

REPORT ON THE CONSERVATION STATUS OF
ASTRAGALUS ANSERINUS, IN IDAHO AND UTAH

by

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Taxon Name: Astragalus anserinus Atwood, Goodrich & Welsh

Common Name: Goose Creek milkvetch

Family: Fabaceae

States Where Taxon Occurs: U.S.A.; Idaho, Utah, Nevada

Current Federal Status: Category 2 Candidate

Recommended Federal Status: Category 2 Candidate

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ABSTRACT

A field investigation of Astragalus anserinus (Goose Creek milkvetch) was conducted in Idaho during June of 1991 by the Idaho Department of Fish and Game's Conservation Data Center¹. Sawtooth NF, Bureau of Land Management (BLM), State, and private lands were all surveyed to gain a comprehensive view of the abundance, distribution and conservation status for Goose Creek milkvetch in the Idaho portion of its range. Goose Creek milkvetch is locally endemic to the Goose Creek basin of extreme southern Cassia County, Idaho and adjacent portions of Nevada and Utah. It is a Category 2 federal candidate species, and a Forest Service Region 4 sensitive species. It is also a sensitive species for the BLM in Idaho and Utah.

Presently, seven populations of Goose Creek milkvetch are known for Idaho, three of these discovered in 1991. All populations occur on BLM land, with several extending onto adjacent private lands. No populations are known for the Sawtooth National Forest, although most populations are within a few miles of the Forest boundary. All previously documented sites were revisited in 1991 and updated information collected. The number of plants at one population is unknown. It is estimated that the other populations supported less than 1000 plants in 1991. Plant density was very low at all sites. Extent of these populations varied from less than 100 yds² to over 100 acres. Two of the populations revisited in 1991 showed declining numbers compared to previous reports.

Eight populations are known for Utah and support a total of approximately 7000 individuals. Most sites are small and estimated to be less than one acre. The majority of populations in Utah occur on BLM land, but occurrences on State and private land have also been found.

Goose Creek milkvetch is restricted to dry, sandy, tuffaceous soils derived from Salt Lake Formation sediments. It has been found from about 4900 to 5480 feet elevation, typically within open Utah juniper or big sagebrush communities.

Disturbances and habitat alteration associated with cattle grazing seem to present the most serious threat to the long-term viability of Goose Creek milkvetch. The presence of threats, the low number of plants in most populations, and its very restricted habitat and geographic range combine to keep Goose Creek milkvetch a conservation concern. Since none is known from the Sawtooth NF, it is recommended that Goose Creek milkvetch be removed from the Forest Service Region 4 sensitive species list. It is further recommended that Goose Creek milkvetch be retained as a Category 2 species pending completion of status survey work in Nevada.

¹Formerly the Idaho Natural Heritage Program

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I. Species Information.

1. Classification and nomenclature.

A. Species.

1. Scientific name.

a. Binomial: Astragalus anserinus Atwood, Goodrich,
& Welsh

b. Full bibliographic citation: Atwood, N.D., S.
Goodrich, and S.L. Welsh. 1984. New Astragalus
(Leguminosae) from the Goose Creek drainage, Utah-
Nevada. Great Basin Naturalist 44(2):263-264.

c. Type specimen: Atwood & Goodrich 8989, 22 km
northwest of Lynn, Goose Creek drainage, Box Elder
County, Utah, 23 June 1982.

2. Pertinent synonym(s): None.

3. Common name(s): Goose Creek milkvetch

4. Taxon codes: PDFAB0FA10 (Idaho Conservation Data
Center and Utah Natural Heritage Program).

5. Size of genus: A very large genus of perhaps 1600
species worldwide, dispersed primarily around the
Northern Hemisphere and most highly diversified in arid
continental, desert and Mediterranean climates.
Approximately 375 species in North America, including
156 (plus 122 varieties) in the Intermountain West
region (Barneby 1989). It is the largest genus of
flowering plants in the Intermountain region.

B. Family classification.

1. Family name: Fabaceae

2. Pertinent family synonyms: Leguminosae
Papilionaceae

3. Common name(s) for family: Bean; Pea; Legume

C. Major plant group: Dicotyledonea (Class Magnoliopsida)

D. History of knowledge of taxon: This taxon is relatively
new to science, first collected in 1982, and described
in 1984 (Atwood, Goodrich & Welsh 1984). In 1991, the
Idaho Conservation Data Center entered into a Challenge

Cost-share project with the Sawtooth NF to conduct a status survey of Astragalus anserinus on the Forest. Concurrently, the Conservation Data Center contracted with the U.S. Fish and Wildlife Service to conduct field inventories throughout the rest of its range and prepare a status report.

Goose Creek milkvetch is known from seven extant populations in Idaho, all in the Goose Creek area of southern Cassia County. In adjacent areas of Utah, eight populations have been documented (Baird, Tuhy and Franklin 1991). In Nevada, four populations are presently known (Morefield pers comm.). Survey work has been completed for the Idaho and Utah portions of its range, while a limited amount still remains to be done in Nevada.

This report concerns the status of Goose Creek milkvetch only in the Idaho and Utah portions of its range. Since a complete status survey in Nevada is still pending, only occasional reference to the Nevada populations will be made.

E. Comments on current alternative taxonomic treatment(s):
None.

2. Present legal or other formal status

A. International: None.

B. National.

1. Present designation of proposed legal protection or regulation: Goose Creek milkvetch is a Category 2 candidate species for federal listing (U.S. Fish and Wildlife Service 1990).

2. Other current formal status recommendation: Goose Creek milkvetch is ranked as "imperiled throughout its range because of rarity or because of other factors making it vulnerable to extinction" (global rank = G2) by The Nature Conservancy.

Goose Creek milkvetch is a sensitive species for Region 4 of the Forest Service (Spahr et al. 1991) and the Bureau of Land Management in Idaho (Bureau of Land Management 1991) and Utah (Atwood et al. 1991).

3. Review of past status: Goose Creek milkvetch is a relatively recently described species (Atwood, Goodrich & Welsh 1984). It was listed as a Category 2 candidate species in 1990 (U.S. Fish and Wildlife

Service 1990).

1. Idaho.

- a. Present designation or proposed legal protection or regulation: None.
- b. Other current formal status recommendation: Goose Creek milkvetch is currently listed as "critically imperiled in Idaho because of extreme rarity or because of some other factor of its biology making it especially vulnerable to extinction" (state rank = S1) by the Idaho Conservation Data Center (Moseley and Groves 1990).

Since it is a federal candidate species, no Idaho Native Plant Society category applies to Goose Creek milkvetch (Idaho Native Plant Society 1991).

- c. Review of Past status: None.

2. Utah

- a. Present designated or proposed legal protection or regulation: None.
- b. Other current formal status recommendation: Goose Creek milkvetch is ranked S1 by the Utah Natural Heritage Program. The definition for the S1 ranking is identical as noted for Idaho (Utah Natural Heritage Program 1990).
- c. Review of past status: None.

3. Nevada

- a. Present designated or proposed legal protection or regulation: None.
- b. Other current formal status recommendation: Goose Creek milkvetch is ranked S1 by the Nevada Natural Heritage Program. The definition for the S1 ranking is identical as noted for Idaho (Morefield pers. comm.).

