WEED RISK ASSESSMENT FORM

Botanical name: *Medicago lupulina* L.

Common name: black medick

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	

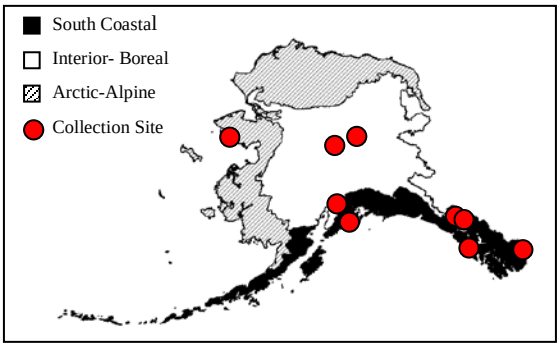
B.	**Invasiveness Ranking**	Total (Total Answered*) Possible	Total
1	Ecological impact	40 (40)	10
2	Biological characteristic and dispersal ability	25 (25)	18
3	Ecological amplitude and distribution	25 (25)	15
4	Feasibility of control	10 (10)	5
	Outcome score	100 (100)[b]	48 [a]
	Relative maximum score†		0.48

* 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: *Medicago lupulina* has been documented in all ecogeographic regions of Alaska (Weeds of Alaska Database 2005, Hultén 1968, UAM 2004).
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/

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 5

Documentation:
Identify ecosystem processes impacted:
Black medick alters edaphic conditions due to fixation of atmospheric nitrogen (USDA 2002). This species has not been observed in undisturbed areas in Alaska. It is unlikely that significant impacts to ecosystem processes occur due to its presence.
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.

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 1

Documentation:
Identify type of impact or alteration:
Black medick establishes in an existing layer and increases the density of the layer (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.

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 1

Documentation:
Identify type of impact or alteration:
Black medick has been observed only on disturbed ground and presumable has little or no impact on natural community composition.
Rational:

Sources of information:

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:
Flowers of black medick are visited by bees and other pollinating insects (Lammerink 1968). Black medick is alternate host for number of viruses and fungus (Royer and Dickinson 1999).
Rational:

Sources of information:
Lammerink, J. 1968. Genetic variability in commencement of flowering in *Medicago lupulina* L. in the South Island of New Zealand. New Zealand Journal of Botany; 6: 33-42.
Royer, F., and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

Total Possible 40

Total 10

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):

Black medick reproduces be seed only (USDA 2002). The number of seed pods produced per plant was 68 to 115 in study in Ontario (Pavone and Reader 1985). Stevens (1932) reported mean number of seed produced by individual plant was 2,350.

Rational:

Sources of information:

Pavone, L.V. and R.J. Reader. 1985. Effect of microtopography on the survival and reproduction of *Medicago lupulina*. Journal of Ecology; 73: 685-695.

Stevens, O.A. 1932. The number and weight of seeds produced by weeds. American Journal of Botany, 19: 784-794.

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.

2.2. 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 3

Documentation:

Identify dispersal mechanisms:

Seeds of black medick can be dispersed over great distances by birds and grazing animals (Sidhu 1971, Lammerink 1968). Seeds and seedlings can float in water (Turkington and Cavers 1979). Seeds are heavy and wind dispersal is unimportant (Pavone and Reader 1982, Pavone and Reader 1985).

Rational:

Sources of information:

Lammerink, J. 1968. Genetic variability in commencement of flowering in *Medicago lupulina* L. in the South Island of New Zealand. New Zealand Journal of Botany; 6: 33-42.

Pavone, L.V. and R.J. Reader. 1982. The dynamics of seed bank size and seed state of *Medicago lupulina*. Journal of Ecology. 70: 537-547.

Pavone, L.V. and R.J. Reader. 1985. Effect of microtopography on the survival and reproduction of *Medicago lupulina*. Journal of Ecology; 73: 685-695.

Sidhu, S.S. 1971. Some aspects of the ecology of black medick (*Medicago lupulina* L.). Ph.D. Thesis, University of Western Ontario, London, Ontario.

Turkington, R. and P.B. Cavers. 1979. The biology of Canadian weeds. 33. *Medicago lupulina* L. Canadian Journal of Plant Science; 59: 99-110.

