

**REPORT ON THE CONSERVATION STATUS OF
Astragalus mulfordiae IN IDAHO**

by

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June 1989

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**Status Survey Report prepared for
Idaho Department of Parks and Recreation
through Section 6 funding from
U.S. Fish and Wildlife Service, Region 1**

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Taxon Name: Astragalus mulfordiae Jones

Common Name: Mulford's milkvetch

Family: Fabaceae

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

Current Federal Status: Category 2 Candidate

Recommended Federal Status: Category 2 Candidate

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Original Date of Report: June 30, 1989

Date of Most recent Revision: N/A

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ABSTRACT

Mulford's milkvetch (*Astragalus mulfordiae*) was discovered in 1892, by Isabel Mulford near Boise, Idaho. Over the next century, populations were also discovered near Weiser and in northern Owyhee County. It has apparently always been rare, with collections being sporadic and widely scattered. This report summarizes our knowledge of its conservation status in Idaho. Recently discovered populations and associated conservation activity in Oregon, will be summarized in a status report for that state.

Eighteen populations of Mulford's milkvetch are known extant in Idaho, occurring in three centers of distribution: Boise foothills, Weiser area, and Owyhee County. Most of the eleven populations in the Boise foothills are critically small. Only one extant population could be relocated in Owyhee County; all extant and historical populations for which population data are available indicate that the Owyhee County populations are/were all small. The Weiser area is the stronghold for the species in Idaho, with most of the six populations having several hundred to over 2,000 individuals.

One historical record is considered extinct. Six historical collections, some with vague location information, could not be relocated during April 1989. Although some of these may be extirpated, further searches may relocate others.

Collective habitat destruction by mining, ORV activity, residential and agricultural development, and livestock grazing and trampling have taken place in virtually all known populations of Mulford's milkvetch in Idaho. The impacts enumerated above are especially acute in the Owyhee County and Boise foothill areas, where the long-term viability of most populations is in jeopardy. While it is likely that at least a few new populations of Mulford's milkvetch will be found in Idaho, the threats to its habitat are great, and probably will accelerate.

It is recommended that Mulford's milkvetch remain a category 2 candidate until the conservation status of Oregon populations can be determined. However, based on the data for Idaho, summarized in this report, and observations made in Oregon, it appears that listing as Threatened may be warranted.

A comprehensive protection strategy for the species should be developed, including Conservation Agreements between the U.S. Fish and Wildlife Service and the two public agencies who manage Mulford's milkvetch populations: Boise District, Bureau of Land Management and Boise City Parks. Conservation efforts should include the protection of the largest and/or the most genetically important populations. A monitoring program is also recommended.

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I. Species Information.

1. Classification and nomenclature.

A. Species.

1. Scientific name.

- a. Binomial:** Astragalus mulfordiae Jones.
- b. Full bibliographic citation:** M. E. Jones. 1898. Contributions to Western Botany 8:18.
- c. Type specimen:** A. Isabel Mulford s.n., Boise City, Idaho, June 7, 1892. Holotype: MO; Isotype: NY.

2. Pertinent synonym(s): Onix mulfordae (Jones) Rydb. in Bulletin of the Torrey Botanical Club 40:51. 1913.

Over the past several years, there has been widespread confusion as to the correct spelling of "mulfordiae". Jones (1898) published the name without the "i", prior to formalization of the International Code of Botanical Nomenclature. According to the code, this is an orthographic error that can be and was changed in later treatments of the taxon (Hitchcock 1961). All commemorative epithets used as nouns include an "i". If it is used to commemorate a female, as in Astragalus mulfordiae, "ae" is added.

3. Common name(s): Mulford's milkvetch.

4. Taxon codes: PDFAB0F5Q0 (Idaho and Oregon Natural Heritage Programs).

5. Size of genus: A vast genus whose numbers have been estimated as high as 2000 species, most highly developed in arid continental, desert, and Mediterranean climates, circumboreal (except Greenland) in dispersal (Barneby 1964).

Astragalus mulfordiae is the type species of the section Neonix (Barneby 1964).

B. Family classification.

- 1. Family name:** Fabaceae.
- 2. Pertinent family synonym:** Leguminosae.
- 3. Common name(s) for family:** Pea.

C. Major plant group: Dicotyledonea.

D. History of knowledge of taxon: Mulford's milkvetch was first collected in "Boise City, Idaho," on June 7, 1892, by A. Isabel Mulford. It was formally described by Marcus Jones in 1898, evidently based on the one Mulford collection. In the next two years, Jones collected specimens at Weiser, Idaho, on April 9, 1899 (6239) and July 7, 1900 (6340, 6241). Other early collections from the Weiser area include Ripley and

Barneby (6134), June 7, 1944, on sandy bluffs by the Snake River near Weiser, and Marion and Gerald Ownbey (2764), June 12, 1946, 10 miles south of Weiser, in Payette County. It was collected south of the Snake River for the first time by John Christ (9548) on June 19, 1938, three miles northwest of Grand View and again by Basset Maguire and Arthur Holmgren (26227) on May 27, 1946, 0.5 mile southeast of Grand View. Other early collections in or around Boise, include Marcus Jones (s.n.), August 2, 1917, and Christ and Ward (6989), May 6, 1937.

No collection records for Mulford's milkvetch are known to exist for the next 25 years. It was not until Noel and Pat Holmgren (4946) collected it near Bruneau, on May 31, 1971, that the next record appeared. In the 1970's, collections and observations were made by Bob Steele and Barbara Ertter in the foothills near Boise. Field surveys by personnel of the College of Idaho, Bureau of Land Management, and the Idaho Natural Heritage Program in the 1980's, located several more populations in the Weiser and Bruneau areas and in the Boise foothills.

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

2. Present legal or other formal status.

A. International: None.

B. National.

1. Present designated or proposed legal protection or regulation:

Currently, Mulford's milkvetch is a category 2 candidate (U.S. Fish and Wildlife Service 1985).

2. Other current formal status recommendation: Mulford's milkvetch is currently listed as "endangered throughout range" (global rank = G2) by The Nature Conservancy.

3. Review of past status: Mulford's milkvetch was recommended for federal threatened status (Federal Register, July 1, 1975) by participants of the workshop held at the Smithsonian Institution in September 1974. It was subsequently changed to a category 2 candidate. Kennison (1980), in his status report to the Fish and Wildlife Service, stated that "available information indicates that the taxon is highly or critically endangered."

C. State.

1. Idaho.

a. Present designated or proposed legal protection or regulation:

None.

b. Other current formal status recommendation: Mulford's milkvetch is currently listed as "critically imperiled in Idaho" (state rank = S1) by the Idaho Natural Heritage Program.

c. Review of past status: Packard (1977) recommended that the federal status of Mulford's milkvetch be changed from Threatened to Endangered, due to its infrequent occurrence and

threats from housing and agricultural development. Packard (1981) later recommended that it be proposed as a Threatened species because of its vulnerable habitat; extirpated populations; and housing, agriculture, and possibly grazing threats.

- 2. Oregon:** Prior to 1988, Mulford's milkvetch was known only from one historical collection in Oregon. During the spring and summer of 1988, substantial new populations were found by botanists from the Oregon Endangered Species Program and Vale District BLM in the vicinity of Vale, Malheur County, Oregon. Since its rediscovery, the BLM has established a seed bank at the Berry Botanic Garden in Portland, and established a monitoring program on selected populations. A status report for the newly discovered populations of Mulford's milkvetch in Oregon, and associated conservation activity, should be prepared by the Oregon Endangered Species Program as soon as possible. It currently appears, however, that Oregon may have a majority of the high quality populations for the species.