The Northern Nevada Native Plant Society has placed Goose Creek milkvetch on its 'Watch' list. This category is reserved for species of uncertain abundance and distribution and/or those whose threats cannot be currently defined (Northern Nevada Native Plant Society 1989).

3. Description.

A. General nontechnical description: Goose Creek milkvetch is a low, mat-forming perennial with a slender taproot. The herbage has a soft, bent-to-tangled pubescence, giving the plant a grayish appearance. The leaves are small and divided into 5-15 leaflets. Flowers are pink-purple, only 9-11 mm long and not elevated above the plant. The brownish-red fruit pods are pubescent (but are not hidden by the pubescence), have a noticeable curved shape, and typically appear to be lying under the edge of the low-spreading stems. See Appendix II for a line drawing of Goose Creek milkvetch and Appendix VII for color slides.

B. Technical Description: Dwarf, tufted or matted, shortly caulescent, perennial herbs from a slender taproot; stems 3-11 cm long, decumbent-spreading; herbage villous-tomentose; stipules all free; leaves 1-4 cm long; leaflets 5-15, 3.2-6.5 mm long, obovate; peduncles 1.1-2.4 cm long; racemes with 3-7 flowers, the axis 1-5 mm long, little if at all elongating in fruit; bracteoles lacking; bracts ca 2 mm long, lance-subulate; pedicels 0.6-4.8 mm long, the teeth 1.1-1.8 mm long, subulate; flowers 9-11.2 mm long, pink-purple; pods sessile 9-12 mm long, 5-7 mm wide, deciduous from within calyx; dorsiventrally compressed, falcately curved, conspicuously trigonous-beaked, thinly villous; ovules 16-20; seeds 1.2 mm long (Atwood, Goodrich & Welsh 1984).

C. Local field characters: Field characteristics are important for identification because we encountered at least eight other Astragalus species while surveying for Goose Creek milkvetch. These included: Astragalus beckwithii var. beckwithii (Beckwith's milkvetch), Astragalus filipes (basalt milkvetch), Astragalus toanus (Toano milkvetch) Astragalus cibarius (browse milkvetch), Astragalus lentiginosus (freckled milkvetch), Astragalus newberryi (Newberry's milkvetch), Astragalus calycosus (Torrey's milkvetch) and Astragalus purshii (Pursh's milkvetch). The first five species are not mat-forming and readily distinguishable. The latter three, Newberry's milkvetch, Torrey's milkvetch and Pursh's milkvetch are mat-forming, and could be confused with Goose Creek milkvetch.

Newberry's milkvetch and Pursh's milkvetch can be distinguished by their larger leaves and leaflets, seed pods which are concealed by dense, silky, whitish hairs, and that have a leathery texture when mature,

and by longer flowers (typically much longer than 11 mm). In Goose Creek milkvetch, the pubescence does not fully cover the thin-textured, reddish-brown pods, and flowers are up to 11 mm long.

Torrey's milkvetch can be distinguished by its larger leaves and leaflets, herbage with appressed dolabriform hairs (hairs attached above their base and pick-shaped), bilocular pods, and larger flowers that vary from white to purple-colored. Goose Creek milkvetch has basafixed pubescence, unilocular pods, and relatively small flowers that are pink-purple.

In addition, Newberry's milkvetch, Torrey's milkvetch and Pursh's milkvetch are all much more widespread and occur in a wider variety of habitats compared to Goose Creek milkvetch.

- D. Identifying characteristics of material which is in interstate or international commerce or trade: No interstate or international trade is known. See above section for differences with closely related genera/species.
- E. Photographs and/or line drawings: Line drawings of Goose Creek milkvetch appear in Atwood, Goodrich and Welsh (1984) and Barneby (1989). Reduced versions of the Atwood, Goodrich and Welsh drawing can be found in the Utah endangered, threatened and sensitive plant field guide (Atwood et al. 1991), Idaho and Wyoming endangered and sensitive plant field guide (USDA Forest Service n. d.), and Threatened, endangered, and sensitive species of the Intermountain region (Spahr et al. 1991). See Appendix II for a reproduction of the line drawing from Atwood, Goodrich and Welsh (1984). Photographs (35 mm slides) of Goose Creek milkvetch and its habitat in Idaho are in the slide collection of the Idaho Conservation Data Center. Several have been reproduced in Appendix VII.

4. Significance.

- A. Natural: None known.
- B. Human: None known.

5. Geographical distribution.

- A. Geographical range: Goose Creek milkvetch is locally endemic to the Goose Creek basin astride the state lines in extreme northwestern Box Elder County, Utah, adjacent Elko County, Nevada, and Cassia County, Idaho,

and south to the Delano Mountains in Nevada (Barneby 1989). Appendix IV lists the areas searched in Idaho during our 1991 field investigation.

B. Precise occurrences in Idaho.

1. Populations currently or recently known extant:
Seven extant populations of Goose Creek milkvetch have been documented for Idaho, three of these discovered in 1991. It was first discovered in Idaho in 1982. Note that the number in parentheses refers to the occurrence number of Astragalus anserinus in the Conservation Data Center's data base.

Idaho

1. Lower Beaverdam Creek (001)
 - a. USA: Idaho, Cassia County
 - d. Blue Hill 7.5 'U.S.G.S. topographic map quadrangle, 1968.
 - e. First observed in 1988.
 - f. Most recently observed by Bob Moseley and Michael Mancuso in 1991.
2. Beaverdam Creek (002)
 - a. USA: Idaho, Cassia County
 - d. Blue Hill 7.5' U.S.G.S. topographic map quadrangle, 1968.
 - e. First observed in 1989.
 - f. Most recently observed by Bob Moseley and Michael Mancuso in 1991.
3. Beaverdam Creek (003)
 - a. USA: Idaho, Cassia County
 - d. Ibex Peak 7.5' U.S.G.S. topographic map quadrangle, 1977.
 - e. First observed in 1985.
 - f. Most recently observed by Bob Moseley and Michael Mancuso in 1991.
4. Coal Banks Creek (004)
 - a. USA: Idaho, Cassia County
 - d. Blue Hill 7.5' U.S.G.S. topographic map quadrangle, 1968.
 - e. First observed in 1989.
 - f. Most recently observed by Bob Moseley and Michael Mancuso in 1991.
5. Goose Creek Cliff Bands (005)
 - a. USA: Idaho, Cassia County
 - d. Blue Hill 7.5' U.S.G.S. topographic map

- quadrangle, 1968.
 - e. First observed by Bob Moseley and Michael Mancuso in 1991.
 - f. Most recently observed by Bob Moseley and Michael Mancuso in 1991.
- 6. Goose Creek, Idaho/Utah border (006)
 - a. USA: Idaho, Cassia County
 - d. Cotton Thomas Basin 15' U.S.G.S. topographic map quadrangle, 1959.
 - e. First observed by Bob Moseley and Michael Mancuso in 1991.
 - f. Most recently observed by Bob Moseley and Michael Mancuso in 1991.
- 7. Border Gulch (007)
 - a. USA: Idaho, Cassia County
 - d. Cotton Thomas Basin 15' U.S.G.S. topographic map quadrangle, 1959.
 - e. First observed by Bob Moseley and Michael Mancuso in 1991.
 - f. Most recently observed by Bob Moseley and Michael Mancuso in 1991.

