

Status of
Precocious Milkvetch
(*Astragalus proimanthus*)
in Southwest Wyoming

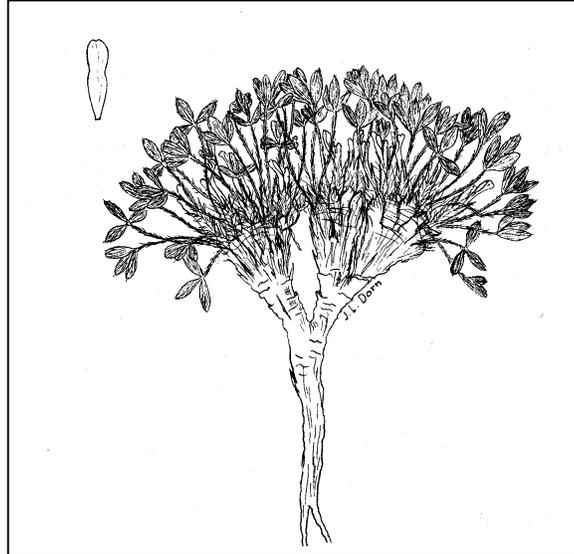


Illustration by Jane Dorn from Dorn & Dorn (1980)

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ABSTRACT

Precocious milkvetch (*Astragalus proimanthus*) is a narrow endemic, restricted to an area of less than 320 acres near the town of McKinnon in southwestern Sweetwater County, Wyoming. This species occurs in sparsely vegetated cushion plant/bunchgrass communities on dry, thin, rocky clay soils of benches and bluffs. Prior to 2000, Precocious milkvetch was known from one historical population (last observed in 1946) and one extant occurrence consisting of 4-5 main subpopulations. Surveys in 2000 resulted in the rediscovery of the historical population and the documentation of a new occurrence approximately 8.5 miles southeast of the nearest known colony. Based on limited sampling, these populations are currently estimated at 10,500-13,000 individuals, representing a possible decline from previous estimates of 20,000 or more plants made in 1989 and 1981. Population size and density data from long-term monitoring plots, however, suggest a more stable population trend over the last decade, despite localized fluctuations. All known populations occur on lands managed by the BLM Rock Springs Field Office, one of which (bluffs on the north side of the Henry's Fork River) is managed as a Special Status Plant Area of Critical Environmental Concern (ACEC). Although protected from most surface disturbances under stipulations of the ACEC, this and other populations remain vulnerable to habitat loss stemming from road construction, off-road vehicle recreation, mineral exploration, and secondary effects of grazing. Due to its limited range and degree of threat, *Astragalus proimanthus* should be considered for designation as "Sensitive" by the BLM Wyoming state office and its needs recognized during the formulation of land management plans in the McKinnon area.

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INTRODUCTION

Precocious milkvetch (*Astragalus proimanthus*) was first discovered by H. Dwight Ripley and Rupert Barneby "6 miles north of McKinnon" in southern Sweetwater County, Wyoming in June 1946. Barneby made a second collection of the plant "3 miles north of McKinnon on white shale bluffs along [the] Henry's Fork" in 1961 and formally described it as a new species in 1964 (Barneby 1964). This population was relocated only once during the next decade, prompting the Smithsonian Institution to recommend *A. proimanthus* for listing as Endangered under the Endangered Species Act in 1976 (Ayensu and DeFilipps 1978). Although not listed at this time, the species was a candidate for listing from 1980-1985 and 1993-1996 and has been proposed for state Sensitive status by the Bureau of Land Management (BLM) Wyoming State Office (Jeff Carroll, personal communication, December 2000).

In order to determine the current status and potential management needs of the Precocious milkvetch, the BLM contracted with the University of Wyoming and the Wyoming Natural Diversity Database (WYNDD) in 2000 to conduct field surveys for this plant on public lands in southwestern Wyoming. The results of this study, as well as information on the biology, distribution, habitat, population size, and potential threats of *A. proimanthus* in Wyoming are discussed in the following report.