3. Description.

A. General nontechnical description: Mulford's milkvetch is a low-lying to erect, freely branching perennial with stems up to 2.5 dm long. The leaves are from 2.5 to 10.5 cm long and they are pinnately divided into 11 to 23 linear leaflets. The inflorescence is a loosely-flowered raceme. The "pea-like" flowers are white- or cream-colored and generally lined to tinged with blue. The pods are from 10 to 16 mm long, have a pointed tip, and are covered with short, crisp hairs.

B. Technical description: Low, slender, commonly sparsely leafy, with a taproot and at length loosely forking, suffruticulose caudex, thinly strigulose with fine, straight, appressed or subappressed hairs up to 0.2-0.5 mm long, the herbage green or yellowish green, the leaflets glabrous above; stems several or numerous, diffuse and ascending, 1-2.5 dm long, simple or branched at 1-2 nodes preceding the first peduncle; stipules 1.5-5(6) mm long, dimorphic, the lowest amplexicaul and connate into a papery-scarious, bidentate sheath, the upper ones semiamplexicaul, free, with triangular or lanceolate, erect or deflexed blades; leaves (2.5) 4.5-10.5 cm long, shortly petioled with very slender, stiff and commonly subpersistent rachis and (7) 15-25 distant, often scattered, linear-oblong, -oblanceolate, or filiform, obtuse or subacute, mostly folded leaflets 1-11 mm long, the terminal one of at least some upper leaves continuous with the rachis, rarely all jointed like the lateral ones; peduncles (0.5) 1.5-7 cm long, usually much shorter than the leaf; racemes loosely and often remotely (5) 8-19 flowered, the flowers early declined, the axis incurve-ascending, (2) 3-10 cm long in fruit; bracts membranous, ovate or lance-ovate, 0.7-2 mm long; pedicels 0.7-2 mm long, at anthesis ascending, in fruit arched outward but scarcely elongating; bracteoles 0-2; calyx 2.8-5 mm long, strigulose with white, white and fuscous, partly black, or wholly black hairs, the disc 0.5-1 mm deep, the campanulate tube 1.8-3 mm long, 1.5-2.4 mm in diameter, the subulate teeth 0.8-2 mm long, the whole becoming papery, marcescent unruptured; petals white or whitish, drying yellowish, the banner sometimes brownish-striate; banner abruptly recurved through (50) 85-100°, ovate- or obovate-cuneate, notched, 6.2-8.2 mm long, 4.5-5.2 mm wide; wings 6.2-8.1 mm long, the claws 2.4-2.7 mm, the obliquely obovate-elliptic, obtuse blades 4.2-5.8 mm long, 2-2.7 mm wide; keel 4.7-5.7 mm long, the claws 2.3-2.7 mm, the half-

circular blades 2.4-3.3 mm long, 1.8-2.5 mm wide, incurved through 115-130° to the deltoid, often slightly correct and then sharply deltoid apex; anthers 0.3-0.5 mm long; pod pendulous, stipitate, the stipe 3-5 mm long, the lunately halfellipsoid body (9) 10-16 mm long, 3.2-4.5 mm in diameter, cuneate at both ends, cuspidate at apex, triquetrously compressed, carinate ventrally by the suture, the lateral angles narrow but obtuse, the lateral faces nearly plane, the dorsal one depressed and openly sulcate, the thin pale green finely strigulose valves becoming papery, stramineous, somewhat lustrous, delicately cross-reticulate, inflexed as a complete septum 1.3-2 mm wide; ovules 11-16; seeds brown or greenish-brown, smooth but dull, 2-2.6 mm long (Barneby 1964).

C. Local field characters: The elegantly pretty Mulford's milkvetch is easily picked out from among species of the Intermountain States with small, whitish to yellowish flowers and may be recognized by its combination of lower stipules connate into a scarious sheath with a pod pendulous, stipitate, and almost exactly triquetrous, the three faces being of almost equal width. The pod is sometimes a trifle turgid, and the papery valves become straw-colored and shiny in ripening (Barneby 1964).

Care must be taken to distinguish it from Astragalus oniciformis, a plant very similar in general habit but more densely and loosely pubescent, and with none of the stipules connate (Barneby 1964). The following key, adapted from Barneby (1964:459), can be used to distinguish the two species:

1. Stipules mostly free; vesture of sinuous or incurved hairs; petals ochroleucous, the banner veined with brownish-purple; leaflets oblong-elliptic, all jointed; body of the pod 6-12 mm long; ovules 6-12; seeds 1.5-1.8 mm long; Blaine, Lincoln, and Minidoka counties, between 3700 and 5200 feet in elevation
..... Astragalus oniciformis

1. Stipules connate; vesture of appressed, straight hairs; petals white; leaflets mostly linear, the terminal one of some upper leaves nearly always continuous with the rachis; body of the pod (9) 10-16 mm long; ovules (11) 12-16; seeds 2-2.6 mm long; Ada, Owyhee, Payette, and Washington counties, Idaho, and adjacent Malheur County, Oregon; between 2100 and 3200 feet in elevation
..... Astragalus mulfordiae

Astragalus oniciformis and Mulford's milkvetch are not known to be sympatric, being separated by at least 80 miles.

D. Identifying characteristics of material which is in interstate or international commerce or trade: No interstate or international commerce or trade is known. See above section for distinguishing features.

E. Photographs and/or line drawings: The only known line drawings of Mulford's milkvetch can be found in Hitchcock (1961), Hitchcock and Cronquist (1973), and Meinke (1982). The drawing from Hitchcock (1961) has been reproduced in Appendix 2. Numerous photographs (35 mm slides) of Mulford's milkvetch and its habitat in Idaho are in the slide collection of the Idaho Natural Heritage Program. Several of these slides are included in Appendix 3.

4. Significance.

A. Natural: As stated in section I.3.D., Mulford's milkvetch is easily distinguished from other milkvetches in the Intermountain area of the western United States. Along with other narrow endemics of the region, Mulford's milkvetch is being used to reconstruct possible plant migration patterns of the southern Idaho flora (Pat Packard, College of Idaho, 1989, personal communication).

B. Human: No human use is known for Mulford's milkvetch. Although quite beautiful in a natural setting, it is delicate in appearance and, therefore, not highly sought after for horticultural purposes.

5. Geographical distribution.

A. Geographical range: Mulford's milkvetch is endemic to the western Snake River Plain in Ada, Owyhee, Payette and Washington counties, Idaho, and adjacent portions of Malheur County, Oregon. See Appendix 4 for maps of the distribution of known populations in Idaho.

B. Precise occurrences in Idaho.

1. Populations currently or recently known extant: The following 18 populations encompass the known extent of Mulford's milkvetch in Idaho (see Appendix 4 for maps of the populations and Appendix 5 for occurrence records):

<u>(Occurrence No.)</u>	<u>Population</u>	<u>County</u>	<u>Location</u>
(003)	Trail Family Ranch	Payette	
(004)	Camelsback Park	Ada	
(008)	Rebecca Sand Hill RNA	Washington	
(009)	Crestline Drive	Ada	
(010)	Boise Foothills	Ada	
(011)	Resseguie Street East	Ada	
(012)	Old Military Reserve	Ada	
(014)	Mud Flat Oolite pACEC	Owyhee	
(015)	Freestone Creek	Ada	
(016)	Sagebrush Hill South	Washington	
(017)	Rebecca Sand Hill N	Washington	
(018)	Stewart Gulch	Ada	
(019)	Boise Hills Village	Ada	
(020)	Sagebrush Hill North	Washington	
(021)	Crane Gulch	Ada	
(022)	Bogus Basin Road	Ada	
(023)	Mann-Weiser Divide	Washington	
(025)	Central Park	Ada	

2. Populations known or assumed extirpated: The following one Idaho population of Mulford's milkvetch is assumed extirpated (see Appendix 4 for maps of the populations and Appendix 5 for occurrence records):

<u>(Occurrence No.)</u>	<u>Population</u>	<u>County</u>	<u>Location</u>
(006)	Grand View Southeast	Owyhee	

3. Historically known populations where current status not known: See

section 5 below. Many historical collections have vague location data and I was unable to locate them in April 1989.