Note that the number in parentheses refers to the occurrence number of Astragalus anserinus in the Utah Natural Heritage Program's data base.

Utah

- 1. Goose Creek NE (001)
 - a. USA: Utah, Box Elder County
 - d. Pole Creek 7.5' U.S.G.S. topographic map quadrangle.
 - e. First observed in 1990.
 - f. Most recently observed in 1990.
- 2. Goose Creek (002)
 - a. USA: Utah, Box Elder County
 - d. Pole Creek and Nile Spring 7.5' U.S.G.S. topographic map quadrangles.
 - e. First observed in 1990.
 - f. Most recently observed in 1990.
- 3. Goose Creek North (003)
 - a. USA: Utah, Box Elder County
 - d. Nile Spring 7.5' U.S.G.S. topographic map quadrangle.

- e. First observed in 1990.
 - f. Most recently observed in 1990.
4. Emigrant Trail (004)
 - a. USA: Utah, Box Elder County
 - d. Nile Spring 7.5' U.S.G.S.
topographic map quadrangle.
 - e. First observed in 1990.
 - f. Most recently observed in 1990.
 5. Lower Drainage to Goose Creek (005)
 - a. USA: Utah, Box Elder County
 - d. Nile Spring 7.5' U.S.G.S.
topographic map quadrangle.
 - e. First observed in 1990.
 - f. Most recently observed in 1990.
 6. Drainage to Goose Creek (006)
 - a. USA: Utah, Box Elder County
 - d. Nile Spring 7.5' U.S.G.S.
topographic map quadrangle.
 - e. First observed in 1982.
 - f. Most recently observed in 1990.
 7. Upper Drainage to Goose Creek (007)
 - a. USA: Utah, Box Elder County
 - d. Nile Spring 7.5' U.S.G.S.
topographic map quadrangle.
 - e. First observed in 1982. Type location.
 - f. Most recently observed in 1990.
 8. Hardesty Creek (008)
 - a. USA: Utah, Box Elder County and Nevada, Elko
County
 - d. Nile Spring 7.5' U.S.G.S.
topographic map quadrangle.
 - e. First observed in 1982.
 - f. Most recently observed in 1990.
2. Populations known or assumed extirpated: None.
 3. Historically known populations where current status not known: None.
 4. Locations not yet investigated believed likely to support additional natural populations: In Idaho, additional potential habitat for Goose Creek milkvetch occurs on BLM land, on slopes east of the very upper reaches of Lower Goose Creek Reservoir.
 5. Reports having ambiguous or incomplete locality information: None.

6. Locations known or suspected to be erroneous reports:
None.

C. Biogeographical and phylogenetic history: Goose Creek milkvetch is just one example of the many astragali in the Intermountain region that are edaphically restricted within a small geographic area. Barneby (1989) states that Astragalus is believed to be a primitively mesophytic genus of the Northern Hemisphere. He suggests that the prolific adaptive radiation of Astragalus into arid, harsh habitats is a relatively recent phenomenon and still in progress. Its ability to establish on new, unstable habitats in progressively dry climates has quickened its evolutionary pace.

Atwood, Goodrich and Welsh (1984) suggest that the generic affinity of Goose Creek milkvetch is apparently within the section Argophylli. Because of its tiny flowers it may be allied to A. subvestitus, a species of moderate elevations in Tulare and Kern counties, California.

6. General environment and habitat description.

A. Concise statement of general environment: Goose Creek milkvetch is apparently confined to dry, ashy sand/sandy, tuffaceous sediments of the Goose Creek basin. These whitish to light brown-colored sediments are components of the Tertiary age Salt Lake Formation (Rember and Bennett 1979a; Rember and Bennett 1979b). Goose Creek milkvetch occurs in drainage bottoms and lower to upper slope and crest positions, typically within open Utah juniper, big sagebrush or rabbitbrush communities. In Idaho, it is restricted to southeast to southwest exposures, while in Utah it was found on all aspects, but predominately southern and western. Sites varied from flat to very steep. Elevations range between 4900 and 5480 feet. Common associates include Juniperis osteosperma, Artemisia tridentata, Chrysothamnus viscidiflorus, Purshia tridentata, Stipa comata, Oryzopsis hymenoides, Cryptantha interrupta, Gilia congesta, Chaenactis douglasii, Eriogonum ovalifolium, and Lupinus lepidus. The rare plant Penstemon idahoensis may be found near, but apparently not sympatric with Goose Creek milkvetch.

B. Physical characteristics.

1. Climate.

a. Koppen climate classification: Habitat for Goose

Creek milkvetch is classified as Koppen's unit BSk: middle latitude steppe, with average annual temperature under 64.4°F (Trewartha 1968).

- b. Regional macroclimate: The regional macroclimate for the Goose Creek basin area supporting Goose Creek milkvetch is extrapolated from the Strevell, Idaho, weather station. Strevell is located at T16S, R28E, which is the same latitude as, but approximately 45 miles east of the Goose Creek basin. Strevell is at 5290 feet, similar to elevations Goose Creek milkvetch is found. Mean annual temperature for Strevell is 45.5°F (7.6°C) and the mean annual precipitation is 10.9 inches (276.4 mm). The annual temperature range for Strevell averages between 22.2°F (-4.7°C) to 70.6°F (20.7°C), with highest temperatures occurring in July and the lowest occurring in January. Mean annual precipitation peaks in the spring months (April, May, June) with approximately 40% of the total annual precipitation. The winter months, November to February, mark the driest part of the year with an average of less than 0.66 inch of precipitation per month (Johnson 1978).
- c. Local microclimate: The slopes and knolls where Goose Creek milkvetch occurs are likely dry much of the year. Snow probably does not linger long on the southerly aspects where Goose Creek milkvetch tends to occur.

2. Air and water quality requirements: Unknown

3. Physiographic provinces: Populations of Goose Creek milkvetch lie within the northern section of the Basin and Range Province (Ross and Savage 1967).

4. Physiographic and topographic characteristics: Goose Creek milkvetch most commonly occurs on southeast to southwest-facing slopes and in drainage bottoms. It is known from elevations ranging between 4900 and 5480 feet. It is locally endemic to a portion of the Goose Creek basin near where the borders of Idaho, Nevada and Utah join. The sandy-textured Salt Lake Formation, tuffaceous soil to which Goose Creek milkvetch is restricted is often sparsely vegetated.

5. Edaphic factors: Goose Creek milkvetch is apparently restricted to ashy sand/sandy, tuffaceous substrates of the Salt Lake Formation in the Goose Creek basin area. Soils are dry and white or grey to light brown-colored. Salt Lake Formation outcrops that weather to a

hard surface or are predominately comprised of large fractured stones or rocks are apparently unsuitable for Goose Creek milkvetch.

6. Dependence of this taxon on natural disturbance: Specific details are unknown, but natural erosion processes are important in producing the weathered, ashy sands to which Goose Creek milkvetch is most adapted.

7. Other unusual physical features: Goose Creek milkvetch is much less common on northerly exposures and has a narrow elevational amplitude, ranging from approximately 4900 to 5480 feet in Idaho and Utah.