METHODS

Information on the habitat and distribution of *Astragalus proimanthus* was obtained from scientific literature, specimens from the Rocky Mountain Herbarium (RM), unpublished reports, and knowledgeable individuals. USGS topographic maps, geologic maps (Love and Christiansen 1985), and BLM land status maps were used to identify areas of potential habitat for ground survey. Field surveys were conducted by Laura Welp and Walter Fertig of WYNDD in June 1999 and June 2000 (survey routes are shown in Appendix B). Data on habitat, reproduction, phenology, and associated species were collected using WYNDD plant survey forms. Locations of occurrences were mapped on 7.5 minute USGS topographic maps and digitized as an Arc-View theme. Voucher specimens were collected for deposit at the RM. Information gathered in the field was entered into the computerized Element Occurrence database of WYNDD.

Marriott (1989) established 5 permanent demographic monitoring plots at two sites (Powerline Ridge and McKinnon Dump) following the protocol of Lesica (1987). These transects consisted of a single belt 1 meter x 50 meters long, subdivided into 1 meter x 1 meter plots. Within each plot, individual rosettes were counted and classified as living or dead. This technique was designed to gauge population density and assess population change over time. Laura Welp relocated 4 of the 5 transects in June 2000 and re-read the lines. Data from these transects are included in Appendix C.

SPECIES INFORMATION

Classification

Scientific Name: *Astragalus proimanthus* Barneby (Barneby 1964). Holotype: USA: Wyoming, Sweetwater County, 3 miles north of McKinnon, 7100 ft., 13 June 1961, Barneby 13185 (CAS). Isotypes at GH, NY, RM, RSA, and US.

Common Name: Precocious milkvetch; Precocious orophaca.

Family: Fabaceae or Leguminosae (Pea family).

Synonyms: *Orophaca proimantha* (Barneby) Isely (Isely 1998).

Phylogenetic Relationships: Worldwide, the genus *Astragalus* contains over 1600 species, with about 375 known from North America (Barneby 1989). Dorn (1992) lists 59 species and an additional 20 varieties in Wyoming. Barneby (1964) placed *A. proimanthus* and the closely related *A. gilviflorus* and *A. hyalinus* in Section *Orophaca*, which he distinguished from similar taxa in Section *Sericoleuci* based on technical features of the flower, calyx, and fruits. Other authors have recognized the *Orophaca* and *Sericoleuci* lines as a segregate genus, *Orophaca*, consisting of 7-9 taxa with a matted growth form, hyaline and fused stipules, and trifoliolate leaves (Isely 1998). Barneby (1989) acknowledged the "naturalness" of the *Orophaca* group, but persisted in keeping the taxa within *Astragalus* due to a lack of significant differences between the two groups in reproductive traits. Roberts (1977) monographed the *Orophaca* group and concluded that *A. proimanthus* was "clearly a vicariant of *A. hyalinus*, varying in several morphological details from its presumed progenitor".

Legal Status: *Astragalus proimanthus* was formerly a Category 2 (C2) candidate for listing under the Endangered Species Act (US Fish and Wildlife Service 1993). The C2 list included species that might have warranted listing as Threatened or Endangered, but for which the USFWS lacked sufficient biological data to support a listing proposal. With the elimination of the C2 program in 1996, Precocious milkvetch currently has no protection status under the Endangered Species Act (US Fish and Wildlife Service 1996). The BLM Wyoming State Office is currently considering this species for possible designation as State Sensitive (Jeff Carroll, personal communication)*. The BLM's Rock Springs Field Office has listed this species as a "Special Status" plant since 1990 (Weynand and Amidon 1990; Amidon 1994).

Natural Heritage Rank: The Association for Biodiversity Information (formerly the heritage division of The Nature Conservancy) and the network of natural heritage programs gives *Astragalus proimanthus* a rank of G1, indicating that the species is "critically imperiled because of extreme rarity" and known from 5 or fewer extant populations or very few remaining individuals. In Wyoming, Precocious milkvetch is ranked S1 because of extreme rarity within the state (Fertig and Beauvais 1999).

