identify type of disturbance:

In Alaska white clover is found in sites disturbed in recent years and readily invades open habitats (Densmore et al. 2001). It is relatively shade intolerant (USDA 2002). Frequent, intense grazing encourages growth of white clover (Rutledge and McLendon 1996).

Rational:

Sources of information:

Densmore, R.V., P.C. McKee, C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.

Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97pp. Northern Prairie Wildlife Research Center Home Page.

<http://www.npwrc.usgs.gov/resource/othrdata/explant/explant.htm> (Version 15DEC98

USDA (United States Department of Agriculture), NRCS (Natural Resource



Conservation Service). 2002. The PLANTS Database, Version 3.5  
 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

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
- U. Unknown

Score 

5
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Documentation:

Describe distribution:

White clover is native to Europe and Asia. It has been introduced to north and southern Africa, North and South America, New Zealand, Australia, Tasmania, and India (Hultén 1968). It is often found north of the Arctic Circle (Royer and Dickinson 1999).

Rational:

Sources of information:

Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, CA. 1008 p.  
 Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

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

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

Score 

4
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Documentation:

Identify states invaded:

White clover occurs in nearly all states of the United States. It is listed as a weed in Kentucky (USDA 2002).

Rational:

Sources of information:

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5  
 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Total Possible 

25
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Total 

14
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**4. FEASIBILITY OF CONTROL**

4.1. Seed banks

- A. Seeds remain viable in the soil for less than 3 years 0
- B. Seeds remain viable in the soil for between 3 and 5 years 2
- C. Seeds remain viable in the soil for 5 years and more 3
- U. Unknown

Score 

3
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Documentation:

Identify longevity of seed bank:

Seeds of white clover remain viable in the soil over 30 years (Rutledge and McLendon

1996).  
 Rational:

Sources of information:  
 Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center Home Page.  
<http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).

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
- U. Unknown

Score 

2
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Documentation:  
 Describe vegetative response:  
 Grazing promotes resprouting of white clover (Rutledge and McLendon 1996).  
 Rational:

Sources of information:  
 Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center Home Page.  
<http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).

4.3. Level of effort required

- A. Management is not required (e.g., species does not persist without repeated anthropogenic disturbance) 0
- B. Management is relatively easy and inexpensive; requires a minor investment in human and financial resources 2
- C. Management requires a major short-term investment of human and financial resources, or a moderate long-term investment 3
- D. Management requires a major, long-term investment of human and financial resources 4
- U. Unknown

Score 

3
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Documentation:  
 Identify types of control methods and time-term required:  
 It is virtually impossible to eradicate white clover from invaded sites (Densmore et al. 2001). Herbicides can be used to control white clover (Rutledge and McLendon 1996).  
 Rational:

Sources of information:  
 Densmore, R. V., P.C. McKee, C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.  
 Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center Home Page.  
<http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm> (Version 15DEC98).

Total Possible 

10
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 Total 

8
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Total for 4 sections Possible	100
Total for 4 sections	59

References:

- AK Weeds Database. 2004. Database of exotic vegetation collected in Alaska. University of Alaska, Alaska Natural Heritage Program – US Forest Service – National Park Service Database.
- Carlson, M.L., Assistant Research Professor – Botany, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.
- Densmore, R.V., P.C. McKee, C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.
- Ennos, R.A. 1981. Detection of selection in populations of white clover (*Trifolium repens* L.). *Biological Journal of the Linnean Society* 15:75-82.
- Hodkinson, D., K. Thompson. 1997. Plant dispersal: the role of man. *Journal of Applied Ecology*, 34: 1484-1496.
- Hultén, E. 1968. *Flora of Alaska and Neighboring Territories*. Stanford University Press, Stanford, CA. 1008 p.
- Lapina, L., Botanist, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2710) – Pers. obs.
- Royer, F., and R. Dickinson. 1999. *Weeds of the Northern U.S. and Canada*. The University of Alberta press. 434 pp.
- Rutledge, C.R. and T. McLendon. 1996. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. 97 pp. Northern Prairie Wildlife Research Center Home Page.
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