4. Locations not yet investigated believed likely to support

additional natural populations: In Idaho, additional Mulford's milkvetch populations will probably be found in all three distribution centers, Boise foothills, Weiser area, and Owyhee County; small, scattered areas of suitable habitat that have yet to be surveyed occur in all three areas. In both the Boise foothills and the Weiser area, a thorough survey could efficiently be performed in all suitable-appearing habitat because it is relatively accessible and geographically restricted. In Owyhee County it is a different story; suitable-appearing habitat is widely scattered between Marsing and Bruneau and its location is not as easy to predict as it is north of the Snake River in Idaho.

Although I predict additional populations will be found, see Section I.11 for discussion on threats faced by Mulford's milkvetch in all three areas.

Extensive surveys for Allium aaseae during 1987 and 1988 between Emmett and Boise by the Boise District BLM revealed no populations in this area (Ann DeBolt, Boise District BLM, 1989, personal communication).

5. Reports having ambiguous or incomplete locality information: Three historical collections of Mulford's milkvetch around Boise, including the type, had insufficient location information to accurately relocate the populations. These collections were merged with occurrence number 012 (Old Military Reserve).

The following six populations have vague location information and I was not able to locate them during April 1989.

(Occurrence No.)	Population	County	Location
(001)	Weiser North	Washington	2200'
(002)	Crystal	Washington	sandy bluffs by Snake River
(005)	Prominent Knoll	Owyhee	7 miles southwest of Bruneau
(007)	Grand View Northeast	Owyhee	3 miles northeast of Grand View
(013)	Con Shea Basin	Owyhee	Between Con Shea Basin & Snake R.
(024)	Hemingway Butte	Owyhee	lower Reynolds Creek

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

C. Biogeographical and phylogenetic history: The sect. Neonix Barneby, contains four xerophytic species in a well-defined geographic area of the intermountain United States (central transmontane California to interior Oregon, north-central Nevada, and southwestern Idaho). It is characterized by species with connate stipules and small trigonous bilocular emmenoloboid pods. Species included in this section are Astragalus mulfordiae, A. johannis-howellii, A. yoder-williamsii, and A. peckii (Barneby 1964; 1980). Mulford's milkvetch is more closely related to A. johannis-howellii, than with the other two members of the section, by way of its conventionally caulescent flaccid stems and foliage and in a pod-body 7-17 mm long. A. peckii and A. yoder-williamsii differ by having smaller pods, dwarf caespitose habit of growth, and pungent leaf stalks. The four species of the section are allopatric, A. peckii in the Cascade foothills of central Oregon, A.

johannis-howellii on the east slope of the Sierra Nevada of California, A. yoder-williamsii in north-central Nevada and the Owyhee Plateau of southwest Idaho, and Mulford's milkvetch on the Snake River Plain in southwest Idaho and adjacent Oregon (Barneby 1980).

Mulford's milkvetch is suggestive of A. oniciformis (sect. Miselli (Rydb.) Barneby) in many important features of its anatomy, including the shortness of the peduncle in relation to the elongate, distantly flowered raceme-axis, and the tiny flowers with unequally incurved wings. The free stipules of A. oniciformis, however, are at variance with the circumscription of the sect. Neonix (Barneby 1964). The likeness to Mulford's milkvetch is immediately striking, but on close observation A. oniciformis differs in several fine details other than the stipules (Barneby 1964). See the key in section I.3.C. for other features to distinguish the two species.

6. General environment and habitat description.

A. Concise statement of general environment and habitat: The habitat of Mulford's milkvetch in Idaho is best characterized by its loose, relatively coarse substrate on predominantly south- and west-facing slopes. Substrates vary from deep sand derived from lake deposits and decomposed sandstone, decomposed oolitic limestone, and lacustrine ash. Plant communities associated with these habitats include Purshia tridentata dominated stands, with bunchgrass understories and salt-desert shrub communities dominated by Sarcobatus, Tetradymia, Atriplex.

B. Physical characteristics.

1. Climate.

a. Koppen climate classification: Type BSk; semiarid or steppe climate, with average annual temperature under 64.4°. This is a middle-latitude, cold desert and steppe climate (Trewartha 1954).

b. Regional macroclimate: The average monthly maximum temperature on the western Snake River Plain reaches its highest point during the month of July, a month which also marks the beginning of a pronounced dry season; about 15% of the total annual precipitation falls during the period from July through October. Two periods of peak precipitation occur, one in January and the other in May. The winter precipitation peak is greatest with more than 38% of the mean annual precipitation falling between December and February.

Mean annual precipitation ranges from 8 to 13 inches and the mean annual temperature ranges from 50° to 52° F. The frost-free period ranges from 140 to 160 days (SCS 1976; 1980).

c. Local microclimate: Specific data are not available, but effective precipitation is less than the averages indicate due to the well-drained substrates characteristic of Mulford's milkvetch habitats. These habitats are also warmer, with the southerly-facing slopes heating up well before surrounding habitats. This lack of water and heat is reflected in the phenology of Mulford's milkvetch and other species of these habitats, which begin to grow and flower in March and April and are senescent by late July.

2. **Air and water quality requirements:** Unknown.
3. **Physiographic provinces:** Populations of Mulford's milkvetch along the northern edge of the Snake River Plain occur on the boundary of the Northern Rocky Mountain Geomorphic Province, while those in Owyhee County occur in the Owyhee Uplands Section of the Columbia-Intermontane Geomorphic Province (Ross and Savage 1967).
4. **Physiographic and topographic characteristics:** All populations of Mulford's milkvetch in Idaho occur on palustrine or lacustrine deposits that have been dated from the Pliocene/Quaternary boundary. The deposits were later dissected by rivers and streams. Mulford's milkvetch occurs mostly on moderately steep to steep, southeast-, south-, and southwest-facing slopes of old river and stream terraces. Occasional populations, such as Mud Flat Oolite pACEC (014), occur on relatively gentle ridgecrests.
5. **Edaphic factors:** As mentioned in the previous section, Mulford's milkvetch in Idaho is restricted to relatively recent lacustrine and alluvial deposits. Substrates include unconsolidated sands, decomposed sandstone, lacustrine ash, and oolitic limestone. All these substrates form relatively coarse-textured substrates.

The Soil Conservation Service (SCS) has mapped soils of several areas occupied by several Mulford's milkvetch populations. For example, the Trail Family Ranch (003) population occurs on soils mapped as the Lolalita-Saralegui association, steep, by the SCS (1976). These soils consist of well-drained soils on fans and the sides of highly dissected terraces. These soils formed in moderately coarse textured sediment and alluvium. Slopes are 65 to 80 percent. A representative soil profile is mainly pale-brown sandy loam to a depth of 48 inches. Below this, to a depth of 60 inches, the profile is light brownish-gray sandy loam. The soil is mildly alkaline and moderately alkaline to a depth of 48 inches and slightly calcareous below a depth of 48 inches. Permeability is moderately rapid. The root zone is more than 60 inches deep and holds 6 to 8 inches of water available to plants. Runoff is very rapid, and the erosion hazard is very high.

The Rebecca Sand Hill (008) population occurs on soils mapped as the Lolalita-Glasgow association. It has sandy loam surface, is very deep (>60 inches) and excessively drained (Rosentreter and Mooers 1985).

Mulford's milkvetch populations in and near Boise occur on lacustrine foothill soils of the Quincy-Lankbush-Brent associations on nearly level to very steep slopes. Soils, which are very deep and excessively drained, formed from acid igneous-derived eolian, lacustrine and alluvial material. Typically, the surface layer is brown, fine, gravelly, loamy coarse sand about 5 to 11 inches thick. The underlying material consists of pale brown, light brownish gray, and light gray, fine, gravelly, loamy coarse sand and a few thin lamellae of brown fine gravelly sandy loam to a depth of 60 inches or more. The root zone extends to a depth of 60 inches or more. Available water capacity is high. Runoff is very rapid and the hazard of erosion is very high (SCS 1980).