C. Biological characteristics.

1. Vegetation physiognomy and community structure: Goose Creek milkvetch occurs in open Juniperis osteosperma communities, and openings within Artemisia tridentata communities. The Artemisia communities are sometimes co-dominated by Chrysothamnus viscidiflorus. These habitats often include the grasses Stipa comata and Oryzopsis hymenoides and a number of low-growing forbs. Species diversity is typically low overall.
2. Regional vegetation type: Kuchler (1964) places the Goose Creek basin area in the juniper-pinyon (Juniperis - Pinus) woodland potential vegetation type.
3. Frequently associated species: Common associates include Juniperis osteosperma, Artemisia tridentata, Chrysothamnus viscidiflorus, Purshia tridentata, Stipa comata, Oryzopsis hymenoides, Cryptantha interrupta, Gilia congesta, Chaenactis douglasii, Eriogonum ovalifolium, Lupinus lepidus, Oenothera caespitosa, and O. pallida. Penstemon idahoensis, another Category 2 candidate species, can occur nearby, but seems to be excluded from the ashy sand microsites typical for Goose Creek milkvetch (Mancuso and Moseley 1991).
4. Dominance and frequency: Goose Creek milkvetch was never found to be a community dominant in any of the Idaho populations. In nearly all situations Goose Creek milkvetch occurs in very low densities. It is commonly missing from similar-looking habitats near sites where it is found. Salt Lake Formation outcrops that were rocky typically did not contain Goose Creek milkvetch.
5. Successional phenomena: Parts of the natural successional patterns of the Goose Creek basin may be

affected by the area's intensive livestock use, and perhaps fire suppression efforts too. Goose Creek milkvetch typically occurs in relatively stable, sparsely vegetated, harsh microsites, unable to support many of the other species present in the area.

6. Dependence on dynamic biotic features: None known.

7. Other endangered species: The rare plant Penstemon idahoensis is occasionally found near, but not sympatric with Goose Creek milkvetch. Penstemon idahoensis is also a Category 2 federal candidate species (Mancuso and Moseley 1991).

7. Population biology.

A. General summary: There are seven populations of Goose Creek milkvetch known from Idaho, all restricted to tuffaceous substrates of the Salt Lake Formation in the Goose Creek basin of very southern Cassia County (see Appendix III for mapped locations). It was first collected in Idaho in 1982 and prior to 1991 only four populations had been documented for the state. During our 1991 field investigation, we revisited all previously known sites and discovered three new locations as well. No population data was collected for one new location, but it is estimated that the other six populations supported less than 1000 individuals in 1991. Two populations supported between 300 and 400 plants each, one supported approximately 200 individuals, one less than 50 plants, and at two populations less than ten plants were found. The extent of these populations varied from over 100 acres to less than 100 yds².

In Utah, eight populations, typically comprised of several subpopulations, have been documented (see Appendix III for mapped locations). Five of these populations were discovered during a field investigation completed under the auspices of the Utah Natural Heritage Program in 1990. Sites supporting Goose Creek milkvetch ranged in size from a few plants to populations of approximately 1500 individuals. Sites were usually small, most estimated to be less than one acre. A total of approximately 7000 individuals were documented during the 1990 survey (Baird, Tuhy and Franklin 1991).

B. Demography.

1. Known populations: Seven populations of Goose Creek milkvetch are known from Idaho and eight from Utah.

They all are located in very southern Cassia County, Idaho, and adjacent northwestern Box Elder County, Utah, near where the borders of Idaho, Nevada and Utah join. Populations range from less than 100 yds² to over 100 acres in size. The Idaho populations are estimated to contain approximately 1000 individuals and the Utah populations approximately 7000 individuals. Plant density is low at many populations, including all in Idaho. The age structure of specific populations are unknown, but a range of individual sizes were noted at a number of them.

In addition to the Idaho and Utah information, four small populations are known from nearby areas in Nevada. Status survey work is incomplete in Nevada, however (Morefield pers. comm.).

2. Demographic details (Idaho and Utah): For additional information see Appendix V for Idaho and Appendix VI for Utah.

Idaho

1. Lower Beaverdam Creek (001)
 - a. Location:
 - b. Area: Unknown
 - c. Number and size of plants: 1988: no data; 1991: only two plants seen
 - d. Density: very low
 - e. Presence of dispersed seeds: Unknown
 - f. Evidence of reproduction: No evidence
 - g. Evidence of expansion/contraction: Unknown
2. Horseshoe Spring (002)
 - a. Location:
 - b. Area: 100 acres
 - c. Number and size of plants: 1989: ca 1000 plants in flower and fruit; 1991: ca 200 plants in four subpopulations, all age classes represented, also numerous dead individuals
 - d. Density: very low
 - e. Presence of dispersed seeds: Unknown
 - f. Evidence of reproduction: No evidence
 - g. Evidence of expansion/contraction: Fewer individuals noted in 1991 compared to 1989
3. Beaverdam Creek (003)
 - a. Location:
 - b. Area: 100 + acres
 - c. Number and size of plants: 1991: seven scattered clusters supporting a total of ca 325 plants.

- d. Density: low
 - e. Presence of dispersed seeds: Unknown
 - f. Evidence of reproduction: Most plants in fruit in 1991
 - g. Evidence of expansion/contraction: Unknown
4. Coal Banks Creek (004)
- a. Location:
 - b. Area: 2 acres
 - c. Number and size of plants: 1989: 1001-10,000 plants in flower and mostly fruit; 1991: ca 30 plants in flower and fruit.
 - d. Density: very low
 - e. Presence of dispersed seeds: Unknown
 - f. Evidence of reproduction: some plants in fruit in 1991
 - g. Evidence of expansion/contraction: An apparent large decline in abundance between 1989 and 1991
5. Goose Creek Cliff Bands (005)
- a. Location:
 - b. Area: 2+ acres
 - c. Number and size of plants: 1991: unknown number; good age class distribution
 - d. Density: Low
 - e. Presence of dispersed seeds: Unknown
 - f. Evidence of reproduction: Most plants in fruit in 1991
 - g. Evidence of expansion/contraction: None
6. Goose Creek, Idaho/Utah Border (006)
- a. Location:
 - b. Area: 2+ acres
 - c. Number and size of plants: 1991: 300-400; good age structure
 - d. Density: Very low
 - e. Presence of dispersed seeds: Unknown
 - f. Evidence of reproduction: ca 80% in immature fruit in 1991
 - g. Evidence of expansion/contraction: None
7. Border Gulch (007)
- a. Location:
 - b. Area: 10-100 yd²
 - c. Number and size of plants: 1991: 7 plants in 2 subpopulations
 - d. Density: Very low
 - e. Presence of dispersed seeds: Unknown
 - f. Evidence of reproduction: No evidence
 - g. Evidence of expansion/contraction: None

Utah

(from Baird, Tuhy and Franklin 1991)

1. Goose Creek NE (001)
 - a. Location:
 - b. Area: 17 acres
 - c. Number and size of plants: 1990: 950+ plants
 - d. Density: Unknown
 - e. Presence of dispersed seeds: Unknown
 - f. Evidence of reproduction: Some plants in mature and immature fruit in 1990
 - g. Evidence of expansion/contraction: None

