

FIELD INVESTIGATION OF ASTRAGALUS VEXILLIFLEXUS VAR. NUBILUS
(WHITE CLOUD MILKVETCH), A REGION 4 SENSITIVE SPECIES,
ON THE SAWTOOTH NATIONAL FOREST

by

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ABSTRACT

An inventory for Astragalus vexilliflexus var. nubilus (White Cloud milkvetch) was conducted on the Sawtooth National Forest by the Idaho Department of Fish and Game's Natural Heritage Program during August of 1990. The inventory was a cooperative Challenge Cost-share project between the Department and the Sawtooth National Forest.

White Cloud milkvetch is a narrow endemic to the White Cloud Peaks and Boulder Mountains of central Idaho, in Custer County. Populations are scattered along the ridge systems that slope generally west to east on the east side of the White Cloud crest. Additionally, one population from the Bowery Creek drainage of the Boulder Mountains is known. It is a high elevation species, found mostly on exposed, dry, rocky ridge crests or upper slopes that typically support a relatively sparse vegetation cover.

Prior to our 1990 survey, the species was known from three populations. Five new populations were discovered during the 1990 field investigation. Together, these eight populations support approximately 5,700 plants and cover an area less than 40 acres. Both current and potential threats have been identified at several populations.

Currently, White Cloud milkvetch is a federal Category 2 candidate species and a Region 4 Sensitive Species for the Sawtooth NF. All known populations are found on Forest Service land.

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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.

Astragalus vexilliflexus var. nubilus (White Cloud milkvetch) is endemic to the White Cloud Peaks and Boulder Mountains of central Idaho, in Custer County. White Cloud milkvetch is a Category 2 candidate for federal listing (U.S. Fish and Wildlife Service 1990), and is a Forest Service Region 4 Sensitive Species for the Sawtooth National Forest (USDA Forest Service 1988). A field investigation of this species was conducted on the Sawtooth National Recreation Area and nearby Forest lands by the Idaho Department of Fish and Game's Natural Heritage Program through the Cooperative Challenge Cost-share Program.

The primary objectives of this investigation was as follows:

- 1) Survey known populations and search potential habitats for new populations of White Clouds milkvetch on the Sawtooth National Recreation Area and adjacent Forest lands.
- 2) Characterize habitat conditions for all populations found.
- 3) Assess population data on, and threats to existing populations and make management recommendations to the Forest based on these assessments.

RESULTS

During August 1990, botanists from the Heritage Program surveyed suitable-appearing habitats for White Cloud milkvetch along the eastern front of the White Cloud Mountains and west slope of the Boulder Mountains in the Sawtooth National Recreation Area (Sawtooth NRA) and the Challis NF. Two of the three previously known populations were revisited. Five new populations were found, all restricted to the same high, dry, mostly open and rocky ridge crest and upper slope habitats as the previously known populations.

Following is a detailed discussion of White Cloud milkvetch, including information on its taxonomy and identification, range and habitat, conservation status and recommendations to the Regional Forester, Sawtooth NRA, Challis NF and U.S. Fish and Wildlife Service, concerning its status in Idaho.

Astragalus vexilliflexus Sheld. var. nubilus Barneby

CURRENT STATUS USFS - Region 4 Sensitive Species (Sawtooth NF)
USFWS - C2
Idaho Native Plant Society - None
Heritage Rank - G4T1/S1

TAXONOMY

Family: Fabaceae [Leguminosae (Pea)]

Common Name: White Cloud milkvetch

Citation: American Midland Naturalist 55: 484. 1956.

Technical Description: Prostrate, densely tufted and intricately matted, taprooted perennial; herbage loosely silky-strigulose or villosulous with sinuous hairs up to (0.3) 0.5-0.8 mm long; leaves short petioled or subsessile with (5) 7-13 commonly crowded leaflets; calyx 3.1-3.8 mm long, the tube 1.5-1.8 mm, the teeth 1.3-2 mm long; petals ochroleucous with purplish keel; banner 5.2-6.2 mm long, 4-5 mm wide; wings 4.7-5.9 mm long, the claws 1.1-1.5 mm, the blades 2.5-2.8 mm long, 1.5-1.7 mm wide; pod subsymmetrically lenticular, 3.5-5 mm long (Barneby 1964; Hitchcock 1961).

