WEED RISK ASSESSMENT FORM

Botanical name: *Rumex acetosella* L.

Common name: sheep sorrel

Assessors:

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Outcome score:

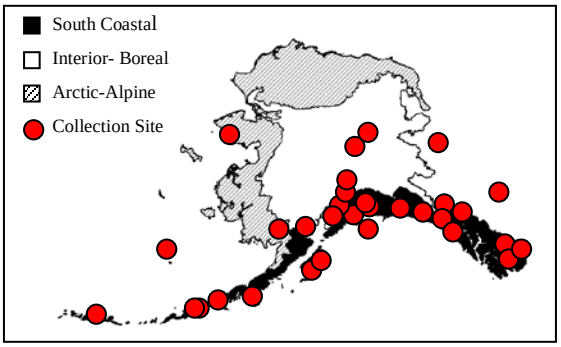
A.	**Climatic Comparison**		
	This species is present or may potentially establish in the following eco-geographic regions:		
1	South Coastal	Yes	
2	Interior-Boreal	Yes	
3	Arctic-Alpine	Yes	

B.	**Invasiveness Ranking**	Total (Total Answered*) Possible	Total
1	Ecological impact	40 (40)	12
2	Biological characteristic and dispersal ability	25 (25)	16
3	Ecological amplitude and distribution	25 (25)	16
4	Feasibility of control	10 (10)	7
	Outcome score	100 (100)[b]	51 [a]
	Relative maximum score†		0.51

* For questions answered "unknown" do not include point value for the question in parentheses for "Total Answered Points Possible."
† Calculated as [a]/[b].

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



Documentation: *Rumex acetosella* has been documented in all ecogeographic regions of Alaska (Weeds of Alaska Database 2005, Hultén 1968, UAM 2004, Welsh 1974).
Sources of information:

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

University of Alaska Museum. University of Alaska Fairbanks. 2004. http://hispida.museum.uaf.edu:8080/home.cfm
Weeds of Alaska Database. 2005. Database of exotic vegetation collected in Alaska. University of Alaska, Alaska Natural Heritage Program – US Forest Service – National Park Service Database. Available: http://akweeds.uaa.alaska.edu/
Welsh, S.L. 1974. Anderson's flora of Alaska and adjacent parts of Canada. Brigham University Press. 724 pp.

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:

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 3

Documentation:
Identify ecosystem processes impacted:
Sheep sorrel might impede the colonization of the post-fire areas by native species.
Rational:
Sheep sorrel is documented as a one of the common colonizer of burned areas (Hall 1955, Fonda 1974, Weaver et al. 1990).
Sources of information:
Fonda, R.W. 1974. Forest succession in relation to river terrace development in Olympic National Park, Washington. Ecology 55(5): 927-942.
Hall, I.V. 1955. Floristic changes following the cutting and burning of a woodlot for blueberry production. Canadian Journal of Agricultural Science 35: 143-152.
Weaver, T., J. Lichthart and D. Gustafson. 1990. Exotic invasion of timberline vegetation, Northern Rocky Mountains, USA. In: Schmidt, W.C., K.J. McDonald, editors. Proceedings – symposium on whitebark pine ecosystems: ecology and management of a high-mountain resource; 1989 March 29-31; Bozeman, MT. Gen. Tech. Rep. INT-270. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station: 208-213.

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 3

Documentation:
Identify type of impact or alteration:
Sheep sorrel has been observed establishing in existing layer of vegetation and increasing the density of the layer in Alaska National Parks and remote areas of Chugach National Forest (M.L. Carlson – pers. obs., I. Lapina – pers. obs.).
Rational:

Sources of information:
Carlson, M.L., Assistant Professor, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.
Lapina, I., Botanist, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2710 – Pers. obs.

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:
Sheep sorrel has been reported to form dense stands and displace native grasses and forbs in California (Cal-IPC 2005). However, this weed does not appear to cause a significant reduction in native species population size in Alaska.
Rational:

Sources of information:
Cal-IPC - California Invasive Plant Council. 2005. *Rumex acetosella* Plant Assessment Form. Available: http://www.cal-ipc.org/ [February 2, 2005].