* No final decision on the State Sensitive species list has been made as of 2 February 2001.

Description: Precocious milkvetch is a stemless perennial forb forming low cushions 2-3 dm in diameter (Figures 1-2). The herbage is densely silvery-whitish throughout with ascending, twisted or spreading hairs 1.5-3 mm long. Leaves are densely clustered, 1-3.5 cm long, and have three narrowly oblanceolate to elliptic leaflets 5-9 mm long. Stipules are fused at the back, whitish-membranous, 7-12 mm long, and glabrous except for the ciliate margins. The yellow or whitish pea-like flowers (often tinged with lavender or pink, especially on the throat) are up to 17 mm long, sessile, erect, and borne in pairs among the basal leaves. The calyx is 8-10.5 mm long with a cylindrical tube 6-6.5 mm long. The banner petal is distinctly constricted in the middle (giving the whole banner a fiddle-like shape) and is glabrous on the back. Fruit pods are sessile, 7-10 mm long, narrowly elliptic to ovoid, slightly flattened from the sides, densely fine-hairy, and have 11-14 ovules (Barneby 1964; Roberts 1977; Dorn and Dorn 1980, Fertig et al. 1994; Isely 1998).

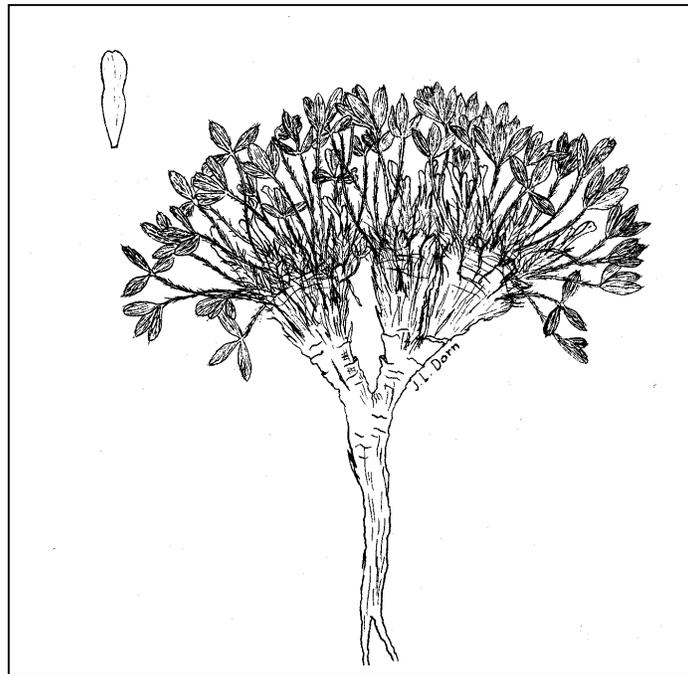


Figure 1. Line drawing of *Astragalus proimanthus* by Jane Dorn from Dorn and Dorn (1980) and Fertig et al. (1994). Note the sessile, pea-like flowers borne among the leaves and the fiddle-shaped banner petal (upper left corner).

Similar Species: *Astragalus gilviflorus* has larger flowers and spoon-shaped banner petals 16-28 mm long. *A. hyalinus* has fiddle-shaped banners that are hairy on the back and smooth pubescence on the stems, calyces, and foliage. An undescribed "orophacoid" *Astragalus* from Park County, Wyoming has predominantly white flowers (often with lavender lines or a lavender tinge) and 6-8 ovules per fruit. Other "*Orophaca*" species of *Astragalus* in Wyoming have smaller flowers (banners are 5-16.5 mm long and calyx tubes under 5.5 mm long) that are borne on short peduncles (Barneby 1989; Dorn 1992; Fertig et al. 1994).



