THE STATUS AND DISTRIBUTION OF BENT-FLOWERED MILKVETCH (*ASTRAGALUS VEXILLIFLEXUS* VAR. *VEXILLIFLEXUS*) IN IDAHO

by

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ABSTRACT

Astragalus vexilliflexus var. *vexilliflexus* (bent-flowered milkvetch) was previously known from along the eastern Rocky Mountain front and northern Great Plains. Initially thought to be var. *A. vexilliflexus* var. *nubilus*, a federal candidate known only from the White Cloud Peaks of south-central Idaho, populations of var. *vexilliflexus* were discovered near Stibnite in 1992, approximately 65 miles north of the White Clouds. Searches for bent-flowered milkvetch between 1992 and 1994 revealed the presence of four populations in Idaho. Two populations on the Payette National, each containing approximately 1000 plants are entirely within proposed mining pits and will be destroyed if the project is approved. Another population on private land nearby consists of between 500-1000 plants and has had considerable habitat destroyed by several mining access roads that traverse the site. One small population, consisting of approximately 200 individuals is undisturbed in the Frank Church-River of No Return Wilderness north of Monumental Summit.

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INTRODUCTION

The National Forest Management Act and Forest Service policy require that Forest Service land be managed to maintain populations of all existing native animal and plant species at or above the minimum viable population level. A minimum viable population consists of the number of individuals, adequately distributed throughout their range, necessary to perpetuate the existence of the species in natural, genetically stable, self-sustaining populations.

The Forest Service, along with other Federal and State agencies, has recognized the need for special planning considerations in order to protect the flora and fauna on the lands in public ownership. Species recognized by the Forest Service as needing such considerations are those that (1) are designated under the Endangered Species Act as endangered or threatened, (2) are under consideration for such designation, or (3) appear on a regional Forest Service sensitive species list.

In 1992, Alma Hanson, Forest Botanist for the Payette National Forest, discovered a high-elevation population of *Astragalus* along a mining road in the vicinity of Stibnite. She tentatively identified it as *A. vexilliflexus*, but was unsure of the infraspecific taxon. The species includes two varieties, var. *vexilliflexus*, known from the northern Great Plains and adjacent eastern Rocky Mountain front, and var. *nubilus*, a narrow endemic from the east slope of the White Cloud Peaks in central Idaho (Moseley and Mancuso 1994). The Conservation Data Center (CDC) sent material collected in 1992 to Dr. Stanley Welsh, Brigham Young University. He tentatively determined that it was *A. vexilliflexus* var. *vexilliflexus*, but stated he needed more material, especially fruits, to feel comfortable with the identification. Alma Hanson collected fruiting material in 1993, and Dr. Welsh's determination was that the population was actually var. *nubilus*.

Astragalus vexilliflexus var. *nubilus* (White Cloud milkvetch) is a federal candidate for listing under the Endangered Species Act (U.S. Fish and Wildlife Service 1993) and a Forest Service Sensitive Species (Spahr et al. 1991). Because of its extreme rarity, the Conservation Data Center conducted a status inventory for White Cloud milkvetch on the Payette National Forest in 1994. The primary objectives of this investigation are as follows:

1) Survey and delineate the known population of White Cloud Milkvetch in the Salmon River Mountains and search suitable habitat for additional populations.

2) Characterize habitat conditions for the population(s).

3) Assess population data on, and threats to the exiting populations and make management recommendations to the Forest based on these assessments.

RESULTS

Upon visiting the known population of *Astragalus vexilliflexus* above Fern Mine near Stibnite during early August 1994, I immediately recognized that this plant was **NOT** var. *nubilus*. This is based on eight years of experience observing var. *nubilus* during the course of floristic and status survey field projects in the White Cloud Peaks and Boulder Mountains (Mancuso and Moseley 1990; Moseley and Mancuso 1994). For reasons outlined in the following section, Michael Mancuso and I have identified the populations of *A. vexilliflexus* in the Salmon River Mountains as var. *vexilliflexus*. Specimens from all known Idaho populations have been sent to the New York Botanical Garden for confirmation by Rupert Barneby, the renowned expert in the genus.