2. Goose Creek (002)
 - a. Location:
 - b. Area: 16 acres
 - c. Number and size of plants: 1990: 1950+ plants
 - d. Density: Unknown
 - e. Presence of dispersed seeds: Yes
 - f. Evidence of reproduction: Some plants in mature fruit in 1990
 - g. Evidence of expansion/contraction: None

3. Goose Creek North (003)
 - a. Location:
 - b. Area: 85 acres
 - c. Number and size of plants: 1990: 782+ plants
 - d. Density: Unknown
 - e. Presence of dispersed seeds: Yes
 - f. Evidence of reproduction: Some plants in mature fruit in 1990
 - g. Evidence of expansion/contraction: None

4. Emigrant Trail (004)
 - a. Location:
 - b. Area: 7 acres
 - c. Number and size of plants: 1990: 160+ plants
 - d. Density: Unknown
 - e. Presence of dispersed seeds: Yes
 - f. Evidence of reproduction: Some plants in mature and immature fruit in 1990
 - g. Evidence of expansion/contraction: None

5. Lower Drainage to Goose Creek (005)
 - a. Location:
 - b. Area: 35 acres
 - c. Number and size of plants: 1990: 1600+ plants
 - d. Density: Unknown
 - e. Presence of dispersed seeds: Yes
 - f. Evidence of reproduction: Some plants in mature and immature fruit in 1990
 - g. Evidence of expansion/contraction: None

6. Drainage to Goose Creek (006)
 - a. Location:
 - b. Area: 14 acres
 - c. Number and size of plants: 1990: 570+ plants
 - d. Density: Unknown
 - e. Presence of dispersed seeds: Yes
 - f. Evidence of reproduction: Some plants in mature and immature fruit in 1990
 - g. Evidence of expansion/contraction: Unknown

7. Upper Drainage to Goose Creek (007)
 - a. Location:
 - b. Area: 13 acres
 - c. Number and size of plants: 1990: 1300+ plants
 - d. Density: Unknown
 - e. Presence of dispersed seeds: Yes
 - f. Evidence of reproduction: Some plants in mature and immature fruit in 1990
 - g. Evidence of expansion/contraction: Unknown

8. Hardesty Creek (008)
 - a. Location:
 - b. Area: 12 acres
 - c. Number and size of plants: 1990: 55+ plants
 - d. Density: Unknown
 - e. Presence of dispersed seeds: No
 - f. Evidence of reproduction: Some plants in mature and immature fruit in 1990
 - g. Evidence of expansion/contraction: Unknown

C. Phenology.

1. Patterns: Flowering occurs from late May into June.
2. Relation to climate and microclimate: Specific details are unknown, but Goose Creek milkvetch is most common on southeast to southwest aspects and may require these warmer microsites to complete its life cycle. It was not found in suitable-appearing habitats above approximately 5300 feet elevation in Idaho. In Utah, it was found up to 5480 feet elevation. This may further suggest range-limiting effects related to temperature. Several Idaho populations showed a decrease in abundance in 1991, compared to earlier reports. The influence of the several-year-old drought on this apparent trend is unknown.

D. Reproductive ecology.

1. Type of reproduction: Apparently by seed only, as no evidence of asexual reproduction has been documented.

2. Pollination.
 - a. Mechanisms: Unknown, but probably flying insects.
 - b. Specific known pollinators: Unknown.
 - c. Other suspected pollinators: None known.
 - d. Vulnerability of pollinators: Unknown.
3. Seed dispersal.
 - a. General mechanisms: Specific details unknown, but wind, insect and bird agents are suspected.
 - b. Specific agents: Unknown, but probably wind, insect and bird agents.
 - c. Vulnerability of dispersal agents and mechanisms: Unknown.
 - d. Dispersal patterns: Unknown, but dehiscence is via the beak after the pod falls from the plant. This indicates wind dispersal may be important.
4. Seed biology.
 - a. Amount and variation of seed production: Specific details unknown, but Barneby (1989) states the pods contain 12-14 ovules. There is no mention if these all typically mature to seed, however. There appears to be a wide variation in the number of fruits produced by individual plants.
 - b. Seed viability and longevity: Unknown.
 - c. Dormancy requirements: Unknown.
 - d. Germination requirements: Unknown.
 - e. Percent germination: Unknown.
5. Seedling ecology: Unknown.
6. Survival and mortality: Unknown.
7. Overall assessment of reproductive success: Specific details unknown, however, several populations in Idaho are apparently decreasing in abundance. All populations are found in areas where varying intensities of livestock grazing occurs. Impacts, especially indirect effects of grazing on the survival and reproduction of

Goose Creek milkvetch are unknown.

8. Population ecology of the taxon.

- A. General summary: Seven populations of Goose Creek milkvetch are known from Idaho and eight from Utah. All populations occur in dry, sandy open areas on tuffaceous soils of the Salt Lake Formation, and are geographically limited to the Goose Creek basin.

All Idaho populations have a low to very low density. One population contains an unknown number of individuals, all others are comprised of less than 500 individuals each, including three with less than 100. Several populations are apparently in decline. At the Horseshoe Spring (002) population numerous dead individuals were observed in 1991. Varying intensities of cattle grazing occur at or near all sites. Impacts, especially the indirect effects of grazing on the survival and reproduction of Goose Creek milkvetch are unknown.

Populations of Goose Creek milkvetch in Utah range in size from approximately 55 to over 1600 individuals, typically dispersed among several subpopulations. Most populations appeared to be of normal vigor and all produced fruit in 1990. No data exists concerning population trends for Goose Creek milkvetch in Utah.

- B. Positive and neutral interactions: None known.

- C. Negative interactions.

1. Herbivores, predators, pests, parasites and diseases: None known.

2. Competition.

- a. Intraspecific: The low density of Goose Creek milkvetch in all populations suggests that intraspecific competition is insignificant.
- b. Interspecific: The majority of astragali do not tolerate direct competition with other herbs or the shade of trees and large shrubs (Barneby 1964). Goose Creek milkvetch seems to fit this generalization well. It occurs in open portions of the surrounding vegetation or on sparsely vegetated outcrops. It therefore appears that interspecific competition is an important ecological factor in the establishment and

persistence of Goose Creek milkvetch.

3. Toxic and allelopathic interactions with other organisms: None known.

D. Hybridization.

1. Naturally occurring: Unknown. A number of other astragali occur in the Goose Creek area, but no evidence of hybridization was observed.
2. Artificially induced: Unknown.
3. Potential in cultivation: Unknown.

E. Other factors of population ecology: None known.

9. Current land ownership and management responsibility:

- A. General nature of ownership: All known populations of Goose Creek milkvetch in Idaho occur on Bureau of Land Management land, at least in part. Several populations extend onto adjacent private lands as well. No populations were found on Forest Service land.

In Utah, one population is located solely on private land. All others occur at least in part on Bureau of Land Management land. In several instances these populations extend onto adjacent private or State ownership lands.