Figure 2. Photo of *Astragalus proimanthus* from the McKinnon area (Sweetwater County, WY) depicting the typical flower color and growth habit of this species. Flowers may also have a pinkish tinge to the banner, as depicted in the *Wyoming Rare Plant Field Guide* (Fertig et al. 1994). Photo by Hollis Marriott, May 1989.

Geographic Range: *Astragalus proimanthus* is a narrow endemic restricted to the bluffs of the Henry's Fork River and vicinity of McKinnon in the southern Green River Basin in southwestern Sweetwater County, Wyoming (Figure 3, Table 1, Appendix A). The entire global distribution of the species is limited to less than 320 acres within an area of 4 x 14 miles.

Extent of Surveys in Wyoming: Precocious milkvetch was apparently unknown to science until 1946, when it was collected by H. Dwight Ripley and Rupert Barneby 6 miles north of McKinnon, Wyoming (Barneby 1964). Barneby located a second population approximately 3 miles north of McKinnon in 1961, and revisited this population again in 1966. This second population was relocated in 1976 by Marvin Roberts, a graduate student from the University of Wyoming who was conducting a monographic study of the *Orophaca* group of *Astragalus* (Roberts 1977). Robert Lichvar of the Wyoming Natural Heritage Program revisited the McKinnon population in 1978-79, and later surveyed 12 subpopulations along a 6 mile stretch of bluffs north of the Henry's Fork River in 1981 (Whiskey Basin Consultants 1981). Robert Dorn also visited the McKinnon area in 1978-80 and documented additional subpopulations along the Henry's Fork, but failed to relocate the original Ripley and Barneby collection site. Jim Locklear of the Nebraska Statewide Arboretum visited the McKinnon population in 1988. Hollis Marriott of WYNDD established 5 permanent monitoring plots along the Henry's Fork bluffs in June 1989 and resurveyed the known