I conducted extensive searches of ridgeline habitats along the divide between the South and Middle Forks of the Salmon River and found only one additional, very small population near Monumental Summit. Following is the status of our knowledge of *Astragalus vexilliflexus* var. *vexilliflexus* (bent-flowered milkvetch) in Idaho, including information on taxonomy, habitat, distribution, conservation status, and management recommendations. Sections containing line drawings, distribution maps, maps of areas searched, population occurrence records, and slides of bent-flowered milkvetch and its habitat are appended to the end of the report.

Astragalus vexilliflexus Sheldon var. *vexilliflexus*

TAXONOMY

Full bibliographic citation: Sheldon, E.P. 1894. On the nomenclature of some North American species of *Astragalus*. Minnesota Botanical Studies 1:19-24.

Type specimen: "Among rocks in the more elevated regions of the Rocky Mountains, Drummond" (Barneby 1964).

Pertinent synonym(s): *A. pauciflorus* Hook., *A. amphidoxus* Blank.

Common name: Bent-flowered milkvetch.

Size of genus: A vast genus of perhaps 2000 species, most highly developed in arid continental, desert, and Mediterranean climates, circumboreal in dispersal, most numerous in central Asia, Iran and Turkey, in western North America, and in the Andes of South America (Barneby 1964).

Family name: Fabaceae; Leguminosae

Common name for family: Pea.

History of knowledge of taxon in Idaho: Discussed previously in Introduction and Results.
In 1992, Alma Hanson, Forest Botanist for the Payette National Forest, discovered a population of bent-flowered milkvetch along a mining access road above the Fern Mine, in the Salmon River Mountains near Stibnite. After some confusion as to its identity, we recently determined that it was not the narrow endemic *Astragalus vexilliflexus* var. *nubilus,* but its conspecific relative var. *vexilliflexus*. Based on field searches conducted between 1992 and 1994 by Alma Hanson, Carolyn Wright, and Bob Moseley, only four populations are known, all in the vicinity of Monumental Summit.

Alternative taxonomic treatments: None.

LEGAL OR OTHER FORMAL STATUS

National:

U.S. Fish and Wildlife Service: None.

U.S. Forest Service: None.

Other current formal status recommendations: Because it is relatively widespread and secure globally, it is given a global (G) conservation rank of 4 (on a scale of 1 to 5) by the Association for Biodiversity Information (the International Association of Natural Heritage Programs and Conservation Data Centres).

State:

Idaho

Idaho Native Plant Society: Not currently included on the Idaho Native Plant Society's list of rare species in the state because of its recent discovery.

Conservation Data Center: Because it is extremely rare in Idaho, the Idaho Department of Fish and Game's Conservation Data Center (the Idaho node of the Association for Biodiversity Information) gives it a state (S) conservation rank of 1 (highest conservation concern).

Review of past status: None.

DESCRIPTION

General nontechnical description: Loosely matted in exposed places at higher altitudes, becoming diffusely tufted or bushy-branched in the lowlands, the stems truly prostrate, decumbent with ascending tips, the foliage varying from green and thinly pubescent to cinereous (most Idaho material) or rarely canescent; flowers variable in size but the petals nearly always pink-purple or clear lilac drying bluish, more rarely only lilac-tipped or -tinged, exceptionally whitish; pod either symmetrical or oblique in profile (5) 6-12 mm long (Barneby 1964).