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 3

Documentation:
Identify type of impact or alteration:
Sheep sorrel contains oxalic acid, which can be poisonous to livestock; it is possible that it could be toxic to wildlife species (Cal-IPC 2005). Sheep sorrel is grazed by mule deer (Kruger and Donart 1974, Nixon et al. 1970). The seeds are rich source of food for birds (Schmidt 1936, Swenson 1985, Wilson et al. 1999).
Rational:

Sources of information:

Cal-IPC - California Invasive Plant Council. 2005. *Rumex acetosella* Plant Assessment Form. Available: http://www.cal-ipc.org/ [February 2, 2005].
Krueger, W.C. and G.B. Donart. 1974. Relationship of soil to seasonal deer forage quality. Journal of Range management 27(2): 114-117.
Nixon, C.M., M.W. McClain and K.R. Russell. 1970. Deer food habits and range characteristics in Ohio. Journal of Wildlife Management 34(4): 870-886.
Schmidt, F.J.W. 1936. Winter food of the sharp-tailed grouse and pinnated grouse in Wisconsin. Wilson Bulletin September: 186-203.
Swenson, J.E. 1985. Seasonal habitat use by sharp-tailed grouse, *Tympanuchus phasianellus*, on mixed-grass prairie in Montana. Canadian Field-Naturalist 99(1): 40-46.
Wilson, J.D., A.J. Morris, B.E. Arroyo, S.C. Clark and R.B. Bradbury. 1999. A review of the abundance and diversity of invertebrate and plant foods of granivorous birds in northern Europe in relation to agricultural change. Agriculture, Ecosystems and Environment 75: 13-30.

Total Possible	40
Total	12

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

Score 3

Documentation:

Describe key reproductive characteristics (including seeds per plant):
Sheep sorrel reproduces by seeds and from creeping roots and rhizomes (Kiltz 1930). Seed production per plant can vary from 250 to 1,622 seeds per season (Stevens 1932, Escarre and Thompson 1991) with estimated the seed production up to 2,700 per m^2.
Rational:

Sources of information:

Escarre, J. and J.D. Thompson. 1991. The effects of successional habitat variation and time of flowering on seed production in *Rumex acetosella*. The Journal of Ecology 79(4): 1099-1112.
Kiltz, B.F. 1930. Perennial weeds which spread vegetatively. Journal of the American Society of Agronomy 22(3): 216-234.
Stevens, O.A. 1932. The number and weight of seeds produced by weeds. American Journal of Botany 19(9): 784-794.

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:
Seeds are large and lack of adaptation for long-distance dispersal. However, seeds can

be dispersed by wind, water, and insects (ants) (Houssard and Escarre 1991).
Rational:

Sources of information:
Houssard, C. and J. Escarre. 1991. The effects of seed weight on growth and competitive ability of *Rumex acetosella* from two successional old-fields. Oecologia 86(2): 236-242.

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:
Seeds of sheep sorrel can be transported on vehicles tires, agricultural equipment, with nursery stock, or contaminated seeds and hay (Gooch 1963). Seeds remain viable after passing through digestive tract of domestic birds and animals (Dorph-Peterson 1925, Evershed and Warburton 1918).
Rational:

Sources of information:
Dorph-Petersen, K. 1925. Examination of the occurrence and vitality of various weed seed species under different conditions, made at the Danish State Seed Testing Station during the years 1896-1923. 4th International Seed Testing Congress, 1924, Cambridge, England. pp. 128-138.
Evershed, A.F.C.-H. and C. Warburton. 1918. Pheasants and agriculture. The Journal of agricultural science 9: 63-91.
Gooch, S.M.S. 1963. The occurrence of weed seeds in samples tested by the official seed testing station, 1960-1. Journal of the National Institute of Agricultural Botany 9(3): 353-371.

2.4. Allelopathic

A.	No	0
B.	Yes	2
U.	Unknown	

Score 0

Documentation:
Describe effect on adjacent plants:
Sheep sorrel is not known to be allelopathic.
Rational:

Sources of information:

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 1

Documentation:
Evidence of competitive ability:
Sheep sorrel is fairly competitive on nitrogen poor soils. Competition from other species on good soils may reduce its abundance and contain its spread (Putwain and

Harper 1970). In Alaska parks units it persists only in areas where competition from other plants is reduced (Densmore et al. 2001).
Rational:

Sources of information:
Densmore, R.V., P.C. McKee and C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.
Putwain, P.D. and J.L. Harper. 1970. Studies in the dynamics of plant populations: III. The influence of associated species on populations of *Rumex acetosa* L. and *R. acetosella* L. in grassland. The Journal of Ecology 58(1): 251-264.