The Mud Flat Oolite pACEC (014) population occurs at the interface of the Quaternary/Tertiary Glenns Ferry Formation (upper) and the Tertiary Chalk Hills Formation (lower). Both are lake and stream deposits with numerous beds of tuffaceous sand, silt and clay, vitric ash, and locally pebble gravel. The base of the Glenns Ferry Formation includes a thick bed of gray oolite (Ekren et al. 1981). At the Mud Flat population, the oolite is approximately 30 feet thick (Moseley 1987). The Mulford's milkvetch population occurs on the exposed upper surface of the oolite.

- 6. Dependence of this taxon on natural disturbance:** In general, populations of Mulford's milkvetch occur on relatively unstable substrates. Mulford's milkvetch is able to cope with a certain degree of downslope movement; mature individuals have a very long taproot, up to five feet, that probably anchors the plant on these unstable slopes. All high quality populations occur in open communities with low ground cover, a condition that is apparently caused by the unstable nature of the substrate. In more stable sites adjacent to Mulford's milkvetch populations, ground cover is generally much greater than within the populations.

Part or all of three populations of Mulford's milkvetch, Camelsback Park (004), Boise Foothills (010), and Old Military Reserve (012), were burned in 1987 or 1988. Although detailed pre- and post-burn data are lacking for all three populations, the Old Military Reserve (012) population had an observed reduction in populations numbers, from 125 observed in 1985, to 38 in 1989.

- 7. Other unusual physical features:** None known.

C. Biological characteristics.

- 1. Vegetation physiognomy and community structure:** Mulford's milkvetch populations in Washington and Payette counties generally occur in the Purshia tridentata/Stipa comata and possibly Purshia tridentata/Agropyron spicatum habitat types (Hironaka et al. 1983). Lomatium dissectum and Chrysothamnus nauseosus ssp. hololeucus both have high prominence at these sites.

Near Boise, while Purshia tridentata is present, the vegetation has been altered to a greater degree and it may not be a community dominant. Here Aristida longiseta usually has the highest cover, along with Stipa comata, Artemisia tridentata ssp. tridentata, A. tridentata ssp. wyomingensis, Oryzopsis hymenoides, Lomatium dissectum, Chrysothamnus nauseosus, and Bromus tectorum.

The Owyhee County sites occur in communities dominated by species typical of the salt desert shrub zone such as Tetradymia spinosa, Atriplex canescens, and Atriplex spinosa.

- 2. Regional vegetation type:** Kuchler (1964) places the regional vegetation type as Sagebrush Steppe (Artemisia-Agropyron). Some populations occur in Kuchler's Saltbush-Greasewood (Atriplex-Sarcobatus) type.
- 3. Frequently associated species:** Following is a list of frequently associated species:

Purshia tridentata
Stipa comata
Chrysothamnus nauseosus ssp. hololeucus
Aristida longiseta
Stipa comata
Artemisia tridentata ssp. tridentata
A. tridentata ssp. wyomingensis
Oryzopsis hymenoides
Lomatium dissectum
Bromus tectorum
Tetradymia spinosa
Atriplex canescens
Atriplex spinosa
Sarcobatus vermiculatus
Agropyron spicatum
Poa secunda
Achillea millefolium
Allium aaseae
Balsamorhiza sagittata
Crepis sp.
Brodiaea douglasii
Chaenactis douglasii
Eriophyllum lanatum

4. **Dominance and frequency:** At some sites Mulford's milkvetch may be a prominent member of the community. Nowhere, however, is it a community dominant. Mulford's milkvetch stems are generally widely spaced from each other and from other species in the community. Individuals in a population range from about one dozen to over 2,000, with an average population having about 200 to 250 individuals.
5. **Successional phenomena:** Habitats occupied by Mulford's milkvetch in Idaho are best characterized as "perpetually" early successional in a classical primary succession scenario sensu Clements. The unstable nature of the substrate probably precludes development of a late successional, "closed" community in the short-term.
6. **Dependence on dynamic biotic features:** Periodic fire is probably a naturally occurring dynamic biotic feature to which Mulford's milkvetch is adapted. Historical fire frequencies were long enough that most native species were able to recover to pre-burn levels rather well. Since the invasion of exotic Eurasian weeds over 100 years ago, the fire frequencies have been gradually reduced, to the point where many native perennials are unable to survive in the stands. Now, many communities are dominated solely by exotics, especially Bromus tectorum. The effect of this increased fire frequency on Mulford's milkvetch is unknown, but it is expected to be detrimental.
7. **Other endangered species:** Several rare plant taxa occur with Mulford's milkvetch. Many populations in and around Boise are associated with Allium aaseae, which is a Category 1 Candidate and has a Heritage rank of G3 S3. The Prominent Knoll (005) population is associated with Astragalus camptopus, a federal Category 2 Candidate that has a Heritage rank of G3 S3. In addition to Mulford's milkvetch, six other rare plant taxa occur at the Mud Flat Oolite pACEC (014) site. They include:

Astragalus camptopus
Astragalus kentrophyta var. jessiae (Heritage rank G4 S2)

Astragalus purshii var. ophiogenes (Heritage rank G3 S3)
Eriogonum shockleyi var. shockleyi (Heritage rank G4 S2)
Glyptopleura marginata (Heritage rank G4 S2)
Mentzelia torreyi var. acerosa (Heritage rank G2 S2)

7. Population biology.

A. General summary: Eighteen extant populations of Mulford's milkvetch occur in Idaho. Three population centers occur here: Weiser area, Boise foothills, and Owyhee County. These centers are separated from each other by 40 to 60 miles (Map 1, Appendix 4). The largest populations in Idaho occur at Rebecca Sand Hill North (017) and Mann-Weiser Divide (023), each having over 2,000 plants. The smallest populations are in the Boise foothills, some having as few as seven individuals. The average population has about 250 individuals. Nothing is known of its reproductive biology.

B. Demography.

1. Known populations: Eighteen extant, one extirpated, and six populations with vague location data are known in Idaho, occurring in three population centers: Weiser area, Boise foothills, and Owyhee County. Eight (six extant and two vague historical) populations are known from the Weiser area in Washington and Payette counties, eleven extant populations in the Boise foothills of Ada County, and six (one extant, one extirpated, and four vague) populations from Owyhee County.

2. Demographic details (Idaho): Following are demographic details for extant populations of Mulford's milkvetch in Idaho:

a. Trail Family Ranch (003)

1. **Area:** 100 acres.
2. **Number and size of plants:** 500? individuals of various size classes in 1987.
3. **Density:** Unknown.
4. **Presence of dispersed seeds:** None observed.
5. **Evidence of reproduction:** Individuals of various size classes probably indicates recruitment of younger age classes into the population.
6. **Evidence of expansion/contraction:** No evidence.

b. Camelsback Park (004)

1. **Area:** 50 acres.
2. **Number and size of plants:** 47 individuals of various size classes in 1989.
3. **Density:** Widely scattered.
4. **Presence of dispersed seeds:** None observed.
5. **Evidence of reproduction:** Individuals of various size classes probably indicates recruitment of younger age classes into the population.
6. **Evidence of expansion/contraction:** No evidence.

c. Rebecca Sand Hill (008)

1. **Area:** 40 acres.