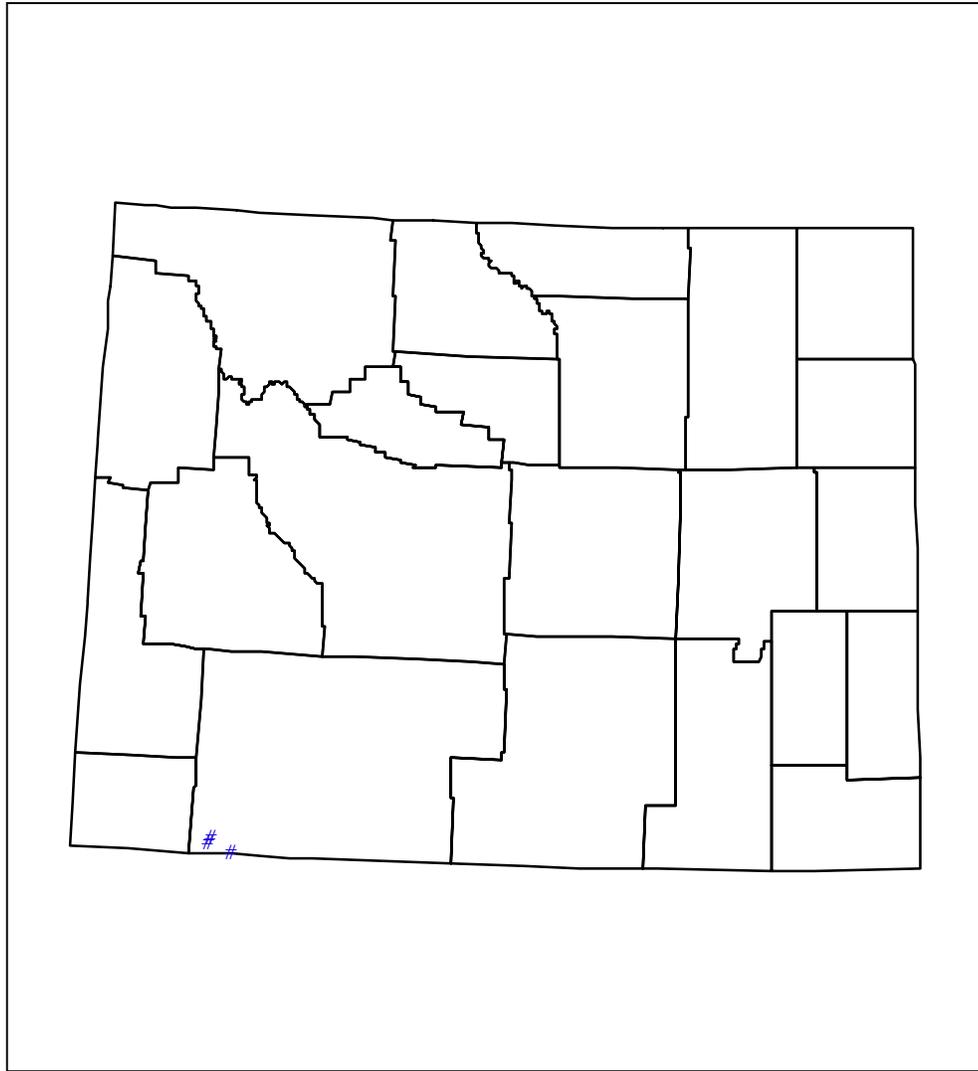


Figure 3. Distribution of *Astragalus proimanthus* in Wyoming

subpopulations, but failed to locate additional populations in the vicinity (Marriott 1989). Charmaine Refsdal Delmatier and B. Ernie Nelson of the Rocky Mountain Herbarium visited the McKinnon dump area to photograph this species for the *Wyoming Rare Plant Field Guide* and during their general floristic survey of southwestern Wyoming in 1993-95 but were unable to locate additional populations (Refsdal 1996). Barbara Amidon and other staff of the BLM Rock Springs Field Office visited the McKinnon colonies in 1993, 1994, and 1998 to continue the monitoring work started by Hollis Marriott. Walter Fertig of WYNDD visited the McKinnon dump site in April 1996 and June 1999.

In June 2000, Laura Welp of WYNDD and Jim Glennon of the BLM Rock Spring Field Office relocated three of the five main subpopulations along the Henry's Fork bluffs and remeasured 4 of Marriott's 5 monitoring plots (one could not be relocated). Welp also discovered a new colony approximately 6 miles north of McKinnon which may represent the original site collected by Ripley

Table 1. Locations of known populations of *Astragalus proimanthus* in Wyoming

Occurrence # 001

County: Sweetwater.

USGS Quads: Antelope Wash & McKinnon.

Latitude: 41° 04' 11" N (centrum)

South Latitude: 41° 03' 25" N

North Latitude: 41° 04' 57" N

Longitude: 109° 54' 55" W (centrum)

East Longitude: 109° 51' 50" W

West Longitude: 109° 58' 00" W

Township/Range/Section: T13N R111W S25

(S4 of NW4 & W2 of SE4 of SW4), S26 (SE4 of NE4 & E2 of SE4SE4), S27 (SE4 of SW4), S31 (SE4SE4 & NE4), S32 (S ¾), S33 (SE4 & SE4 of NW4), S34 (E2), S35 (NW4 of SW4), S36 (E2, NW4, & S2); T13N R110W S31 (SW4 & NW4).

Location: Green River Basin, bluffs along the north side of the Henry's Fork River, 2-3 miles north of McKinnon. Population consists of 5 main subpopulations (divided into 21 smaller colonies) and extends from ca 1.25 miles west of Sweetwater County Highway 1 east ca 5 air miles to the Big Hollow area (a distance of ca 6.25 miles).

Five subpopulations:

(1) bench bordering the first tributary of the Henry's Fork ca 1 mile east of Sweetwater County Highway 1 (3 colonies in T13N R111W S33-34).

(2) bench 4-4.25 miles east of Highway 1 (1 colony in T13N R111W S36/T13N R110W S31).

(3) first bench southwest of McKinnon dump (and vicinity), 0.1-1.25 miles west of Sweetwater County Highway 1 (11 colonies in T13N R111W S31-32).