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:
Black medick is frequent contaminant of alfalfa and clover seed (USDA, ARS 2005, Rutledge and McLendon 1996, Sidhu 1971). Seeds can adhere to dry and especially to damp clothing (Turkington and Cavers 1979).
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).
Sidhu, S.S. 1971. Some aspects of the ecology of black medick (*Medicago lupulina* L.). Ph.D. Thesis, University of Western Ontario, London, Ontario.
Turkington, R. and P.B. Cavers. 1979. The biology of Canadian weeds. 33. *Medicago lupulina* L. Canadian Journal of Plant Science; 59: 99-110.
USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov2/cgi-bin/npgs/html/taxon.pl?23613 (05 October 2005).

2.4. Allelopathic

A.	No	0
B.	Yes	2
U.	Unknown	

Score 0

Documentation:
Describe effect on adjacent plants:
Black medick is not allelophathic (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.

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 3

Documentation:
Evidence of competitive ability:
Black medick is fairly successful on dry soils, but it does not compete strongly with perennials (Foulds 1978). This species has high nitrogen fixing ability (USDA 2002).

Rational:

Sources of information:
Foulds, W. 1978. Response to soil moisture supply in three leguminous species. I. Growth, reproduction, and mortality. New Phytologist, 80: 535-545.
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 0

Documentation:
Describe grow form:
Black medick is a low trailing plant. It does not possess climbing or smothering growth habit (Whitson et al. 2000, Royer and Dickinson 1999).
Rational:

Sources of information:
Royer, F., and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.
Whitson, T. D., L. C. Burrill, S. A. Dewey, D. W. Cudney, B. E. Nelson, R. D. Lee, R. Parker. 2000. Weeds of the West. The Western Society of Weed Science in cooperation with the Western United States Land Grant Universities, Cooperative Extension Services. University of Wyoming. Laramie, Wyoming. 630 pp.

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 3

Documentation:
Describe germination requirements:
Turkington and cavers (1979) found that germination of black medick usually promoted by cultivation or animal digging. But in another study germination was significantly greater on vegetated soils (Wolfe-Bellin and Moloney 2000).
Rational:

Sources of information:
Turkington, R. and P.B. Cavers. 1979. The biology of Canadian weeds. 33. *Medicago lupulina* L. Canadian Journal of Plant Science; 59: 99-110.
Wolfe-Bellin, K.S. and K.A. Moloney. 2000. The effect of gopher mounds and fire on the spatial distribution and demography of a short-lived legume in tallgrass prairie. Canadian Journal of Botany; 78: 1299-1308.

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

A.	No	0
B.	Yes	3
U.	Unknown	

Score 3

Documentation:

Species:
Medicago sativa L., *M. polymorpha* L., *M. minima* (L.) L. (Gubanov et al. 2003, USDA 2002, Whitson et al. 2000, Royer and Dickinson 1999).
Sources of information:
Gubanov, I.A., K.V. Kiseleva, V.S. Novikov, V.N. Tihomirov. 2003. An illustrated identification book of the plants of Middle Russia, Vol.2: Angiosperms (dicots: archichlamydeans). Moscow. Institute of Technological Researches; 666 p.
Royer, F., and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.
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.
Whitson, T. D., L. C. Burrill, S. A. Dewey, D. W. Cudney, B. E. Nelson, R. D. Lee, R. Parker. 2000. Weeds of the West. The Western Society of Weed Science in cooperation with the Western United States Land Grant Universities, Cooperative Extension Services. University of Wyoming. Laramie, Wyoming. 630 pp.

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 0

Documentation:
Describe type of habitat:
Black medick is weed of lawns, gardens, roadsides, and pastures. It is most adapted to dry sites (Gubanov et al. 2003, Foulds 2000, Royer and Dickinson 1999).
Rational:

Sources of information:
Foulds, W. 1978. Response to soil moisture supply in three leguminous species. I. Growth, reproduction, and mortality. New Phytologist, 80: 535-545.
Gubanov, I.A., K.V. Kiseleva, V.S. Novikov, V.N. Tihomirov. 2003. An illustrated identification book of the plants of Middle Russia, Vol.2: Angiosperms (dicots: archichlamydeans). Moscow. Institute of Technological Researches; 666 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 18