2. **Number and size of plants:** 1,000 - 1,500 individuals of various size classes in 1989.
3. **Density:** Moderately to widely scattered.
4. **Presence of dispersed seeds:** None observed.
5. **Evidence of reproduction:** All size classes present in population probably indicating good recruitment.
6. **Evidence of expansion/contraction:** No evidence.

d. Crestline Drive (009)

1. **Area:** 50 acres.
2. **Number and size of plants:** About 200 individuals of various size classes in 1989.
3. **Density:** Scattered.
4. **Presence of dispersed seeds:** None observed.
5. **Evidence of reproduction:** Individuals of various size classes probably indicates recruitment of younger age classes into the population.
6. **Evidence of expansion/contraction:** No evidence.

e. Boise Foothills (010)

1. **Area:** 10 - 100 square yards.
2. **Number and size of plants:** Seven individuals (six mature and one juvenile) in 1989.
3. **Density:** Widely scattered.
4. **Presence of dispersed seeds:** None observed.
5. **Evidence of reproduction:** One juvenile indicates at least some recruitment of younger age classes into the population.
6. **Evidence of expansion/contraction:** No evidence.

f. Resseguie Street East (011)

1. **Area:** About 100 square yards.
2. **Number and size of plants:** Twelve individuals of various size classes in 1989.
3. **Density:** Scattered.
4. **Presence of dispersed seeds:** None observed.
5. **Evidence of reproduction:** Individuals of various size classes probably indicates recruitment of younger age classes into the population.
6. **Evidence of expansion/contraction:** No evidence.

g. Old Military Reservation (012)

1. **Area:** 30 acres.
2. **Number and size of plants:** Thirty-eight individuals of various size classes observed in 1989. About 125 plants were observed in 1985.
3. **Density:** Moderately to widely scattered.
4. **Presence of dispersed seeds:** None observed.
5. **Evidence of reproduction:** Individuals of various size classes probably indicates recruitment of younger age classes into the population.
6. **Evidence of expansion/contraction:** A reduction in the number of individuals observed in 1989 may be the result of a fire burned the population in 1987.

h. Mud Flat Oolite (014)

1. **Area:** 2 acres.
2. **Number and size of plants:** Only a few individuals have ever been observed at this site.
3. **Density:** Unknown.
4. **Presence of dispersed seeds:** Unknown.
5. **Evidence of reproduction:** Unknown.
6. **Evidence of expansion/contraction:** Unknown.

i. Freestone Creek (015)

1. **Area:** 50 acres.
2. **Number and size of plants:** About 75 individuals of various size classes in 1989.
3. **Density:** Unknown.
4. **Presence of dispersed seeds:** Unknown.
5. **Evidence of reproduction:** Various size classes represented in population, probably indicating recruitment of young age classes.
6. **Evidence of expansion/contraction:** Unknown.

j. Sagebrush Hill South (016)

1. **Area:** 70 acres.
2. **Number and size of plants:** Several hundred to one thousand individuals of various size classes in 1989.
3. **Density:** Mostly widely scattered.
4. **Presence of dispersed seeds:** None observed.
5. **Evidence of reproduction:** Individuals of various size classes, probably indicating recruitment of younger age classes into the population.
6. **Evidence of expansion/contraction:** No evidence.

k. Rebecca Sand Hill North (017)

1. **Area:** 40+ acres.
2. **Number and size of plants:** Over 2,000 individuals of various size classes in 1989.
3. **Density:** Moderately to widely scattered.
4. **Presence of dispersed seeds:** None observed.
5. **Evidence of reproduction:** Individuals of various size classes, probably indicating recruitment of younger age classes into the population.
6. **Evidence of expansion/contraction:** No evidence.

l. Stewart Gulch (018)

1. **Area:** 500 acres.
2. **Number and size of plants:** Several hundred to one thousand individuals of various size classes in 1987.
3. **Density:** Unknown.
4. **Presence of dispersed seeds:** Unknown.
5. **Evidence of reproduction:** Various size classes represented in population, probably indicating recruitment of young age

classes.

6. **Evidence of expansion/contraction:** Unknown.

m. Boise Hills Village (019)

1. **Area:** 1 acre.

2. **Number and size of plants:** Perhaps one dozen individuals in 1989.

3. **Density:** Widely scattered.

4. **Presence of dispersed seeds:** None observed.

5. **Evidence of reproduction:** No.

6. **Evidence of expansion/contraction:** Much of population has been impacted by ORV tracks on ridgeline. This population is not expected to persist.

n. Sagebrush Hill North (020)

1. **Area:** About 2 acres.

2. **Number and size of plants:** About 50 individuals of various size classes in 1989.

3. **Density:** Widely scattered.

4. **Presence of dispersed seeds:** None observed.

5. **Evidence of reproduction:** Individuals of various size classes, probably indicating recruitment of younger age classes into the population.

6. **Evidence of expansion/contraction:** Population impacted by cattle concentration along the fence.

o. Crane Gulch (021)

1. **Area:** 1 acre.

2. **Number and size of plants:** Approximately 40 individuals of various size classes in two subpopulations in 1989.

3. **Density:** Very widely scattered.

4. **Presence of dispersed seeds:** None observed.

5. **Evidence of reproduction:** Individuals of various size classes, probably indicating recruitment of younger age classes into the population.

6. **Evidence of expansion/contraction:** No evidence.

p. Bogus Basin Road (022)

1. **Area:** 1 acre.

2. **Number and size of plants:** About 16 individuals in 1988.

3. **Density:** Unknown.

4. **Presence of dispersed seeds:** Unknown.

5. **Evidence of reproduction:** Unknown.

6. **Evidence of expansion/contraction:** Unknown.

q. Mann-Weiser Divide (023)

1. **Area:** 70 acres.

2. **Number and size of plants:** Over 2,000 individuals in various size classes in 1989.

3. **Density:** Moderately to widely scattered.

4. **Presence of dispersed seeds:** None observed.

5. **Evidence of reproduction:** Individuals of various size classes, probably indicating recruitment of younger age classes

into the population.

6. Evidence of expansion/contraction: No evidence.

p. Central Park (025)

1. Area: Less than 2 acres.

2. Number and size of plants: Nineteen individuals of various size classes in 1989.

3. Density: Widely scattered.

4. Presence of dispersed seeds: None observed.

5. Evidence of reproduction: Individuals of various size classes, probably indicating recruitment of younger age classes into the population.

6. Evidence of expansion/contraction: The upper part of population was probably covered with fill from housing development on ridge.

C. Phenology.

1. Patterns: On the average, green-up begins in early March, with flowering taking place in April and early May, depending on the late winter and early spring weather. It is expected that fruit maturation takes place in June, the plant becoming senescent shortly thereafter.

2. Relation to climate and microclimate: The weather patterns in late winter and early spring will affect the timing of green-up and first growth, which in turn will affect the timing of the various phenological stages.

D. Reproductive ecology.

1. Type of reproduction: Mulford's milkvetch does not reproduce vegetatively; new individuals arise from seeds.

2. Pollination.

a. Mechanisms: The specific pollination mechanism for Mulford's milkvetch is not known, but is probably either flying insects or self-pollination.

b. Specific known pollinators: Unknown.

c. Other suspected pollinators: None.

d. Vulnerability of pollinators: If insects are the primary pollinator of Mulford's milkvetch, they are vulnerable to insecticide spraying. Although insecticide spraying may not take place directly in Mulford's milkvetch populations, wholesale spraying of southern Idaho rangelands for grasshoppers may have a detrimental effect. Livestock grazing, which takes place in some populations of Mulford's milkvetch, has been shown to have a detrimental effect on pollinators of a rare *Astragalus* in California (Sugden 1985).

3. Seed dispersal.

a. General mechanisms: The pod of Mulford's milkvetch remains

permanently attached to the receptacle, and the thickened pedicel supporting it remains as firmly attached to the raceme-axis; the whole fruit may persist on the withered stems into the winter, only to disintegrate by gradual weathering. This type of pod is termed emmenoloboid. Dehiscence of the pod is apical and downward through the ventral suture. The walls of the septum also separate with age (Barneby 1964).