- B. Specific landowners: Idaho: The Beaverdam Creek (003), Coal Banks Creek (004), and Goose Creek Idaho/Utah border (006), populations occur solely on lands administered by the BLM's Burley District, Snake River Resource Area. The lower Beaverdam Creek (001), Horseshoe Spring (002), Goose Creek Cliff Bands (005), and Border Gulch (007) populations occur on both BLM and private lands.

Utah: The Emigrant Trail (004), Drainage to Goose Creek (006), and Upper Drainage to Goose Creek (007) populations occur solely on lands administered by the BLM's Salt Lake District, Bear River Resource Area. Ownership of the Hardesty Creek (008) population is shared with the BLM's Elko District in Nevada. The Goose Creek NE (001) population extends from BLM to Utah State Trust Land land. Goose Creek North (003) and Lower Drainage to Goose Creek (005) populations occur on both BLM and private lands, and the Goose Creek (002) population occurs only on private land (Baird, Tuhy and Franklin 1991).

C. Management responsibility: Same as above.

D. Easements, conservation restrictions, etc.: Goose Creek milkvetch is presently listed as "Sensitive" for the BLM in Idaho (Bureau of Land Management 1991) and Utah (Atwood et al. 1991), as well as Region 4 of the Forest Service for the Sawtooth NF (Spahr et al. 1991). Land administered by either federal agency that supports Goose Creek milkvetch populations would be managed according to the agencies respective regulations for sensitive species. The BLM is the only federal agency with Goose Creek milkvetch known to occur on land it manages.

10. Management practices and experience.

A. Habitat management.

1. Review of past management and land-use experiences.

a. This taxon: Livestock grazing has been the dominant land-use practice both past and present for sites supporting Goose Creek milkvetch in Idaho and Utah.

b. Related taxa: Unknown

c. Other ecologically similar taxa: The rare plant Penstemon idahoensis is also endemic to the Goose Creek basin area and restricted to Salt Lake Formation sediments. In at least one instance it occurs near Goose Creek milkvetch, but on less sandy microsites (Mancuso and Moseley 1991).

2. Performance under changed conditions: Goose Creek milkvetch would likely decrease or be eliminated if any management practices were to alter the open community structure of its habitat. An example would be seeding to crested wheatgrass. Goose Creek milkvetch can occur on fragile slopes that are easily impacted by cattle. This kind of negative disturbance has been documented at several populations in Idaho.

3. Current management policies and actions: Livestock grazing occurs throughout the range of Goose Creek milkvetch in Idaho and Utah.

4. Future land use: Future plans unknown.

B. Cultivation.

1. Controlled propagation techniques: None known.

2. Ease of transplanting: Unknown.
3. Pertinent horticultural knowledge: None known.
4. Status and location of presently cultivated material:
None known to be in cultivation.

11. Evidence of threats to survival.

A. Present or threatened destruction, modification, or curtailment of habitat or range.

1. Past threats: It is unlikely that much if any Goose Creek milkvetch habitat was lost in converting the bottomlands along Goose Creek for agricultural purposes. Some habitat has probably been destroyed during construction of the network of secondary roads that criss-cross much of the Goose Creek basin. Livestock grazing has been ongoing in the area for many years and indirect affects such as cattle trails and increased erosion, especially on fragile slopes, has likely impacted some habitat too. In the less than ten years since Goose Creek milkvetch was discovered, there has been no documentation of any populations being extirpated. For unknown reasons, several populations seem to be in decline in Idaho.

2. Existing threats: Indirect impacts due to cattle grazing, such as increased erosion of fragile slopes, trampling and trailing, and the construction of access roads and water tank facilities are the principle existing threats to Goose Creek milkvetch.

3. Potential threats: Although not directly associated with any known Goose Creek milkvetch populations, leafy spurge (*Euphorbia esula*) is invading the Goose Creek basin and apparently can become established in sites similar to the habitat used by the milkvetch. Direct competition with, or chemical weed control methods for leafy spurge may be potential threats to Goose Creek milkvetch. Although not foreseen at this time, if mining of the Salt Lake Formation sediments for any purpose was to ever be initiated, at least local negative impacts to Goose Creek milkvetch populations could be expected.

B. Overutilization for commercial, sporting, scientific, or educational use.

1. Past threats: Minimal to no past threats.

2. Existing threats: Minimal to no existing threats.

3. Potential threats: Several populations contain too few individuals to justify collecting even for scientific purposes.

C. Disease, predation, or grazing.

1. Past threats: No direct past threats to population viability of Goose Creek milkvetch due to disease or predation are known. Several indirect effects of grazing, already noted, have been ongoing for many years. There are no historical data for this recently discovered species concerning long-term population trends. It appears these threats can have localized impacts, but it seems less likely they have adversely affected the overall distribution and vitality of the species.
2. Existing threats: Baird, Tuhy and Franklin (1991) speculate that natural predation and disease may have greater impacts on Goose Creek milkvetch than grazing. No direct threats to its population viability due to disease or predation have been documented, however. Current threats posed by grazing are a continuation of impacts noted above.
3. Potential threats: No direct potential threats to population viability of Goose Creek milkvetch due to disease or predation are known. Impacts associated with heavy grazing will continue to be a potential threat, however. Another potential threat may be adverse impacts to the pollinators of Goose Creek milkvetch. Information concerning pollinators and pollination of this taxon is totally lacking, but it is a reasonable assumption that insects, especially bees are important.

Several populations of Goose Creek milkvetch occur in areas subject to very heavy cattle grazing. Sugden (1985) studied the effects of intensive sheep grazing on the pollinators (bees) of a rare milkvetch (*Astragalus monoensis*) in California that is also restricted to sandy, sparsely vegetated sites. Sugden found that sheep grazing practices endanger pollinators by destroying potential nest sites, destroying existing nests, trampling of adult bees, and the removal of food resources. The various pollinator species are subject to varying degrees of these threats depending on their specific life histories. Sugden concludes that the long-term effects of these impacts on the milkvetch's population size and structure needs further investigation, but that if pollination becomes limited, seed set may decline. To what if any degree pollinators are a limiting factor for Goose Creek milkvetch is

presently unknown. Since there are habitat and other similarities between the California study and the situation in Goose Creek, concerns about the effects of grazing on pollinators seems legitimate and worthy of future study.

D. Inadequacy of existing regulatory mechanisms.

1. Past threats: None.

2. Existing threats: Four of the seven Idaho populations of Goose Creek milkvetch occur in part on private land. At present, no regulatory mechanisms exist to extend protection to populations occurring on private land in Idaho.

In Utah, four of eight populations occur in part or whole on private and State lands. No regulatory mechanisms exist to extend protection to populations occurring on private or State land in Utah.

3. Potential threats: Same as above.

E. Other natural or manmade factors.

1. Past threats: None known.

2. Existing threats: None known.

3. Potential threats: None known.

II. Assessment and Recommendations.

12. General assessment or vigor, trends, and status: Goose Creek milkvetch has a restricted distribution, both geographically and edaphically. It is known only from the Goose Creek basin area, extending south from Idaho into adjacent areas of Utah and Nevada. In Idaho, it is often absent from sites supporting what appears to be suitable habitat. Furthermore, Goose Creek milkvetch typically occupies only a very small fraction of the suitable-looking habitat encompassing a given population.