(4) bench along third main tributary branch of Henry's Fork east of Sweetwater County Highway 1 (3 colonies in T13N R111W S27 & 34-35).

(5) Powerline ridge along upper reach of fourth tributary branch of Henry's Fork east of Sweetwater County Highway 1 (3 colonies in T13N R111W S25-26 & 35-36).

Comments: This EO includes former EOR # 002, 003, 005, and 006 (included in Marriott's 1989 status survey).

Occurrence # 004

County: Sweetwater.

USGS Quad: McKinnon.

Latitude: 41° 06' 04" N

Longitude: 109° 53' 11" W

Township/Range/Section: T13N R111W S14 (SE4SE4SE4).

Location: Green River Basin, ca 0.1 air mile south of the South Fork of the North Fork of Lane Meadow Creek and ca 0.5 air miles southeast of Sweetwater County Highway 1, about 6 miles north-northeast of McKinnon.

Occurrence # 007

County: Sweetwater.

USGS Quad: Linwood Canyon.

Latitude: 41° 01' 00" N (centrum)

South Latitude: 41° 00' 58" N

North Latitude: 41° 01' 12" N

Longitude: 109° 42' 48" W (centrum)

East Longitude: 109° 42' 33" W

West Longitude: 109° 42' 49" W

Township/Range/Section: T12N R109W S16 (SW4), S17 (NE4NE4 OF SE4).

Location: Green River Basin, east end of ridge on south side of BLM road paralleling the south bank of the Henry's Fork River, ca 1.5 air miles west of the mouth of Cottonwood Creek, ca 3 air miles northwest of Linwood Bay, ca 11 air miles east of McKinnon and ca 1.2 miles north of Manila, Utah.

and Barneby in 1946 (and not relocated since). Laura also discovered a third population nearly 8.5 miles southeast of the McKinnon colonies and 1.5 miles west of the mouth of Cottonwood Creek. Welp also surveyed potential sites elsewhere on public lands along the Henry's Fork River, but was unable to locate additional colonies (Appendix B).

Habitat: *Astragalus proimanthus* occurs primarily on sparsely vegetated rims and gullied upper slopes of benches, bluffs, and mesa-like ridges at elevations of 6400-7200 feet (1950-2195 m). Populations are typically found in cushion plant/bunchgrass communities dominated by *Phlox hoodii*, *Haplopappus nuttallii*, *Cryptantha sericea*, and *Elymus spicatus* in openings within *Artemisia tridentata* or *Juniperus osteosperma* grasslands (Figure 4, Table 2). Occasionally, colonies may also occur on open toe slopes of ridges within a matrix of *Artemisia nova*, *Sarcobatus vermiculatus*, *Juniperus osteosperma*, and *Grayia spinosa*. Vegetation cover is typically less than 5-10%. Soils are whitish, fine-textured, dry, shallow, calcareous shale clays covered with a dense layer of coarse cobbles, whitish shaley flakes, and dark volcanic rock. The populations along the bluffs of the Henry's Fork River and Lane Meadow Creek (north of McKinnon) are found on



Figure 4. Habitat of *Astragalus proimanthus* on the bluffs along the north side of the Henry's Fork River north of McKinnon (Occurrence # 001). Plants occur most frequently on the barren slopes and rims to the right of the junipers. Photo by Hollis Marriott, June 1989.