Nontechnical Description: White Cloud milkvetch is a prostrate, taprooted, cushion-type perennial herb; the herbage has short hairs; the leaves are divided into (5) 7-13 leaflets; the flowers are small, mostly 5-8 mm long and yellowish in color except for the purplish keel, the flowering stem is not raised above the leaves, so that the flowers can be almost hidden by the foliage; the fruit is a membranous 'pea' pod approximately 7-11 mm long and 2.5-3 mm wide. See Appendix 1 for a line drawing and Appendix 5 for photographs of White Cloud milkvetch.

Distinguishing Features and Similar Species: The genus Astragalus is well represented throughout central Idaho, including several species which occur sympatrically with White Cloud milkvetch; they are Astragalus alpinus (alpine milkvetch), A. kentrophyta (thistle milkvetch), A. miser (weedy milkvetch), A. platytropis (broad-keeled milkvetch) and A. whitneyi (balloon milkvetch). All are more widespread than White Cloud milkvetch. Four of the five species can be readily distinguished via the following characteristics (Barneby 1964; Hitchcock 1961):

Alpine milkvetch - plants with widely spreading rootstocks, a more ascending and diffuse habit, and lilac-purplish flowers.

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

Broad-keeled milkvetch - its habit is similar to White Cloud milkvetch, but can be differentiated by its silvery-gray foliage, purplish flowers and a disproportionately large and swollen red-speckled or mottled pod.

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

White Cloud 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.

1. Leaflets all continuous with the rachis, sharp-pointed to spinose; raceme 1-3 flowered; flowers usually more purplish than White Cloud milkvetch.....Astragalus kentrophyta

1. Leaflets not continuous with the rachis, nor sharp-pointed; racemes usually more than 3 flowered; flowers mostly yellow..... Astragalus vexilliflexus var. nubilus

DISTRIBUTION

Range: White Cloud milkvetch is a narrow endemic known only from the White Cloud Peaks and Boulder Mountains in Custer County, Idaho. It is restricted to open, high elevation sites typically along ridge lines. Populations are scattered along the ridge systems that slope generally west to east on the east side of the White Cloud crest. Populations extend from Railroad Ridge south to approximately the ridge complexes of Germania Creek and West Pass Creek, west and east of the East Fork of the Salmon River respectively.

White Cloud milkvetch was not described until 1956, although it was first collected east of the Livingston Mine by R. Davis in 1938. Another collection was made east of Castle Peak in 1944 by Hitchcock and Mühlick. Dr. R. Taylor, during his 1980 vegetation reconnaissance (Taylor no date) work in the Sawtooth NRA, found some White Cloud milkvetch in the same general location as the 1944 collection. In 1986, D. Atwood and B. Moseley conducted a limited botanical survey and discovered one new population. Our 1990 survey was more specific in scope and thorough in extent than previous studies, resulting in the discovery of five new White Cloud milkvetch populations. We surveyed most of the suitable-appearing habitat east of the White Cloud crest. Additional potential habitat may exist west of the crest and the central and eastern portions of the Boulder Mountains, but it is unknown if White Cloud milkvetch occurs there.

All populations occupy a relatively small amount of area, most averaging approximately one acre in size. Usually, suitable-appearing habitat occurs adjacent to or near the populations, but is unoccupied. Such unoccupied areas are quite extensive in several cases. There is a wide variability in the number of individuals comprising a population, ranging from approximately two thousand, to less than ten.

Below is a summary of the eight known populations of White Cloud milkvetch (the number in parentheses refers to the occurrence number of this species in the Heritage Program data base). See Appendix 4 for the Heritage Program's element occurrence records for White Cloud milkvetch. These records provide additional detail on location, ownership and population data, among other things.

Railroad Ridge (001) - White Cloud Peaks, Railroad Ridge; elevation 8800-9400 feet; five subpopulations supporting a total of ca. 700 plants; discovered in 1990.

South of Bowery Creek (002) - White Cloud Peaks, along ridge complex between the East Fork Salmon River and Narrow Canyon; elevation 8800 feet; ca. 500 individuals; discovered in 1990.