As of 1991, seven extant populations of Goose Creek milkvetch are known in Idaho. The number of plants within all populations are low, with none supporting more than 400 individuals in 1991. All populations exhibit a low to very low density pattern. Two populations revisited in 1991 had considerably fewer individuals than reported in earlier estimates.

In Utah, eight populations have been documented and most appear healthy and vigorous. In general, the geographically restricted habitat appears sufficient and stable enough to maintain viable populations of Goose Creek milkvetch. The number of plants comprising a population ranges from approximately 55 to 1600. Population size is directly proportional to site size. Similar to the situation in Idaho, quantified population trend data is unavailable (Baird, Tuhy and Franklin 1991).

Localized negative impacts associated with the indirect effects of grazing are occurring at some Goose Creek milkvetch populations, at least in Idaho. In combination with this species very restricted distribution, the long-term effects of these impacts on the persistence of Goose Creek milkvetch are unknown, but potentially significant, at least for some populations. For Utah, Baird, Tuhy and Franklin (1991) state there are no indications that current land use practices are adversely affecting Goose Creek milkvetch to the point of threatening its survival.

The overall rarity of Goose Creek milkvetch in Idaho, and apparent precipitous decline at two of its seven known populations in the state, indicates that this species should remain a conservation concern in Idaho. The situation seems less tenuous, but Goose Creek milkvetch is still a very uncommon species in Utah.

13. Recommendations for listing or status change.

- A. Recommendations to the U.S. Fish and Wildlife Service:
Goose Creek milkvetch is listed presently as a Category 2 species with the U.S. Fish and Wildlife Service (1990). Goose Creek milkvetch was not described until 1984 (Atwood, Goodrich & Welsh 1984), and survey work in Idaho, Utah and Nevada only recently undertaken.

Goose Creek milkvetch is locally endemic to the Goose Creek basin, centered around the common border area of Idaho, Utah and Nevada. One population is also reported a little further south in the Delano Mountains of Nevada. Within this limited range it is further restricted to specific tuffaceous sediments.

Although they may cover rather large areas, all seven Idaho populations contain relatively few individuals. Completed survey work in Utah reports eight occurrences there, some of them relatively large (Baird, Tuhy and Franklin 1991). There are four documented populations in Nevada, but survey work is incomplete. Like most of the Idaho populations, the Nevada populations can be large in area, but all support low numbers of

individuals (Morefield pers. comm.).

Based on population information and lack of apparent threats found during their Utah survey, the Utah Natural Heritage Program suggests downgrading the federal status of Goose Creek milkvetch may be appropriate, but recommend maintaining the species at the Category 2 level until survey work in Idaho and Nevada are completed. Survey work in Idaho has now been completed, but is still pending in Nevada. We therefore recommend that Goose Creek milkvetch be retained as a Category 2 candidate pending completion of survey work in Nevada.

If completed survey work in Nevada does little to improve the present conservation status of Goose Creek milkvetch, at a very minimum, a species management guide for this species should be produced.

B. Recommendations to other U.S. Federal Agencies.

1. U.S. Forest Service: Despite thorough searching, no Goose Creek milkvetch has ever been found on the Sawtooth NF. Several populations occur within two miles of the Sawtooth NF boundary and some suitable-appearing habitat does occur, but Goose Creek milkvetch is apparently absent from the Forest. It may be that Forest Service land, which is at a higher elevation than Goose Creek and the very lower portions of its tributaries where Goose Creek milkvetch is known to occur, does not support Goose Creek milkvetch for temperature related reasons.

Since there is no Goose Creek milkvetch known from the Sawtooth NF, we recommend it be removed from the Region 4 sensitive species list. If Goose Creek milkvetch is discovered on the Forest at some future time, it may be necessary to reinstate this species.

2. Bureau of Land Management: All of the Goose Creek milkvetch populations known for Idaho occur at least in part on BLM land administered by the Snake River Resource Area of the Burley District. Based on information contained in this report Goose Creek milkvetch still meets sensitive species criteria and should remain on the BLM sensitive species list. It is recommended that a monitoring program designed to study the effects and trends of grazing on the persistence of Goose Creek milkvetch populations be established or sponsored by the BLM. Limiting cattle use at several sites where indirect grazing effects appear the most serious is an option that must be considered. The Lower

Beaverdam Creek (001), Goose Creek Cliff Bands (005), and Border Gulch (007) populations would probably benefit the most from such actions.

All but one population of Goose Creek milkvetch in Utah occur, at least in part, on BLM land administered by the Bear River Resource Area of the Salt Lake District. Based on information contained in the report prepared by the Utah Natural Heritage Program (Baird, Tuhy and Franklin 1991) and this report, Goose Creek milkvetch still meets sensitive species criteria and should remain on the BLM sensitive species list for Utah too. Baird, Tuhy and Franklin (1991) note that additional research on population trend would be helpful in determining any future needs of the species. They also comment that future monitoring is primarily the responsibility of the BLM and their cooperators.

C. Other status recommendations.

1. Counties and local areas: No recommendations.
2. State: Currently Goose Creek milkvetch is ranked S1 by the Idaho Conservation Data Center. Based on data collected in 1991, this ranking still seems appropriate. It is also currently ranked S1 by the Utah Natural Heritage Program (Utah Natural Heritage Program 1990). No recommended change is made in their 1991 report. The ultimate decision at changing this status rests with the Utah Natural Heritage Program.
3. Other Nations: No recommendations.
4. International: No recommendations.

14. Recommended critical habitat:

A. Concise statement of recommended critical habitat.

Since survey work for Goose Creek milkvetch is incomplete in Nevada, recommendations for critical habitat may be premature. If completed survey work in Nevada does little to improve the current conservation status for Goose Creek milkvetch, then the designation of critical habitat may be desirable. If this is the case, we recommend three populations of Goose Creek milkvetch in Idaho be considered for designation. All three are located solely on BLM land. The populations recommended are:

- 003 - Beaverdam Creek
- 004 - Coal Banks Creek
- 006 - Goose Creek, Idaho/Utah border

These three sites are defensible and contain two of the three largest populations documented for Idaho. Each of these populations are also good candidates for monitoring studies.

In addition, Idaho penstemon (population 002), another Category 2 candidate, occurs in the same general area as the Beaverdam Creek population (Mancuso and Moseley 1991). Both species are widely scattered, especially the Goose Creek milkvetch. The vegetation of the area is mostly in good ecological condition and cattle use of the area is restricted to some flatter sites and trails. Leafy spurge is beginning to invade the area, but none was seen in the immediate vicinity of either rare plant. This area, is geologically very interesting. The multi-colored bands of sediments eroded into strange shapes are also of high scenic value.

In Utah, essential habitat is delineated in the "Assessments and Recommendations" section of the report prepared by Baird, Tuhy and Franklin (1991).

- B. Legal Description of boundaries:
See Appendices III, V and VI for legal description of the occurrence records listed above.
- C. Latitude and longitude: See Appendix V and VI for latitude and longitude of the occurrence records listed above.
- D. Publicity/sensitivity of critical habitat area:
All of the above recommended critical habitat areas in Idaho are located solely on BLM land. This should make these areas and any monitoring studies easier to establish. If any further protective measures are needed at a later date, BLM ownership will allow more efficient implementation. One of the Utah areas recommended occurs on private land, the others on BLM land.