- b. **Specific agents:** Details unknown, but probably gravity and wind.
- c. **Vulnerability of dispersal agents and mechanisms:** Probably not very vulnerable.
- d. **Dispersal patterns:** Unknown.

4. Seed biology.

- a. **Amount and variation of seed production:** Details unknown. Pods produce 11 to 16 ovules (Barneby 1964). It is not known how many of these become viable seeds and what factors affect maturation.
- b. **Seed viability and longevity:** Details for Mulford's milkvetch unknown, but seeds of many Astragali of desert and steppe regions retain viability for many years. Pavlik and Barbour (1988) found that seeds of Astragalus lentiginosus var. micans, a rare taxon endemic to the Eureka Dunes, California, had 60 percent viability after eight years. Barneby (1964) states that seeds of some desert Astragali retain their viability for 30 to 40 years or more, germinating readily if thoroughly soaked.
- c. **Dormancy requirements:** Details for Mulford's milkvetch unknown, but experimental greenhouse studies by Pavlik and Barbour (1988) found that Astragalus lentiginosus var. micans retained 60 percent viability after eight years, with seed stored dry, dark, and at room temperature.
- d. **Germination requirement:** Unknown.
- e. **Percent germination:** Unknown.

5. Seedling ecology: Unknown.

- 6. **Survival and mortality:** Details unknown, but presence of all size classes at most extant populations may indicate that there is good representation of the various age classes. In other words, seedling recruitment into the larger populations may be adequate for long-term viability.

- 7. **Overall assessment of reproductive success:** It appears that at least in some populations, reproductive potential is good. This statement is only applicable to those population of medium to large size (>200 individuals).

8. Population ecology of the taxon.

- A. **General summary:** Mulford's milkvetch occurs on southerly-facing slopes in shrub-steppe communities. Vegetative cover in populations is generally low, with considerable bare ground at some sites. All populations,

except possibly two are subjected to various levels of disturbance by ORVs, cattle grazing/trampling, and mining of substrate.

B. Positive and neutral interactions: None known.

C. Negative interactions.

1. Herbivores, predators, pests, parasites and diseases: Mulford's milkvetch has been observed to be palatable to cattle. No other herbivores and predators are known.

2. Competition.

a. Intraspecific: Probably minimal, given the relatively wide spacing of individuals in most populations.

b. Interspecific: Also probably minimal due to the open nature of of the communities in which Mulford's milkvetch is found. It does not appear to inhabit adjacent areas that are heavily infested with Bromus tectorum.

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

D. Hybridization.

1. Naturally occurring: None known. Mulford's milkvetch is a clearly marked taxon that is allopatric with closest relatives (Barneby 1964; 1980).

2. Artificially induced: None known.

3. Potential in cultivation: Not known.

E. Other factors of population ecology: None known.

9. Current land ownership and management responsibility.

A. General nature of ownership: A majority of Mulford's milkvetch populations in Idaho (at least 12) are on private land, followed by six on Boise District, Bureau of Land Management (BLM)-administered land and two populations on land managed by Boise City Parks.

B. Specific landowners (Idaho): Following are the land owners/managers of extant Mulford's milkvetch populations in Idaho.

Trail Family Ranch (003)	Private
Camelsback Park (004)	City of Boise
Rebecca Sand Hill (008)	BLM, Cascade Resource Area
Crestline Drive (009)	Private
Boise Foothills (010)	Private
Resseguie Street East (011)	Private
Old Military Reserve (012)	City of Boise
Mud Flat Oolite pACEC (014)	BLM, Bruneau Resource Area
Freestone Creek (015)	Private
Sagebrush Hill South (016)	BLM, Cascade Resource Area, and possibly private
Rebecca Sand Hill N (017)	BLM, Cascade Resource Area
Stewart Gulch (018)	Private

Boise Hills Village (019)	Private
Sagebrush Hill North (020)	Private or BLM, Cascade Resource Area
Crane Gulch (021)	Private
Bogus Basin Road (022)	Private
Mann-Weiser Divide (023)	Private and/or BLM, Cascade Resource Area
Central Park (025)	Private

C. Management responsibility: Same as ownership given above.

D. Easements, conservation restrictions, etc.: Unknown, but probably none on private land.

10. Management practices and experience.

A. Habitat management.

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

a. This taxon: All known Mulford's milkvetch populations have been subject to cattle grazing within the last 130 years. More recently, disturbance by ORVs, residential development, cattle/grazing and trampling, and mining of substrate (sand and limestone) have threatened some populations. The extent to which these disturbances have affected Mulford's milkvetch populations is unknown, but may be significant given the relative fragility of communities in which it is found. The Trail Family Ranch (003) and Rebecca Sand Hill RNA (008) populations are the only populations currently protected in Idaho.

b. Related taxa: Not applicable.

c. Other ecologically similar taxa: Not applicable.

2. Performance under changed conditions: No population of Mulford's milkvetch has been followed for a period of time greater than four years. Most of the populations have only been discovered since 1980. The Grand View Southeast (006) population first collected in 1946, is the only one considered extirpated, apparently succumbing to commercial and/or residential development. Several other populations from Owyhee County, having vague location information, have not been relocated. This includes the Con Shea Basin (013) population that was collected in 1980, and the Prominent Knoll (005) population, first collected in 1971, and the focus of numerous searches in the 1980s (Rosentreter 1986). No obvious habitat destruction appears to have taken place at these sites recently and the absence of Mulford's milkvetch is a mystery.

Caicco made detailed population counts at four Ada County populations [Crestline Drive (009), Old Military Reserve (012), Freestone Creek (015), Boise Hills Village (019)] in 1985. Population counts in 1989 were similar to Caicco's at three of the four populations. The exception was the Old Military Reserve population, estimated to be approximately 125 individuals in 1985; I counted 38 in April 1989. Although no major habitat destruction had taken place between the two counts, a fire burned through the population in 1987. Disturbance regimes were

unchanged at the other three populations. Long-term trend data are desperately needed on the other populations, especially those where human-caused disturbance is high.

3. Current management policies and actions: As stated above only two populations are currently being protected: the Trail Family Ranch (003) population is voluntarily being protected by the landowner and the Rebecca Sand Hill RNA (008) population is currently within the Rebecca Sand Hill Research Natural Area, so designated by the BLM in 1987. No management plan has been prepared for the RNA, so it is unknown at what level the RNA is being protected from disturbances such as mining, ORVs and cattle grazing, which take place on adjacent lands. The Mud Flat Oolite (014) population is included within the proposed Mud Flat Oolite Area of Critical Environmental Concern (ACEC). To date, the Bruneau Resource Area of the Boise District BLM has not considered any special protection for this area, even though seven rare plant taxa, including two candidates, occur on the site. It is currently threatened by mining. The remaining populations are all threatened by numerous and varied disturbances, including ORVs, mining, residential development, and cattle grazing and trampling.

4. Future land use: Future development in the Boise foothills will almost certainly continue and possibly intensify, and, therefore, continue to threaten a majority of populations occurring there.

B. Cultivation.

1. Controlled propagation techniques: None known.

2. Ease of transplanting: Not known.

3. Pertinent horticultural knowledge: None known.

4. Status and location of presently cultivated material: None known.

11. Evidence of threats to survival.

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

1. Past threats: As stated in previous sections, collective impacts from mining, ORVs, residential and agricultural development, and livestock grazing and trampling have taken place in virtually all known populations of Mulford's milkvetch in Idaho.

Habitat disturbance due to livestock grazing has taken place in all populations over the last century. ORV disturbance, a more recent threat, has taken place in localized areas throughout the range of Mulford's milkvetch in Idaho. Mining also is localized but occurs in all three of the major centers of distribution. Residential development has certainly destroyed habitat in Ada County and near Grand View in Owyhee County. Agricultural development has had impacts in the Weiser and Owyhee County areas.

2. **Existing threats:** With the exception of possibly two populations, all the threats listed above collectively continue to threaten all populations.
3. **Potential threats:** All threats listed above are expected to continue, and in some cases intensify.