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

Documentation:
Describe grow form:
Seep sorrel sometimes forms dense colonies by shoots from roots and rhizomes on human-disturbed grounds. In Europe it commonly form monocultural stand on post fire sites. Dense thickets in native communities have not been observed in Alaska (I. Lapina – pers. obs., M.L. Carlson – pers. obs.).
Rational:

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

Documentation:
Describe germination requirements:
Sheep sorrel requires open soil for germination (Putwain et al. 1968).
Rational:
No establishment of sheep sorrel in a closed sward of vegetation was recorded in a study by Putwain et al. (1968). The number of seedlings emerged from buried seeds increased substantially on sites with open soil and removed vegetation in another experiment (Putwain and Harper 1970).
Sources of information:
Putwain, P.D. and J.L. Harper. 1970. Studies in the dynamics of plant populations: III. The influence of associated species on populations of *Rumex acetosa* L. and *R. acetosella* L. in grassland. The Journal of Ecology 58(1): 251-264.
Putwain, P.D., D. Machin and J.L. Harper. 1968. Studies in the dynamics of plant populations: II. Components and regulation of a natural population of *Rumex acetosella* L. The Journal of Ecology 56(2): 421-431.

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

A.	No	0
B.	Yes	3

U. Unknown

Score 3

Documentation:
Species:
Rumex crispus L. is declared a Noxious in Iowa (USDA, NRCS 2006).
Sources of information:
USDA, NRCS. 2006. *The PLANTS Database*, Version 3.5 (http://plants.usda.gov). Data compiled from various sources by Mark W. Skinner. 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 3

Documentation:
Describe type of habitat:
Sheep sorrel can be found in variety of habitats including riverbars, beaches (Fonda 974, Pojar and MacKinnon 1994), and freshwater and brine marshes (Fiedler and Leidy 1987).
Rational:

Sources of information:
Fiedler, P.L. and R.A. Leidy. 1987. Plant communities of Ring Mountain Preserve, Marin County, California. Madroño 34(3): 173-192.
Fonda, R.W. 1974. Forest succession in relation to river terrace development in Olympic National Park, Washington. Ecology 55(5): 927-942.
Pojar, J. and A. MacKinnon. 1994. Plants of the Pacific Northwest coast. Washington, Oregon, British Columbia & Alaska. Forest Service British Columbia, Lone Pine, P. 129.

Total Possible 25
Total 16

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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 2

Documentation:
Identify reason for selection, or evidence of weedy history:
Sheep sorrel is a weed of fields, gardens, and pastures (Douglas and MacKinnon 1999, Welsh 1974).
Rational:

Sources of information:
Douglas, G.W. and A. MacKinnon. Polygonaceae. In: Douglas, G.W., D. Meidinger and J. Pojar. 1999. Illustrated flora of British Columbia. V. 4. Ministry of Environment, Lands and Parks Ministry of Forests. British Columbia. Pp. 60-102.
Welsh, S.L. 1974. Anderson's flora of Alaska and adjacent parts of Canada. Brigham University Press. 724 pp.

3.2. Known level of ecological 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 1

than exist in regions of Alaska

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

Documentation:

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

Sheep sorrel is known to have medium impact on plant community and higher trophic levels in California wildlands (Cal-IPC 2005). Sheep sorrel is found in areas disturbed in the last 10 years in Rocky Mountain National Park, Colorado, where it may inhibit the establishment of native species (Rutledge and McLendon 1996). Its impact on plant communities of Kenai Fjords National Park and Sitka National Historical Park in Alaska is considered to be low (Densmore et al. 2001).

Sources of information:

Cal-IPC - California Invasive Plant Council. 2005. *Rumex acetosella* Plant Assessment Form. Available: http://www.cal-ipc.org/ [February 2, 2005].

Densmore, R.V., P.C. McKee and 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).

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 3

Documentation:

Identify type of disturbance:

Sheep sorrel rapidly colonizes clearcuts, burned, and flood-disturbed sites (Hall 1955, Fonda 1974, Weaver et al. 1990). Animal disturbances such as mole hills or cattle tracks can be sufficient for establishment of sheep sorrel in natural communities (Putwain et al. 1968).

Rational:

Sources of information:

Fonda, R.W. 1974. Forest succession in relation to river terrace development in Olympic National Park, Washington. Ecology 55(5): 927-942.