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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:
Black medick is weed of roadsides and pastures. It is occasionally found in cultivated crops and gardens (Royer and Dickinson 1999).
Rational:

Sources of information:

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: 0

Documentation:
Identify type of habitat and states or provinces where it occurs:
No documented negative impact on natural areas was found.
Sources of information:

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:
Seedlings of black medick are most likely to survive on bare soil or in small of disturbances created by animals or erosion (Wolfe-Bellin and Maloney 2000, Turkington and Cavers 1997, Pavone and Reader 1985, Pavone and Reader 1982, Sidhu 1971).
Rational:

Sources of information:
Pavone, L.V. and R.J. Reader. 1982. The dynamics of seed bank size and seed state of *Medicago lupulina*. Journal of Ecology. 70: 537-547.
Pavone, L.V. and R.J. Reader. 1985. Effect of microtopography on the survival and reproduction of *Medicago lupulina*. Journal of Ecology; 73: 685-695.
Sidhu, S.S. 1971. Some aspects of the ecology of black medick (*Medicago lupulina* L.). Ph.D. Thesis, University of Western Ontario, London, Ontario.
Turkington, R. and P.B. Cavers. 1979. The biology of Canadian weeds. 33. *Medicago lupulina* L. Canadian Journal of Plant Science; 59: 99-110.
Wolfe-Bellin, K.S. and K.A. Moloney. 2000. The effect of gopher mounds and fire on the spatial distribution and demography of a short-lived legume in tallgrass prairie. Canadian Journal of Botany; 78: 1299-1308.

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:
Native range of black medick includes Europe, temperate and tropical Asia, and Northern Africa (USDA, ARS 2005). Today this species is introduced into North America, Central Africa, Australia, New Zealand, and the Philippines (Hultén 1968).
Rational:

Sources of information:
Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, CA. 1008 p.
USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/var/apache/cgi-bin/npgs/html/taxon.pl?300618 [October 5, 2005].

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:
Black medick is found throughout United States and Canada (USDA 2002, Royer and Dickinson 1999). *Medicado lupulina* is listed as a weed in Manitoba. It is declared a noxious weed seed in Alaska (Alaska Administrative Code 1987).
Rational:

Sources of information:
Alaska Administrative Code. Title 11, Chapter 34. 1987. Alaska Department of Natural Resources. Division of Agriculture.
Royer, F., and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.
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
Total 15

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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:
Most seeds germinate within 2 or 2½ years (Van Assche et al. 2003, Leishman et al. 2000, Pavone and Reader 1982, Chepil 1946, Brenchley and Warington 1930). Medvedev (1973, cited in Turkington and Cavers 1979) reported that storage for 10-11 years had little effect on viability of seeds. Less than 1% seeds were viable after 20 years (Lewis 1973).
Rational:

Sources of information:
Brenchley, W.E. and K. Warington. 1930. The weed seed population of arable soil: I. Numerical estimation of viable seeds and observations on their natural dormancy. The Journal of Ecology; 18: 235-272.

Chepil, W.S. 1946. Germination of weed seeds. I. Longevity, periodicity of germination, and vitality of seeds in cultivated soil. Scientific Agriculture; 26: 307-346.
Leishman, M.R., G.J. Masters, I.P. Clarke, and V.K. Brown. 2000. Seed bank dynamics: the role of fungal pathogens and climate change. Functional Ecology; 14: 293-299.
Lewis, J. 1973. Longevity of crop and weed seeds: survival after 20 years in soil. Weed Research. 13: 179-191.
Pavone, L.V. and R.J. Reader. 1982. The dynamics of seed bank size and seed state of *Medicago lupulina*. Journal of Ecology. 70: 537-547.
Turkington, R. and P.B. Cavers. 1979. The biology of Canadian weeds. 33. *Medicago lupulina* L. Canadian Journal of Plant Science; 59: 99-110.
Van Assche, J.A., K.L.A. Debucquoy, and W.A.F. Rommens. 2003. Seasonal cycles in the germination capacity of buried seeds of some Leguminosae (Fabaceae). New Phytologist, 158: 315-323.