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

1. **Past threats:** Many populations in the Boise foothills are extremely small (<50 individuals). Scientific and educational collections from these populations over the past decade probably have had detrimental effects on such small populations [e.g., Camelsback Park (004), Boise Foothills (010), Old Military Reserve (012), Boise Hills Village (019), and Bogus Basin Road (022)]. Given the paucity of individuals known to occur in Owyhee County, collecting in these populations may also have had detrimental effects.
2. **Existing threats:** Since enough specimens exist in regional and national herbaria for scientific study (see section III.17.B), it is no longer necessary to collect specimens from small populations. Future sightings should be recorded on observation forms and submitted to the Idaho Natural Heritage Program for permanent recordation in its data base.
3. **Potential threats:** See above.

C. Disease, predation, or grazing.

1. **Past threats:** Cattle have been observed to graze on Mulford's milkvetch. Several individuals at Sagebrush Hill South (016) had been grazed by ungulates in April 1989, presumably by cattle, which occupied the pasture at the time. It is not known whether sheep or horses, which grazed the area in high numbers early this century, feed on it.

Individuals at several Ada County and Weiser area populations were observed to have their leaflets eaten in the early stages of growth, presumably by an insect.

2. **Existing threats:** Cattle continue to graze many populations.
3. **Potential threats:** Same as above.

D. Inadequacy of existing regulatory mechanisms.

1. **Past threats:** See below.
2. **Existing threats:** Since most populations of Mulford's milkvetch in Idaho occur on private land, there is obviously a lack of regulatory mechanisms to prevent current and future loss of habitat. This problem is especially acute in the Boise foothills where residential development is encroaching on Mulford's milkvetch habitat virtually everywhere. It is expected to continue.

The only known extant population in Owyhee County occurs, along

with six other rare plants, on a unique outcrop of oolitic limestone. Although this area has been recommended for protection by several individuals and organizations since 1980, the BLM has not acted on the recommendations, largely due to conflicts with mining. The 1872 Mining Law is often cited as the reason, due to its precedence over all other land-management regulations and legislation.

3. **Potential threats:** See 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 of vigor, trends and status:** The current status of Mulford's milkvetch in Idaho is as follows:

- o One historical record is considered extinct.
- o Six historical collections, some with vague location information, could not be relocated during April 1988. Although some of these may be extirpated, further searches may relocate others.
- o Eighteen populations are known extant, occurring in three centers of distribution: Boise foothills, Weiser area, and Owyhee County. Most of the eleven populations in the Boise foothills are small, ranging in size from seven to 200 individuals. One Boise foothill population has several hundred individuals. Only one extant population could be relocated in Owyhee County; all extant and historical populations for which population data are available indicate that the Owyhee County populations are/were all small, less than 100 individuals. The Weiser area is the stronghold for the species in Idaho, with most of the six populations having several hundred to over 2,000 individuals.

Collective habitat destruction by mining, ORV activity, residential and agricultural development, and livestock grazing and trampling have taken place in virtually all known populations of Mulford's milkvetch in Idaho. Habitat disturbance due to livestock grazing has taken place in all populations over the last century. ORV disturbance, a more recent threat, has taken place in localized areas throughout the range of Mulford's milkvetch in Idaho. Mining also is localized but occurs in all three of the major centers of distribution. Residential development has certainly destroyed habitat in Ada County and near Grand View in Owyhee County. Agricultural development has had impacts in the Weiser and Owyhee County areas.

The impacts enumerated above are especially acute in the Owyhee County and Boise foothill areas, where the long-term viability of most

populations is in jeopardy.

While it is likely that at least a few new populations of Mulford's milkvetch will be found in Idaho, the threats to its habitat are great, and probably will accelerate.

13. Recommendations for listing or status change.

A. Recommendation to U.S. Fish and Wildlife Service: It is recommended that Mulford's milkvetch remain a category 2 candidate until the conservation status of Oregon populations can be determined. However, based on the data for Idaho, summarized in this report, and observations made in Oregon, it appears that listing as Threatened may be warranted. A listing priority of 7 (high magnitude threat with non-imminent immediacy) seems appropriate at present.

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

1. Bureau of Land Management: Mulford's milkvetch is currently on the Idaho BLM Sensitive Plant Species List as a Threatened Plant. No status change is recommended at this time.

As part of a comprehensive protection strategy for the species, the BLM should develop a Conservation Agreement with the U.S. Fish and Wildlife Service. In the agreement, the largest populations in the Weiser and Owyhee County areas (no known populations of Mulford's milkvetch occur on BLM land in the Boise foothills) should be permanently protected. Populations of moderate size could be managed within a multiple use framework, with at least some special consideration given to their maintenance. The smallest populations could be sacrificed, if necessary, if there is some assurance that the best populations are being protected.

Preparation of a management plan for Rebecca Sand Hill RNA is needed to assure long-term maintenance of the population of Mulford's milkvetch there. The largest populations known in Idaho fall just to the north of the established RNA on BLM land; the RNA could be enlarged to include these populations. The BLM should also vigorously pursue the protection of the Mud Flat Oolite population by establishing the long-proposed ACEC; this is the only known extant population of Mulford's milkvetch in Owyhee County.

Following the example of Vale District BLM in Oregon, a monitoring program should be established to determine population trends. The only BLM-protected population in Rebecca Sand Hill RNA is the obvious choice to start this program. Consult with the Vale District Office on methodology, so that results can be compared reasonably well.

I will recommend to the Idaho Field Office of The Nature Conservancy that all high quality populations occurring on private land are worthy of acquisition. I will also recommend that they cooperate with the BLM, if needed, to help facilitate the protection of any populations occurring on private property adjacent to BLM land [e.g., Mann-Weiser Divide (023)].

C. Other status recommendations.

- 1. Counties and local areas:** The only known Boise foothill populations to occur on public land are Camelsback Park (004) and Old Military Reserve (012), both managed by Boise City Parks. A Conservation Agreement between Boise and the U.S. Fish and Wildlife Service is needed to assure that these populations are taken into account when planning land management activities in the parks.

Any Conservation Agreement arrived at will hopefully establish a monitoring program to determine population trends of these two populations.

- 2. State:** Mulford's milkvetch is currently listed as "critically imperiled in Idaho" (state rank = S1) by the Idaho Natural Heritage Program. No status change is recommended.

- 3. Other Nations:** No recommendation.

- 4. International:** No recommendation.

- 14. Recommended critical habitat:** The complete status of Mulford's milkvetch is not yet known in the Oregon portion of its range. Thus, critical habitat is not being recommended at this time.

15. Conservation/recovery recommendations.

A. General conservation recommendations.

- 1. Recommendations regarding present or anticipated activities:** Habitat destruction represents the greatest threat to Mulford's milkvetch. This activity is not regulated on private land. The BLM, therefore, must limit as much habitat destruction as possible, especially in the largest (Sagebrush Hill and Rebecca Sand Hill areas) or genetically important (i.e., Mud Flat Oolite, the only known extant in Owyhee County) populations.

- 2. Areas recommended for protection:** On BLM-administered lands, the largest and most genetically important populations should be protected: Mud Flat Oolite pACEC (014), Sagebrush Hill South (016), Rebecca Sand Hill North (017), and Mann-Weiser Divide (023). Both Boise City Parks populations should be protected to the greatest extent possible. Although both are small and their inherent long-term prospects may not be good, they represent the only known publicly-managed populations in the Boise foothills.

The highest quality populations in the Boise foothills [Crestline Drive (009) and Stewart Gulch (018)] should be protected by The Nature Conservancy.

- 3. Habitat management recommendations:** Habitat destruction is the ultimate threat and should be curtailed wherever possible. No regulatory mechanisms are available to enforce this on private land, but they do exist on publicly-administered land. The effect of cattle grazing on Mulford's milkvetch needs to be determined. Trampling of its unstable habitat and grazing of plants are known to occur. A monitoring program should be established to determine the effects on population trends.