Jim Creek (003) - White Cloud Peaks, north of Jim Creek elevation 9100 feet; ca. 500 plants; discovered in 1938, revisited in 1990.

Boulder Chain Lakes (004) - White Cloud Peaks, adjacent to trail SW of Frog Lake; elevation 8700 feet; fewer than ten plants found; discovered in 1986, not revisited in 1990.

Wickiup Creek Ridge (005) - White Cloud Peaks, ridge complex between upper Wickiup Creek and Little Boulder Creek; elevation 9400-9900 feet; more than 100 plants observed; discovered in 1944, revisited in 1990.

Germania Ridge (006) - White Cloud Peaks, ridge that forms divide between Wickiup and Germania Creeks; elevation 9100-9485 feet; comprised of three small subpopulations supporting a total of ca. 30 plants; discovered in 1990.

Red Ridge (007) - White Cloud Peaks, Red Ridge, between Little Boulder and Big Boulder Creeks; elevation 8400 feet; ca. 1500 plants; discovered in 1990.

Bowery Ridge (008) - White Cloud Peaks, ridge complex between Germania Creek and the East Fork Salmon River; elevation 8800-9200 feet; eight subpopulations supporting ca. 2000 plants; discovered in 1990.

See Appendix 2 for the mapped locations of known White Cloud milkvetch populations

and Appendix 3 for a list of all areas searched.

All populations occur on National Forest land. Part of one population (002) extends onto land administered by the Challis NF. All others are located on land administered by the Sawtooth National Recreation Area.

Habitat and Associated Species: White Cloud milkvetch is a high elevation species, occurring along ridge crests and upper slopes between 8400 and 9900 feet. It is not known to occur in the alpine zone, however. It is found on flat to steep slopes and all aspects, with southerly exposures more common. Except for part of one population located within a patch of whitebark pine where partial shading occurs, it was found only on open, generally exposed sites. These sites are generally rocky, dry and relatively sparsely vegetated. It is not found within adjacent areas characterized by greater vegetation cover. White Cloud milkvetch occurs predominantly on substrates of the Challis volcanics and related rocks (Fisher et al. 1983), and at one site on till of metamorphic and granitic origin. Substrate texture varies from fine to rocky, the latter predominating. It is commonly absent from similar-looking habitats near sites supporting the species.

White Cloud milkvetch occurs within Artemisia tridentata ssp. vaseyana/Agropyron spicatum, Artemisia tridentata ssp. vaseyana/Festuca idahoensis and Pinus albicaulis habitat types (Hironaka et al. 1983; Steele et al. 1981). As a component of an unclassified community with low species richness characteristic of the rocky, ridge crest sites, it was typically found near one of the above vegetation types. Common associates included Agropyron spicatum, Festuca idahoensis, Chrysothamnus viscidiflorus, Haplopappus acaulis, Lupinus argenteus, Astragalus kentrophyta, Phlox austromontanus, Bupleurum americanum and Carex rossii.

CONSERVATION STATUS

Conservation Status - Idaho: When White Cloud milkvetch was described in 1956, it was known from only two sites. It would be thirty years before any new populations were documented. White Cloud milkvetch was among the species recommended for threatened status when the original federal list was proposed after passage of the Endangered Species Act (Federal Register, July 1, 1975). In his evaluation of White Cloud milkvetch for the Idaho rare plant project of the Idaho Natural Areas Council, Steele (1977) recommended threatened status due to its very limited distribution. In 1981, he (Steele 1981) again recommended keeping the species as threatened with a note that it may prove not to be threatened if more thoroughly sought.

White Cloud milkvetch is currently a Category 2 candidate species (U.S. Fish and Wildlife Service 1990). Candidate 2 ranking includes taxa for which information now in possession of the U.S. Fish and Wildlife Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat are not currently available to support proposed rules. Further biological research and field study may be needed to ascertain their status (Moseley and Groves 1990).

White Cloud milkvetch is a Forest Service Region 4 Sensitive Species and is currently listed as a High Priority species for the Sawtooth NF (Forest Service 1988).

Since it is a federal candidate, White Cloud milkvetch is not included in a state-rare category by the Idaho Native Plant Society (1990).