Table 2. Species Commonly Associated with *Astragalus proimanthus*

Scientific Name	Common Name	Growth Form
<i>Artemisia frigida</i>	Fringed sagebrush	Shrub
<i>Artemisia nova</i>	Black sagebrush	Shrub
<i>Artemisia tridentata</i> var. <i>wyomingensis</i>	Wyoming big sagebrush	Shrub
<i>Astragalus spatulatus</i>	Spoonleaf milkvetch	Perennial forb
<i>Atriplex confertifolia</i>	Shadscale	Shrub
<i>Atriplex gardneri</i>	Gardner's saltbush	Shrub
<i>Chrysothamnus nauseosus</i>	Rubber rabbitbrush	Shrub
<i>Cryptantha caespitosa</i>	Tufted cryptantha	Perennial forb
<i>Elymus spicatus</i>	Bluebunch wheatgrass	Perennial graminoid
<i>Eriogonum umbellatum</i>	Sulfur buckwheat	Perennial forb
<i>Gutierrezia sarothrae</i>	Broom snakeweed	Shrub
<i>Haplopappus nuttallii</i>	Nuttall's goldenweed	Perennial forb
<i>Hymenopappus filifolius</i>	Wyoming hyalineherb	Perennial forb
<i>Juniperus osteosperma</i>	Utah juniper	Shrub/Tree
<i>Krascheninnikovia lanata</i>	Winterfat	Shrub
<i>Lesquerella alpina</i>	Alpine bladderpod	Perennial forb
<i>Oryzopsis hymenoides</i>	Indian ricegrass	Perennial graminoid
<i>Phlox hoodii</i>	Hood's phlox	Perennial forb
<i>Sarcobatus vermiculatus</i>	Greasewood	Shrub
<i>Stanleya pinnata</i>	Bushy prince's-plume	Perennial forb

substrates derived from the Eocene-age Bridger Formation, while the newly discovered population near the mouth of Cottonwood Creek is found on banded red and brown clays and gravels of the Laney member of the Eocene Green River Formation (Figure 5) (Love and Christiansen 1985). Colonies may occur on any aspects, but are most common on flats or south to west-facing slopes of 1-30%.

Average annual precipitation within the range of *Astragalus proimanthus* is 10 inches (25 mm), with peak precipitation coming as rain in May and June (Martner 1986). Mean annual temperature is 40° F (4.4° C). January mean high and low temperatures are 32° F (0° C) and 6° F (- 14.4° C), respectively. July mean high temperature is 84° F (66.2° C) and July low temperature averages 50° F (10° C). The average number of days at or below freezing in the McKinnon area is 225, while the average number of days exceeding 90° F (32.2° C) is 5-10 (Martner 1986).

Population Size and Trends: *Astragalus proimanthus* is currently known from three extant occurrences worldwide, two of which were newly discovered or relocated after more than 50 years during surveys in 2000. These occurrences consist of six extant subpopulations that can be further subdivided into 25 colonies (colonies are defined as discrete population segments located within 0.5 miles of other segments and not isolated by major breaks in habitat). An additional subpopulation reported by Whiskey Basin Consultants (1981) from 4-4.25 miles east of Sweetwater County Highway 1 and north of the Henry's Fork River has not been relocated since 1981 and may be



Figure 5. Habitat of *Astragalus proimanthus* on gentle south-facing slopes of clay-rich soil derived from the Green River Formation along the slopes on the south side of the BLM road paralleling the Henry's Fork River (Occurrence # 007). Note the small gray mats of *A. proimanthus* in the foreground.

extirpated. Individual colonies range in size from 0.1 to over 40 acres and may number from less than one dozen plants to over 3200 (Table 3).

Population estimates for Precocious milkvetch have varied widely over the years, reflecting survey intensity. Dorn and Dorn (1980) estimated the population at 400 plants in 2 main colonies on either side of Sweetwater County Highway 1. Robert Lichvar and associates conducted the first intensive survey in May 1981 and estimated the total population to be approximately 22,000 individuals, based on extrapolations from subsamples of 12 major colonies in 5 subpopulations (Whiskey Basin Consultants 1981). Marriott (1989) resurveyed this area in May-June 1989, focusing on identifying new populations and initiating a monitoring program, rather than a quantitative census. Her population estimate is significantly higher, ranging from 25,000-40,000 individuals in 19 colonies. Marriott estimated each major subpopulation to contain 5000-10,000 plants based on ocular estimates of habitat quality. Laura Welp and Jim Glennon counted 2644 individuals at 11 colonies in June 2000 and estimated the total population at these sites (representing all three known occurrences) at 5500-7000 plants. Extrapolating from these figures, the current total population of *Astragalus proimanthus* is estimated at a minimum of 10,500-13,000 individuals.