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: 0

Documentation:

Describe vegetative response:
Black medick showed no vegetative regeneration in natural condition (Sidhu 1971).
Rational:

Sources of information:
Sidhu, S.S. 1971. Some aspects of the ecology of black medick (*Medicago lupulina* L.). Ph.D. Thesis, University of Western Ontario, London, Ontario.

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:
Black medick can be controlled easily be the use of herbicides (Turkington and Cavers 1997).
Rational:

Sources of information:
Turkington, R. and P.B. Cavers. 1979. The biology of Canadian weeds. 33. *Medicago lupulina* L. Canadian Journal of Plant Science; 59: 99-110.

Total Possible	10
Total	5

Total for 4 sections Possible	100
Total for 4 sections	48

References:

Alaska Administrative Code. Title 11, Chapter 34. 1987. Alaska Department of Natural Resources. Division of Agriculture.

Brenchley, W.E. and K. Warington. 1930. The weed seed population of arable soil: I. Numerical estimation of viable seeds and observations on their natural dormancy. The Journal of Ecology; 18: 235-272.

Chepil, W.S. 1946. Germination of weed seeds. I. Longevity, periodicity of germination, and vitality of seeds in cultivated soil. Scientific Agriculture; 26: 307-346.

Foulds, W. 1978. Response to soil moisture supply in three leguminous species. I. Growth, reproduction, and mortality. New Phytologist, 80: 535-545.

Gubanov, I.A., K.V. Kiseleva, V.S. Novikov, V.N. Tihomirov. 2003. An illustrated identification book of the plants of Middle Russia, Vol.2: Angiosperms (dicots: archichlamydeans). Moscow. Institute of Technological Researches; 666 p.

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

Lammerink, J. 1968. Genetic variability in commencement of flowering in *Medicago lupulina* L. in the South Island of New Zealand. New Zealand Journal of Botany; 6: 33-42.

Leishman, M.R., G.J. Masters, I.P. Clarke, and V.K. Brown. 2000. Seed bank dynamics: the role of fungal pathogens and climate change. Functional Ecology; 14: 293-299.

Lewis, J. 1973. Longevity of crop and weed seeds: survival after 20 years in soil. Weed Research. 13: 179-191.

Pavone, L.V. and R.J. Reader. 1982. The dynamics of seed bank size and seed state of *Medicago lupulina*. Journal of Ecology. 70: 537-547.

Pavone, L.V. and R.J. Reader. 1985. Effect of microtopography on the survival and reproduction of *Medicago lupulina*. Journal of Ecology; 73: 685-695.

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. 97pp. Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/othrdata/explant/explant.html (Version 15Dec98).

Sidhu, S.S. 1971. Some aspects of the ecology of black medick (*Medicago lupulina* L.). Ph.D. Thesis, University of Western Ontario, London, Ontario.

Stevens, O.A. 1932. The number and weight of seeds produced by weeds. American Journal of Botany, 19: 784-794.

Turkington, R. and P.B. Cavers. 1979. The biology of Canadian weeds. 33. *Medicago lupulina* L. Canadian Journal of Plant Science; 59: 99-110.

University of Alaska Museum. University of Alaska Fairbanks. 2003. http://hispida.museum.uaf.edu:8080/home.cfm

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.

USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/var/apache/cgi-bin/npgs/html/taxon.pl?300618 [October 5, 2005].

Van Assche, J.A., K.L.A. Debucquoy, and W.A.F. Rommens. 2003. Seasonal cycles in the germination capacity of buried seeds of some Leguminosae (Fabaceae). New Phytologist, 158: 315-323.

Weeds of Alaska Database. 2004. AKEPIC Mapping Project Inventory Field Data. Alaska Natural Heritage Program, University of Alaska – US Forest Service – National Park Service. Available: http://akweeds.uaa.alaska.edu/

Whitson, T.D., L.C. Burrill, S.A. Dewey, D.W. Cudney, B.E. Nelson, R.D. Lee, R. Parker. 2000. Weeds of the West. The Western Society of Weed Science in cooperation with the

Western United States Land Grant Universities, Cooperative Extension Services. University of Wyoming. Laramie, Wyoming. 630 pp.
Wolfe-Bellin, K.S. and K.A. Moloney. 2000. The effect of gopher mounds and fire on the spatial distribution and demography of a short-lived legume in tallgrass prairie. Canadian Journal of Botany; 78: 1299-1308.