Technical description: Low, slender, diffusely bushy-branched, low-tufted, or matted, with a thick, sometimes trunklike woody taproot and at length well-developed, suffruticulous caudex, thinly to quite densely strigulose, strigose-pilosulous, or rarely silky-villosulous with fine, straight or sinuous hairs up to 0.3-0.6(0.8) mm long, the herbage green, cinereous, or silvery-canescent, the leaflets often medially glabrescent or glabrous above; *stems* several or numerous, incurved-ascending, decumbent, or prostrate, 3-25(30) cm long, closely leafy, repeatedly branched or at least spurred at all the lower and middle nodes, sometimes throughout, exceptionally simple above the immediate base; *stipules* 2-5 mm long, dimorphic, those at the lowest nodes of the year's growth-cycle amplexicaul and connate into a brownish, firmly papery, truncate or bidentate sheath, the median and upper ones connate through half their length or less, sometimes free nearly to the base, with herbaceous, lance- or deltoid-acuminate free blades; *leaves* 1-5.5 cm long, shortly petioled or the uppermost subsessile, with (5)7-13 commonly crowded, elliptic or linear-elliptic, rarely lanceolate, oblanceolate, or narrowly obovate, flat, folded, or involute leaflets acute at both ends, rarely subobtuse and mucronulate distally, in age dorsally carinate by the prominent, pale midrib; *peduncles* 0.5-4 cm long, slender or filiform; *racemes* loosely 3-7(11)-flowered, the flowers at full anthesis spreading from ascending pedicels, the axis 0.5-3 cm long in fruit; *bracts* membranous, narrowly lance-acuminate, 1.5-3 mm long; *pedicels* filiform or nearly so, at anthesis 1.5-2.5 mm long, tardily disjointing with the calyx and pod; *bracteoles* 0, exceptionally 1 but minute; *calyx* 2.4-4.5 mm long, strigulose or rarely villosulous with white or sometimes partly black hairs, the disc 0.4-0.7 mm deep, the campanulate or turbinate-campanulate tube 1.4-2.2 mm long, 1.4-2 mm in diameter, the subulate, linear-subulate, or subsetaceous teeth (0.8)1-3 mm long; *petals* pink-purple with pale striate eye in the banner, the wing-tips sometimes paler or white, or all lilac, or all but the maculate keel-tip whitish with or without lilac veins in the banner; *banner* abruptly recurved through +/-90°, broadly ovate-cuneate, notched or emarginate, (4.3)5.2-9.3 mm long, 4-6 mm wide; *wings* (3.5)4.4-7.2 mm long, the claws (0.7)1.1-2.1 mm, incurved, obliquely obovate, very obtuse or obscurely emarginate blades of unequal width, the left one

broader that the other and concave, its upper margin folded over the keel, the right one plane or nearly so, (3.1)3.4-5.6 mm long, 1.5-2.8 mm wide; *keel* much shorter than the wings, (2.9)3.4-5.6 mm long, the claws (0.9)1.1-2.1 mm, the obliquely obovate blades abruptly incurved through 100-110° into the bluntly deltoid apex; *anthers* 0.3-0.4 mm long; *pod* loosely deflexed or declined, sessile or nearly so (the stipe, when present, vestigial and not over 0.3 mm long), the body variable in profile, elliptic, obovate-elliptic, rarely linear-oblong, 4.5-12 mm long 1.8-3.5 mm in diameter, nearly straight but either symmetric or oblique (either the dorsal or the ventral suture then convex and the opposite one nearly straight), commonly cuneate at base, either obtuse and apiculate or acuminate distally, strongly compressed, bicarinate by the slender but salient sutures, the lateral faces at first flat, becoming papery and stramineous, not inflexed; *ovules* (4)5-8(11); *seeds* olivaceous, dark brown, or black, smooth and somewhat lustrous, 1.8-2.7 mm long (Barneby 1964).

Local field characters: Unlike farther south in central Idaho (Brunsfeld 1981; Mancuso and Moseley 1990; Moseley and Mancuso 1994), there are few *Astragalus* at high elevations in the Salmon River Mountains. Although only *Astragalus alpinus* (alpine milkvetch) was observed to be sympatric with bent-flowered milkvetch, several other species may be encountered in later searches including , *A. kentrophyta* (thistle milkvetch), *A. miser* (weedy milkvetch), *A. platytropis* (broad-keeled milkvetch), and *A. whitneyi* (balloon milkvetch). All are widespread in south-central Idaho. Four of the five species can be readily distinguished via the following characteristics:

Alpine milkvetch - plants with widely spreading rootstocks and a more ascending and diffuse habit; calyx with black hairs.