The Idaho Natural Heritage Program ranks White Cloud milkvetch as G4T1/S1 [G4 = Astragalus vexilliflexus is apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery; T1 = var. nubilus is critically imperiled throughout its range because of extreme rarity or because of some other factor of its biology making it vulnerable to extinction; S1 = since var. nubilus is endemic to Idaho, the state (S) rank equals the global rank for the taxon (T);(Moseley and Groves 1990)].

Conservation Status - Elsewhere: White Cloud milkvetch is endemic to Idaho.

Ownership: All known populations of White Cloud milkvetch occur on National Forest land. Part of one population extends onto land administered by the Yankee Fork Ranger District of the Challis NF. All others are located on land administered by the Sawtooth National Recreation Area.

Threats: Several populations are currently impacted by livestock and/or recreational use. A summary of which populations are subject to which current or potential threats is given below. Names of each population correspond to those previously listed in the Distribution section of this report.

Railroad Ridge (001) - current ORV use appears minimal and no threat. At least two of the subpopulations are in areas that could potentially be impacted if ORV use patterns were to change. Increased livestock use could also potentially prove detrimental to parts of the population, mainly via trampling.

South of Bowery Creek (002) - cattle graze the area around this population fairly heavily, but for the most part do not spend much time in the relatively sparsely vegetated areas where most of the White Cloud milkvetch occurs. Trampling of some plants however, was evident.

Jim Creek (003) - road maintenance or improvement of FS Road 669 could destroy part or all of this small population. Cattle grazing also occurs in the vicinity.

Boulder Chain Lakes Creek (004) - this small population is on the edge of recreation trail #047 and within the zone of disturbance caused by hikers, horses and motorcycles.

Red Ridge (007) - continued locally heavy cattle and horse grazing may be impacting this population.

Management Implications: Several populations of White Cloud milkvetch face current or potential threats to their long-term viability. In light of the species relative rarity, current management objectives and practices should be evaluated where threats exist. The Forest Service should consider the impacts of at least three activities on the species long-term viability - livestock, ORV and road maintenance and construction.

The impacts of livestock should be monitored as part of Allotment Management Planning. Potential impacts to White Cloud milkvetch from ORV's should be taken into consideration in formulating area travel plans. For example, the Boulder Chain Lakes Creek population (004) could easily be impacted or extirpated by erosion from trail # 047. The Jim Creek population (003) should be monitored to determine the effects of any road maintenance or related activities along FS Road 669.

ASSESSMENT AND RECOMMENDATIONS

Summary: Results of our 1990 field investigation further confirmed the limited and scattered distribution of White Cloud milkvetch, despite a thorough search of the east slope of the White Clouds. The species restriction to a relatively narrow range of habitat conditions was also substantiated. Eight populations have been documented, five of these discovered during 1990. Together, these populations support approximately 5,700 individuals and cover an area less than 40 acres. Five of the eight populations face current or potential threats to their long-term viability.

Recommendations to the Regional Forester: All known populations of White Cloud milkvetch occur on Region 4 Forest lands. Several of the populations are very small and threats to some populations have been identified. Based on information discussed in this report, White Cloud milkvetch should remain a Sensitive Species for the Sawtooth NF and should be added to the Challis NF list.

Recommendations to the Sawtooth National Recreation Area: All of the populations with identified current or potential threats are within the Sawtooth NRA. Establishment of monitoring regimes to assess impacts and trends are recommended

where these threats pose the most serious questions to long-term population viability. The following populations are therefore recommended for monitoring: South of Bowery Creek (002), Jim Creek (003), Boulder Chain Lakes Creek (004) and Red Ridge (007). Additionally, immediate protection measures are recommended for the Boulder Chain Lake Creek (004) population. Rerouting a section of trail #047 may be one option.

We thoroughly searched the east slope of the White Cloud Mountains. Limited, additional potential habitat for White Cloud milkvetch may exist on the west side of the White Cloud crest. Further status inventory for this area should be conducted as soon as practicable.

Land managers and field personnel should be informed of the occurrence of this species in their area. Possible sightings should be documented by specimens (if the size of the population warrants collection) and should be sent to the University of Idaho Herbarium (Department of Biological Sciences, University of Idaho, Moscow, Idaho 83843) for verification of their identity. Confirmed sightings should be reported to the Idaho Natural Heritage Program, using Region 4 TES Plant Forms, for entry into their permanent data base on sensitive species.