Hall, I.V. 1955. Floristic changes following the cutting and burning of a woodlot for blueberry production. Canadian Journal of Agricultural Science 35: 143-152.

Putwain, P.D., D. Machin and J.L. Harper. 1968. Studies in the dynamics of plant populations: II. Components and regulation of a natural population of *Rumex acetosella* L. The Journal of Ecology 56(2): 421-431.

Weaver, T., J. Lichthart and D. Gustafson. 1990. Exotic invasion of timberline vegetation, Northern Rocky Mountains, USA. In: Schmidt, W.C., K.J. McDonald, editors. Proceedings – symposium on whitebark pine ecosystems: ecology and management of a high-mountain resource; 1989 March 29-31; Bozeman, MT. Gen. Tech. Rep. INT-270. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station: 208-213.

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

Documentation:
Describe distribution:
Sheep sorrel is a forb of European origin. Today it has naturalized throughout temperate North America; it is introduced into South America, Africa, Hawaii (Hultén 1968).
Rational:

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

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 5

Documentation:
Identify states invaded:
Sheep sorrel is found in nearly all American States. It is declared a Noxious in Connecticut and Iowa (USDA, NRCS 2006).
Rational:

Sources of information:
USDA, NRCS. 2006. *The PLANTS Database*, Version 3.5 (http://plants.usda.gov). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Total Possible 25
Total 16

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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

Documentation:
Identify longevity of seed bank:
Seeds of sheep sorrel are long-lived. Seeds remained viable for more than six to seven years in the soil (Chippindale and Milton 1934, Steinbauer and Grigsby 1958). In a Massachusetts study sheep sorrel was not present in the ground cover of 80-year old pine stands, but viable seeds were found in soil samples. Presumably viable seeds remained buried in the soil since earlier successional stages (Livingston and Allessio 1968).
Rational:

Sources of information:

Chippindale, H.G. and W.E.J. Milton. 1934. On the viable seeds present in the soil beneath pasture. The Journal of Ecology 22(2): 508-531.
Livingston, R.B. and M.L. Allessio. 1968. Buried viable seed in successional field and forest stands, Harvard Forest, Massachusetts. Bulletin of the Torrey Botanical Club 95(1): 58-69.
Steinbauer, G.P. and B. Grigsby. 1958. Dormancy and germination characteristics of the seeds of sheep sorrel, *Rumex acetosella* L. Proceedings of the Association of Official Seed Analysts on North America 48: 118-120.

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

Documentation:

Describe vegetative response:
Sheep sorrel is able to survive severe fire and resprout from rhizomes and roots (Granström and Schimmel 1993).
Rational:

Sources of information:
Granström, A. and J. Schimmel. 1993. Heat effects on seeds and rhizomes of a selection of boreal forest plants and potential reaction to fire. Oecologia 94: 307-313.

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 2

Documentation:

Identify types of control methods and time-term required:
Control of sheep sorrel can be difficult because of its creeping rhizomes and long-lived seeds. Plants are too low to be affected by mowing or grazing. It usually survives prescribed burning. Repeated cultivation and frequent removal of resprouted plants will eventually exhaust the population. Several herbicides are available for be used in pastures and lawns; however sheep sorrel is resistant to several herbicides (Putwain and Harper 1970). Liming the soil may help eradicate sheep sorrel (Rutledge and McLendon 1996). Densmore et al. (2001) suggested that eradication of sheep sorrel is not necessary, because it usually does not persist when shaded out by other vegetation.
Rational:

Sources of information:
Densmore, R.V., P.C. McKee and C. Roland. 2001. Exotic plants in Alaskan National Park Units. Report on file with the National Park Service – Alaska Region, Anchorage, Alaska. 143 pp.
Putwain, P.D. and J.L. Harper. 1970. Studies in the dynamics of plant populations: III. The influence of associated species on populations of *Rumex acetosa* L. and *R. acetosella* L. in grassland. The Journal of Ecology 58(1): 251-264.
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
Total	7

Total for 4 sections Possible	100
Total for 4 sections	51

References:

Cal-IPC - California Invasive Plant Council. 2005. Rumex acetosella Plant Assessment Form. Available: http://www.cal-ipc.org/ [February 2, 2005].

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

Chippindale, H.G. and W.E.J. Milton. 1934. On the viable seeds present in the soil beneath pasture. The Journal of Ecology 22(2): 508-531.

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

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