15. Conservation/recovery recommendations.

A. General conservation recommendations.

- 1. Recommendations regarding present or anticipated activities: Some adjustments in grazing patterns may be necessary to decrease the degree of disturbance and allow for recovery at some populations.
- 2. Areas recommended for protection: In Idaho, three sites are recommended for protection (see "Concise

Statement of recommended critical habitat"). In Utah, several sites from two populations are recommended (see Baird, Tuhy and Franklin 1991).

3. Habitat management recommendations: Habitats should be managed to reduce excessive impacts from man-caused land use disturbances that may destroy habitat, reduce population size/numbers, or extirpate populations.

4. Publicity sensitivity: Low.

5. Other recommendations: None.

- B. Monitoring activities and further studies recommended:
Very little is presently known about the life history of Goose Creek milkvetch. Collecting further biological and ecological information will be necessary to fully assess the conservation status of Goose Creek milkvetch and to ensure its long-term viability. Monitoring activities should include some basic demographic attributes, community structure, and effects of habitat disturbance by livestock, including perhaps impacts on pollinators.

16. Interested parties:

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III. Information Sources.

17. Sources of information.

A. Publications.

1. References cited in report: See Appendix I.
2. Other pertinent publications.
 - a. Technical: None.
 - b. Popular: None.

B. Herbaria consulted: Specimens of Goose Creek milkvetch from Idaho are known to be deposited at Brigham Young University (BRY), New York Botanical Garden (NY), and the Bureau of Land Management herbarium in Boise. The following is a list of known herbarium specimens, indexed by population:

001 - A. Debolt 979 (NY, BLM)
002 - A. DeBolt 1197 (uncertain)
003 - D. Atwood 11161 (BRY)
004 - D. Atwood 15645 (BRY)

C. Fieldwork: In June, 1991, the Idaho Conservation Data Center conducted a field investigation for Goose Creek milkvetch in the Goose Creek basin of southern Cassia County, Idaho. The objectives of this investigation were to relocate known populations and search potential habitat for new populations, delineate the overall distribution of the taxon in Idaho, characterize habitat conditions, collect population data and assess threats.

In Utah, field work was conducted during June, July and August of 1990. Additional information is contained in Baird, Tuhy and Franklin (1991).

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E. Other information sources: None known.

18. Summary of material on file: Color slides, field forms, maps, and all published and unpublished references pertaining to Goose Creek milkvetch in Idaho are on file at the Idaho Conservation Data Center office in Boise, Idaho. Similar references and materials concerning populations in Utah are on file at the Utah Natural Heritage Program office in Salt Lake City, Utah.

IV. Authorship.

19. Initial authorship:

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20. Maintenance of statue report: The Idaho Conservation Data Center, and Utah and Nevada Natural Heritage Programs will maintain current information for their respective states and update the status report as needed.

V. New information.

21. Record of revisions: Not applicable.

APPENDIX I

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Appendix II

Line drawing of Astragalus anserinus
(From Atwood, Goodrich & Welsh 1984)

Appendix III

Map locations of Astragalus anserinus populations in Idaho and Utah.

Map 1. Overall distribution of known Astragalus anserinus populations in Idaho and Utah. Portion of Sawtooth National Forest (Twin Falls and Burley Ranger Districts) Visitor Map (1970).

Idaho

Map 2. Coal Banks Creek (004) population. Portion of Blue Hill 7.5' USGS quadrangle.

Map 3. Lower Beaverdam Creek (001), Horseshoe Spring (002), and Goose Creek Cliff Bands (005) populations. Portion of Blue Hill 7.5' USGS quadrangle.

Map 4. Beaverdam Creek (003) population. Portion of Ibex Peak 7.5' USGS quadrangle.

Map 5. Goose Creek, Idaho/Utah Border (006) and Border Gulch (007) populations. Portion of Cotton Thomas Basin 15' USGS quadrangle.

Utah

Map 6. Goose Creek NE (001) population. Portion of Cotton Thomas Basin 15' USGS quadrangle.

Map 7. Goose Creek (002), Goose Creek North (003), Emigrant Trail (004), Lower Drainage of Goose Creek (005), Drainage to Goose Creek (006), Upper Drainage to Goose Creek (007), and Hardesty Creek (008) populations. Portion of Goose Creek 15' USGS quadrangle.

Note: For the Idaho populations, the number in parentheses refers to the occurrence number of Astragalus anserinus in the Conservation Data Center's data base. For the Utah populations, the number in parentheses refers to the occurrence number for this species in the Utah Natural Heritage Program's data base.

Portions of Pole Creek 7.5' and Nile Spring 7.5' USGS topographic maps with the precise locations of the Utah populations can be found in Baird, Tuhy and Franklin (1991).

Appendix IV

List of areas searched for Astragalus anserinus in Idaho.

East of Goose Creek (predominately BLM land with portions along Goose Creek under private ownership).

1. Wilson Gulch, and north to upper portions of Lower Goose Creek Reservoir.
2. Day Canyon.
3. Cold Creek.
4. Spring Creek (and draws between Cold and Spring Creeks).
5. Coyote Creek.
6. Emery Creek.
7. Blue Hill Creek.
8. Devine Canyon.
9. Birch Creek.
10. Several gulches between Birch and Pole Creek.
11. Pole Creek.

West of Goose Creek (Sawtooth NF land; most areas searched extend onto contiguous BLM, State, and/or private lands).

1. Lone Cedar Creek.
2. Cave Gulch (including Daves Pass area).
3. Owen Corral Creek.
4. Coal Banks Creek.
5. Cliffs and gullies between Beaverdam and Coal Banks Creeks (BLM and private lands).
6. Gulches in lower Beaverdam Creek south of Emery Ranch (BLM and private lands).
7. NE Canyon and NE Creek.
8. Carlson Creek.
9. Left Hand Fork.
10. Right Hand Fork.
11. Dry Gulch.

Upper Goose Creek drainage (Sawtooth NF).

1. upper Goose Creek.
2. Thoroughbred Creek.
3. Trout Creek.

Trapper Creek drainage (Sawtooth NF and some BLM and/or private lands).

1. Trapper Creek.
2. Violets Hollow.
3. Squaw Creek and Little Squaw Creek.
4. Trapper Creek Demonstration Project Area.

A number of areas extending east from Salmon Falls Creek Reservoir to Shoshone Basin were also searched. Most of this area is BLM land, but some State and private land is also present.

Appendix V

Occurrence records for Astragalus anserinus
populations in Idaho.

Appendix VI

Occurrence records for Astragalus anserinus
populations in Utah.
(From Baird, Tuhy, and Franklin 1991)

Appendix VII

Slides of Astragalus anserinus and its habitat.

- Slide 1. Close-up of plant; note mat-forming habit, small, pink-purple flowers, and fruits lying around edge of plant.
- Slide 2. Close-up of fruit pods and leaves; note silvery pubescence, small size of leaflets, and curve-shaped pods.
- Slide 3. Overview of habitat; note the white bare spots scattered along the drainage bottom.
- Slide 4. Habitat; note open sparsely vegetated, light-colored tuffaceous substrate; Goose Creek milkvetch is widely scattered, notebook is for scale.