4. Publicity sensitivity: No deleterious effects are anticipated.

5. Other recommendations: None.

B. Monitoring activities and further studies recommended: Monitoring programs should be established by both the BLM and Boise City Parks to determine population trends.

16. Interested parties:

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III. Information Sources.

17. Sources of information.

A. Publications.

1. **References cited in report:** See Appendix 1.

2. **Other pertinent publications.**

a. **Technical:** None.

b. **Popular:** None.

B. Herbaria consulted: Specimens of Mulford's milkvetch from Idaho are known to be deposited in the New York Botanical Garden (NY), Claremont College (POM, RSA), Utah State University (UTC), Idaho State University (IDS), University of Idaho ((ID), University of Washington (WTU), Washington State University (WS), College of Idaho (CIC), Boise State University (SRP), California Academy of Sciences (CAS), Missouri Botanical Garden (MO), and Brigham Young University (BYU). Following is a list of known herbarium specimens, indexed by population:

001 - Jones 6239 (NY, POM, WS); 6240 and 6241 (WTU)
002 - Ripley and Barneby 6134 (CAS, IDS, NY, RSA, UTC)
003 - M. & G. Ownbey 2764 (WS, WTU)
004 - Chapman 35 (SRP)
005 - N. & P. Holmgren 4946 (NY, UTC, WTU)
006 - Maguire and Holmgren 26227 (UTC, NY)
007 - Christ 9584 (NY)
008 - Rosentreter 3376 (CIC)
 Bolin 12 (SRP)
 Mooers 727 (SRP); 808 (CIC)
009 - Ertter 4086 (CIC)
010 - Ertter & Strachan 3226 (CIC, NY)
012 - Christ and Ward 6989 (ID, NY)
 Mulford s.n. (MO, NY) Type
 Jones s.n. (NY)
 Ertter 42/2 (CIC)
 Rosentreter 3614 (CIC)
013 - Packard and Ralston 80-24 (WTU, CIC)
016 - Rosentreter 3372 (CIC)
017 - Mooers 739 (CIC)
018 - Rosentreter 4254 (CIC?)
019 - Rosentreter 3426 (CIC)
020 - D. Atwood & R. Rosentreter 12040 (BYU)
022 - DeBolt 892 (CIC)
023 - Mooers 816 (CIC)

C. Fieldwork: Over the past eight years, field workers from the College of Idaho, Boise District Office and Idaho State Office of the BLM, and the Idaho Natural Heritage Program have expended considerable effort to locate populations of Mulford's milkvetch in Idaho. Contributions of the group have been summarized in this report.

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E. Other information sources: None known.

18. Summary of materials on file: Color slides, field forms, maps and all published and unpublished references pertaining to Mulford's milkvetch in Idaho are on file at the Idaho Natural Heritage Program office.

IV. Authorship.

19. Initial authorship:

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20. Maintenance of status report: The Idaho Natural Heritage Program will maintain current information and update the status report as needed. Should Mulford's milkvetch be listed as an endangered or threatened species by the U.S. Fish and Wildlife Service, the Service, through its Boise Field Office, should maintain the primary file on information, encourage others to provide new information, and distribute new findings, as received, to the interested parties (section II.16.).

V. New Information.

21. Record of revisions: Not applicable.

APPENDIX 1.

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APPENDIX 2.

Line drawing of Astragalus mulfordiae.
(Reproduced from Hitchcock 1961)

APPENDIX 3.

Slides of Astragalus mulfordiae and habitat in Idaho.

Slide 1. Close-up view of inflorescence.

Slide 2. Close-up view of inflorescence and leaves.

Slide 3. View of whole plant from Old Military Reserve 012 population.

Slide 4. Habitat for Astragalus mulfordiae at Rebecca Sand Hill North 017 population. Note open community on unconsolidated sandy substrate dominated by Oryzopsis hymenoides.

Slide 5. Overview of Rebecca Sand Hills North 017 population. Astragalus mulfordiae habitat occurs on the light-colored, horizontal band of open, sandy substrate immediately below the crest of the ridge.

Slide 6. Astragalus mulfordiae at Boise Hills Village 019 population. Note plant in foreground on edge of ORV trail, with new residential development taking place in the background.

Slide 7. Overview of Boise Hills Village 019 population. Population occurs on lower ridgeline above sandstone bluffs in upper right of photograph.

Slide 8. Overview of Resseguie Street 011 population. Twelve Astragalus mulfordiae plants occur on hillside between the two houses.

Slide 9. For Sale sign on property containing Resseguie Street 011 population.

Slide 10. Portion of Old Military Reserve 012 population occurs to the left of this active gully.

Slide 11. Overview of Camelsback Park 004 population. Astragalus mulfordiae occurs in localized areas on hillside where sandy-loam substrates are exposed.

APPENDIX 4.

Maps of Astragalus mulfordiae distribution in Idaho.

Overview

Map 1. Overview of the distribution of extant, extirpated, and historical populations in Idaho (note: each dot may represent more than one population).

Extant populations

Map 2. Trail Family Ranch (003) population (portion of 1951 Weiser South 7.5' USGS quadrangle).

Map 3. Camelsback Park (004), Crestline Drive (009), Boise Foothills (010), Resseguie Street East (011), Old Military Reserve (012), Freestone Creek (015), Crane Gulch (021), Bogus Basin Road (022), and Central Park (025) populations (portion of 1972 Boise North 7.5' USGS quadrangle).

Map 4. Rebecca Sand Hill RNA (008) population (portion of 1952 Weiser Cove 7.5' USGS quadrangle).

Map 5. Mud Flat Oolite pACEC population (portion of 1947 Chalk Hills 7.5' USGS quadrangle).

Map 6. Sagebrush Hill South (016) population (portion of 1952 Weiser Cove 7.5' USGS quadrangle).

Map 7. Rebecca Sand Hill N (017) and Mann-Weiser Divide (023) populations (portion of 1987 Provisional Edition Mann Creek SE 7.5' USGS quadrangle).

Map 8. Stewart Gulch (018) population (portion of 1972 Boise North 7.5' USGS quadrangle).

Map 9. Sagebrush Hill North (020) population (portion of 1974 Mann Creek SW 7.5' USGS Orthophoto quadrangle).

APPENDIX 5.

Occurrence records for Astragalus mulfordiae populations in Idaho.

- Page 1. Record for Weiser North population (001).
- Page 2. Record for Crystal population (002).
- Page 3. Record for Trail Family Ranch population (003).
- Page 4. Record for Camelsback Park population (004).
- Page 5. Record for Prominent Knoll population (005).
- Page 6. Record for Grand View Southeast population (006).
- Page 7. Record for Grand View Northeast population (007).
- Page 8. Record for Rebecca Sand Hill population (008).
- Page 9. Record for Crestline Drive population (009).
- Page 10. Record for Boise Foothills population (010).
- Page 11. Record for Resseguie Street East population (011).
- Page 12. Record for Old Military Reserve population (012).
- Page 13. Record for Con Shea Basin population (013).
- Page 14. Record for Mud Flat Oolite pACEC population (014).
- Page 15. Record for Freestone Creek population (015).
- Page 16. Record for Sagebrush Hill South population (016).
- Page 17. Record for Rebecca Sand Hill North population (017).
- Page 18. Record for Stewart Gulch population (018).
- Page 19. Record for Boise Hill Village population (019).
- Page 20. Record for Sagebrush Hill North population (020).
- Page 21. Record for Crane Gulch population (021).
- Page 22. Record for Bogus Basin Road population (022).
- Page 23. Record for Mann-Weiser Divide population (023).
- Page 24. Record for Hemingway Butte population (024)
- Page 25. Record for Central Park population (025).