Weedy milkvetch - plants generally with a more ascending and diffuse habit, leaflets relatively remote and more elongated flowering stems.

Broad-keeled milkvetch - differentiated by its disproportionally large and swollen, red-speckled or -mottled pod.

Balloon milkvetch - plants with a diffuse and somewhat ascending habit and inflated red or purple-mottled pods.

Bent-flowered milkvetch is most likely to be confused with thistle milkvetch. The following key, modified from Hitchcock and Cronquist (1973), should help distinguish the two species:

1a. Leaflets all continuous with the rachis, sharp pointed to spinose; racemes 1-3 flowered; flowers usually purplish . . . . . *Astragalus kentrophyta*

1b. Leaflets not continuous with the rachis, nor sharp pointed; racemes usually with more than 3 flowers; flowers also purplish .....*Astragalus vexilliflexus* var. *vexilliflexus*

Specimens of *A. vexilliflexus* var. *vexilliflexus* from the Salmon River Mountains of central Idaho have been confused with var. *nubilus*, although upon viewing the two taxa in the field, the differences are obvious. Below is a conspectus comparing several morphological features:

	vexilliflexus (Idaho material)	*nubilus*
herbage pubescence	appressed	silky-villosulous
inflorescence	extends beyond leaves	does not extend beyond foliage
flower color	purple	cream-yellow; few purple lines on banner
plant habit	strongly prostrate	weakly prostrate; leaves somewhat erect, although plant matted

Photos and line drawings: Reproductions of a line drawing of bent-flowered milkvetch by Jeanne Janish appears in Hitchcock (1961) and Hitchcock and Cronquist (1973) and Appendix 1. Photographs of its habit and habitat are in the slide collection of the Conservation Data Center, some of which appear in Appendix 5.

DISTRIBUTION

Global distribution: Bent-flowered milkvetch was previously known from along the Rocky Mountains, mostly east of the Continental Divide, from southern Alberta (Banff National Park) to southwestern Montana and western Wyoming, east to the Cypress Hills of southwestern Saskatchewan and the badlands of South Dakota (Hitchcock 1961; Barneby 1964). The Idaho populations represent a disjunction of approximately 125 miles southwest of the nearest populations in Beaverhead County, Montana. The populations lie approximately 65 miles north of the range of *Astragalus vexilliflexus* var. *nubilus* in the White Cloud Peaks (Moseley and Mancuso 1994).

Distribution in Idaho: It is known from four populations (treated as two occurrences in the CDC data base), covering a total of approximately 40 acres on ridges in the vicinity of Monumental Summit, which lies on the divide between the South and Middle Forks of the Salmon River. This area of the Salmon River Mountains is approximately 40 miles east of McCall and 11 miles east of Yellow Pine. See Appendix 2 for maps of the distribution of bent-flowered milkvetch in Idaho.

Precise occurrences in Idaho: There are only two known occurrences of this species in Idaho (see above section). Further data are provided in the Occurrence Records that appear in Appendix 3. Searches by Alma Hanson, Carolyn Wright (Greystone 1994), and myself, between 1992 and 1994, have elucidated the present distribution of bent-flowered milkvetch in Idaho. See Appendix 4 maps of areas I searched during August 1994. Further searches may reveal the existence of additonal populations in the future.

Historical sites: None.

Unverified/undocumented reports: None.

HABITAT

General habitat description: Throughout the rest of its range, bent-flowered milkvetch grows on "hills and rock slopes" (Dorn 1988), "barren clay bluffs, rocky knolls, and outcrops of shale or sandstone, ascending in open places to rocky slopes, crests, and talus in the mountains" (Barneby 1956; 1964), and "streambanks and open forest to sagebrush plains" (Hitchcock 1961).