Recommendations to the Challis National Forest: The South of Bowery Creek (002) population extends onto Challis NF-administered land along the Sawtooth NRA boundary in the Boulder Mountains. Coordination with the Sawtooth NRA to establish a monitoring regime for this population is encouraged. The range of White Cloud milkvetch in the Boulder Mountains has not been adequately determined. Additional potential habitat exists in the Sheep Peak/Bowery Peak areas, east into the Herd Creek drainage. Further status inventory for these areas should be conducted as soon as practicable.

Land managers and field personnel should be informed of the occurrence of this species in their area. Possible sightings should be documented by specimens (if the size of the population warrants collection) and should be sent to the University of Idaho Herbarium (Department of Biological Sciences, University of Idaho, Moscow, Idaho 83843) for verification of their identity. Confirmed sightings should be reported to the Idaho Natural Heritage Program, using Region 4 TES Plant Forms, for entry into their permanent data base on sensitive species.

Recommendations to the U.S. Fish and Wildlife Service: White Cloud milkvetch is a Category 2 candidate. Our 1990 survey significantly added to the understanding of its abundance and distribution, but this understanding remains incomplete. There has never been a collection of White Cloud milkvetch from the west side of the White Cloud crest, but this may be an artifact of minimal botanical investigation. In addition, portions of the Challis NF (Sheep Creek/Bowery Creek and Herd Creek areas) need to be searched. It is recommended that White Cloud milkvetch remain a Category 2 candidate until further survey work documents its abundance, distribution and any threats on the west side of the White Clouds and on the Challis NF. If such status surveys indicates that White Cloud Milkvetch is still rare, the Fish and Wildlife Service should coordinate the development of a Habitat Management Plan for the species with the Forest Service.

REFERENCES

- Barneby, R.C. 1964. Atlas of North American Astragalus - Parts 1 and 2. The New York Botanical Garden, Bronx, N.Y. 1188 p.
- Fisher, F.S., D. H. McIntyre, and K.M. Johnson, compilers. 1983. Geologic Map of the Challis quadrangle, Idaho (scale 1:250,000). Idaho Bureau of Mines and Geology, Moscow.
- Hironaka, M., M.A. Fosberg, and A.H. Winward. 1983. Sagebrush-grass habitat types of southern Idaho. Bull. No. 35, Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Hitchcock, C.L. 1961. Astragalus. Pages 197-273 In: Vascular plants of the Pacific Northwest, Part 3, By C.L. Hitchcock, A. Cronquist, M. Ownbey, and J.W. Thompson. University of Washington Press, Seattle.
- Hitchcock, C.L., and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle. 730 p.
- Idaho Native Plant Society. 1990. Results of the sixth annual rare plant meeting, March 1990. Unpublished manuscript on file at the Idaho Natural Heritage Program, Idaho Department of Fish and Game, Boise. 5 p.
- Moseley, R., and C. Groves. 1990. Rare, threatened and endangered plants and animals of Idaho. Natural Heritage Section, Nongame and Endangered Wildlife Program, Idaho Department of Fish and Game, Boise, ID. 33 p.
- Steele, R. 1977. Astragalus vexilliflexus var. nubilus. Page 42 In: Endangered and threatened plants of Idaho - A summary of current knowledge, By the Rare and Endangered Plants Technical Committee of the Idaho Natural Areas Council, Bull. No. 21, Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Steele, R. 1981. Astragalus vexilliflexus var. nubilus. Page 10 In: Vascular plant species of concern in Idaho, By the Rare and Endangered Plants Technical Committee of the Idaho Natural Areas Council, Bull. No. 34, Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Steele, R., R.D. Phister, R.A. Ryker, and J.A. Kittams. 1981. Forest habitat types of central Idaho. General Technical Report INT-114. USDA, Forest Service, Intermountain Research Station, Ogden, UT. 138 p.
- Taylor, R. No date. Vegetation reconnaissance of selected locations in the Sawtooth National Recreational Area. Unpublished report on file at the Idaho Natural Heritage Program, Boise, ID. 24 p.
- USDA Forest Service. 1988. Sensitive plant program handbook R-4 FSH 2609.25. Intermountain Region, Ogden, UT.
- U.S. Fish and Wildlife Service. 1990. Endangered and threatened wildlife and plants; Review of plant taxa for listing as endangered or threatened species; Notice of Review. Federal Register 50 CFR Part 17:6184-6229 (Wednesday, 21 February 1990).

Appendix 1

Line drawing of Astragalus vexilliflexus var. nubilus
(from Hitchcock 1961).

Appendix 2

Locations of Astragalus vexilliflexus var. nubilus
on the Sawtooth and Challis National Forests.

- Map 1. Overview of distribution on the Sawtooth and Challis National Forests. Portion of Sawtooth NF map, 1985 (Fairfield and Ketchum Ranger Districts), Sawtooth National Recreation Area.
- Map 2. Railroad Ridge population (001). Portion of Livingston Creek 7.5' USGS quadrangle.
- Map 3a. South of Bowery Creek population (002). Portion of Bowery Creek 7.5' USGS quadrangle.
- Map 3b. South of Bowery Creek population (002). Portion of Ryan Peak 7.5' USGS quadrangle.
- Map 4. Jim Creek population (003). Portion of Livingston Creek 7.5' USGS quadrangle.
- Map 5. Boulder Chains Lake Creek (004) and Wickiup Creek Ridge (005) populations. Portion of Boulder Chain Lakes 7.5' USGS quadrangle.
- Map 6a. Germania Ridge population (006). Portion of Bowery Creek 7.5' USGS quadrangle.
- Map 6b. Germania Ridge population (006). Portion of Boulder Chain Lakes 7.5' USGS quadrangle.
- Map 7. Red Ridge population (007). Portion of Bowery Creek 7.5' USGS quadrangle.
- Map 8a. Bowery Ridge population (008). Portion of Bowery Creek 7.5' USGS quadrangle.
- Map 8b. Bowery Ridge population (008). Portion of Boulder Chain Lakes 7.5' USGS quadrangle.
- Map 8c. Bowery Ridge population (008). Portion of Galena Peak 7.5' USGS quadrangle.

Appendix 3

List of areas searched for
Astragalus vexilliflexus var. nubilus
during the 1990 field investigation.

White Cloud Peaks (west of the East Fork Salmon River)

1. Railroad Ridge as far east as directly north of Livingston Mill.
2. Ridge separating upper Silver Rule Creek and upper Big Lake Creeks.
3. Livingston Mine area.
4. Peaks and portion of ridge system separating Tin Cup Lake Basin from upper Jim Creek.
5. Red Ridge.
6. Ridge system dividing Little Boulder and Wickiup Creeks.
7. Ridge system dividing Wickiup and Germania Creeks.
8. Ridge system dividing Germania Creek and the East Fork Salmon River, to south of Sawtooth NRA boundary.
9. Ridge system between Sheep and Bowery Creeks.

Boulder Mountains (east of the East Fork Salmon River)

1. Portion of ridge complex from Bowery Creek south to West Pass Creek, that is east of the East Fork Salmon River and approximately two miles west of Long Tom Creek.
2. Upper West Pass Creek to near Ryan Peak.
3. Lost Mine Canyon Creek to Glassford Peak and down IbeX Creek.

Duane Atwood, FS Regional Botanist, and Bob Moseley, searched the core of the White Clouds between Fourth of July Creek and Railroad Ridge in 1986. Also see Taylor (no date) for areas he surveyed in his floristic inventory in 1980.

Appendix 4

Element occurrence records for
Astragalus vexilliflexus var. nubilus
on the Sawtooth and Challis National Forests.

NOT INCLUDED IN CDC HOME PAGE VERSION OF THIS REPORT

Appendix 5

Slides of Astragalus vexilliflexus var. nubilus
and its habitat.

1. Close-up; note yellow flowers and small fruits, neither raised above level of the leaves, and leaflets not spine-tipped.
2. Note prostrate habit of plant (hammer gives scale).
3. Habitat along Red Ridge (007); note open, sparsely vegetated ground.
4. Habitat along Railroad Ridge (001); note rocky texture of substrate.
5. Habitat along "Bowery Ridge" (008); note overall sparse vegetation cover.