The Idaho populations occur on exposed, subalpine ridgelines in *Pinus albicaulis - Abies lasiocarpa* parklands. At the Cinnabar Peak site (occurrence 001), it occurs on both northerly and southerly slopes up to 20% declivity. The vegetation is very open with low ground cover. Near Peak 8789 (002), bent-flowered milkvetch occurs on an exposed, rocky knob. Plants are growing in cracks in the highly fractured bedrock or in gravelly soil on ledges on relatively gentle slopes.

Geology and Soils: The area is mapped as Challis volcanics (Fisher et al. 1983), but the two sites differ considerably in the type of bedrock and derived soils. Site 001 appears to be a sandstone, possibly a calcareous sandstone. Consequently, the soils derived from this rock are very sandy. At the second site, 002, the bedrock is "typical" volcanic rock with gravelly, well-drained soils.

Associated species: *Pinus albicaulis, Abies lasiocarpa, Sitanion hystrix, Solidago multiradiata, Phlox diffusa, P. pulvinata, Draba sphaerocarpa, Cymopterus glaucus, Arenaria congesta, Haplopappus suffruticosus, Achillea millefolium, Linum lewisii, Arabis* sp., *Penstemon humilis, Castilleja applegatei, Chaenactis evermannii, Sedum lanceolatum, Gilia spicata, Linanthastrum nuttallii, Pedicularis contorta, Shepherdia canadensis, Antennaria umbrinella, Erigeron peregrinus, Astragalus alpinus, Trisetum spicatum, Erigeron compositus, Potentilla glandulosa, Saxifraga bronchialis, Poa secunda, Arenaria aculeata.*

Other rare plant species: None known.

POPULATION BIOLOGY

Phenology: Growth probably begins slightly before or soon after the snow melts in June or early July. Peak flowering occurs from late-June to mid-August, depending on the year. Fruits begin to mature soon afterward. The mature fruits appear to fall off the senescing branches during the fall and probably do not disperse far from the parent.

Population size and condition: Occurrence 001, near Cinnabar Peak, consists of three populations, each containing approximately 1,000 individuals and covering approximately 40 total acres. Occurrence 002 near Peak 8789 consist of approximately 200 individuals densely distributed in an 8 m x 5 m area. Both populations appear vigorous, each having a well distributed size (age?) class structure.

Reproductive Biology: Bent-flowered milkvetch reproduces by seed. Nothing is known about seed dispersal or viability; no pollinators were observed.

Biological Interactions: Unknown.

Competition: It appears that bent-flowered milkvetch is not a good competitor. As stated above, the

habitat occupied by bent-flowered milkvetch is very open, with considerable bare ground between plants. Newly open or disturbed habitat, such as road banks, appears to be readily invaded by the milkvetch.

Herbivory: None observed.

Land ownership: The eastern population of occurrence 001 appears to be entirely on private land, a patented mining claim within the Payette National Forest. The other two populations at 001 are on public land managed by the Payette National Forest, Krassel Ranger District. Occurrence 002 is also on the Payette National Forest.

Land use: The population near Peak 8789 (occurrence 002) is within the Frank Church-River of No Return Wilderness and is far removed from any ongoing human disturbance. No recreation trails come close to the population.

The eastern population of occurrence 001 is on private land and its habitat has been traversed by at least three mine access roads, in addition to a few miscellaneous bulldozer scraps. A high percentage of the habitat for this population was destroyed by this activity. If the newly-opened ground remains undisturbed, however, bent-flowered milkvetch appears to readily recolonize the new bare-soil habitat. The other two populations are also traversed by mining access roads.

ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

Threats to currently known populations: No apparent threats exist in and around the population near Peak 8789 (occurrence 002). Considerable habitat has been destroyed at the population above the Fern Mine (eastern population of occurrence 001), but apparently will remain relatively undisturbed int he near future (Greystone 1994). The other two populations at this occurrence are each entirely within proposed mining pits, the Doris K Pit (western population) and the Cinnamid Pit (middle population). If these pits are developed, they will destroy each of these populations (Greystone 1994).

Recommendations:

- Bent-flowered milkvetch is apparently secure globally. Because the U.S. Fish and Wildlife Service will not consider listing populations of globally secure plants, as they do for animals, no candidate status is recommended.

- As of 1994, Region 4 of the Forest Service no longer lists globally secure plants as Forest Service Sensitive Species, as it did before. Globally secure plants that are rare within a geographic area and have been identified as having local planning unit viability concerns are treated on "Forest Watch" lists in order to meet regulations and policies promulgated under the National Forest Management Act. I recommend that bent-flowered milkvetch be added to the Forest Watch list for the Payette National Forest.

- Due to the extreme rarity and isolation of the Idaho populations of bent-flowered milkvetch, they should be protected to the greatest degree possible. No habitat loss should be acceptable on public land.

- I will recommend the bent-flowered milkvetch be added to the Idaho Native Plant Society's Priority 1 category in their list of Idaho's rare flora at the annual Rare Plant Conference in February 1995. Priority 1 species include those that are in danger of becoming extirpated from Idaho in the foreseeable future if identifiable factors contributing to their decline continue to operate. These are species whose populations are present only at critically low levels and/or whose habitat has been degraded or depleted to a significant degree (Conservation Data Center 1994; Idaho Native Plant Society 1994).

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Appendix 1

Line drawings of *Astragalus vexilliflexus* var. *vexilliflexus*
(from Hitchcock 1961).

Appendix 2

The distribution of *Astragalus vexilliflexus* var. *vexilliflexus* in Idaho.

Map 1. State of Idaho map showing the location of the known populations of bent-flowered milkvetch.
Map 2. Location of occurrences 001 and 002 near Monumental Summit. Copy of 1973 USGS 7.5' Stibnite quadrangle.

Appendix 3

Occurrence records from the Conservation Data Center
for *Astragalus vexilliflexus* var. *vexilliflexus* in Idaho.
NOT INCLUDED IN CDC HOME PAGE VERSION OF THIS REPORT

Appendix 4

Maps of areas searched in the Salmon River Mountains
for *Astragalus vexilliflexus* var. *vexilliflexus* during 1994.

Map 1. Mt. Eldridge-Elk Summit-Wolf Fang Peak area; Pueblo Summit; Profile Gap-Coin Mountain-The Pinnacles area. Copy of 1989 Warren, 1:100,000-scale map published by the Idaho Transportation Department.
Map 2. Thunder Mountain-Lightning Peak area; ridges around Monumental Summit, including Cinnabar Peak-Pyramid Point-Murphy Peak-Red Peak-Red Ridge. Copy of 1989 Pistol Creek, 1:100,000-scale map published by the Idaho Transportation Department.
Map 3. Chilcoot Peak-Trapper Mountain; Pistol Creek Ridge-Artillery Dome. Copy of 1989 Pistol Creek, 1:100,000-scale map published by the Idaho Transportation Department.

Appendix 5

Slides of *Astragalus vexilliflexus* var. *vexilliflexus* and its habitat.

Slide 1. Close-up of flower and branch. Note purple flowers, cinereous (silver-hairy) nature of the foliage, and the inflorescence extending beyond the leaves.
Slide 2. Close-up of *Astragalus vexilliflexus* var. *nubilus* for comparison. Note yellow flowers that are submerged in the foliage and the greener color to the leaves due to the lack of a dense covering of hair.
Slide 3. Prostrate habit of *Astragalus vexilliflexus* var. *vexilliflexus*.
Slide 4. Habitat at occurrence 001, above the Fern Mine. Note open, sandy soil surface and road traversing habitat below.
Slide 5. Habitat at occurrence 002, a small rocky, ridgeline knob.