Trend data are difficult to determine for these populations because of differences in survey methodology, the lack of baseline data for occurrences 004 and 007, and the drought conditions prevalent in June 2000. Since 1989, populations in two monitoring transects along Powerline

Ridge (Occurrence # 001) have shown a long-term increase, while a third transect at this site decreased by 7% before it could no longer be relocated. Frequency studies show that shifts in distribution patterns have occurred in these transects, suggesting that individual Precocious milkvetch plants may be shorter-lived than is typically assumed for a mat-forming perennial. It remains unknown how important yearly fluctuations in precipitation and temperature are on the establishment and survival of this species. In contrast to Powerline Ridge, data from two transects near the McKinnon dump show a decline of 8.5-43% over 12 years. Frequency has also changed at these latter two transects, with transect 4 showing a significant decrease and transect 5 showing a comparable increase over 12 years. Overall, monitoring data suggest that the population along the bluffs of the Henry's Fork River has been relatively stable over the last dozen years, despite localized shifts in distribution. A more rigorous sampling strategy or a full census (similar to that done by Whiskey Basin Consultants in 1981) is needed to better determine actual population numbers.

Population Biology and Ecology: Precocious milkvetch is named for its early flowering period. This species has been observed in bud and flower as early as April 28, and continues to flower throughout May and often into mid June. Fruits are produced from mid May to late July (Roberts 1977). Fruit production may be limited during drought years, as evidenced by low reproductive output observed at 10 sites in 2000.

Pollination biology is essentially unknown for this plant. Whiskey Basin Consultants (1981) noted that small insects appeared to chew off the tips of the keel petal to get at pollen, although this may represent herbivory rather than attempted pollination. Barneby (1964) also noted that "faded flowers were eaten by birds or insects". Seed dispersal is probably passive (there are no morphological structures on the seed to enhance dispersal) and is limited to short distances. The absence of plants from seemingly suitable habitat may be the result of poor dispersal or episodic establishment events.

Populations typically consist of small, non-randomly clusters of plants separated by patches of underutilized habitat. Monitoring studies in 1989 and 2000 suggest an average density ranging from 1.1 – 3.4 plants per square meter along "Powerline Ridge" (T13N R111W S26) to 1.75-3.8 per square meter southwest of the McKinnon Dump (T13N R111W S32). Laura Welp documented lower densities (0.18-0.89 plants per square meter) at the two other sites discovered in 2000. The largest populations are typically associated with barren rims and upper slopes, while population densities are lower on flats and toe slopes.

There is no evidence of hybridization between *A. proimanthus* and other orophacoid *Astragalus* species in the field. All species within the subgenus have a chromosome count of $n = 12$ (Roberts 1977), but it is unknown if they are interfertile.

Stem and leaf herbivory on this species is low, probably due to the plant's coarse pubescence, matted growth form, and low palatability. Herbivory may be significant on flowers and fruits, especially by insects, birds, and rodents.

Table 3.
Demographic Information for Known Populations of *Astragalus proimanthus* in Wyoming

Occurrence # 001 (21 colonies in 5 main subpopulations)

Area: 310 acres.

Number of Plants: Population estimated at 5500-7000 plants at 11 of 20 known extant colonies (and representing 3 of 4 known extant subpopulations) by Laura Welp in June 2000. Extrapolating from these numbers, the total population of the 4 extant subpopulations of the occurrence is currently estimated at 10,000-12,730 individuals.

Density: Density varied from 1.75-3.4 plants per square meter at 4 monitoring sites surveyed in June 2000. In 1998, density ranged from 1.2-2.5 plants per square meter in these same plots. Density in 1989 varied from 1.1-3.8 plants per square meter (Marriott 1989).

Evidence of Reproduction: Plants were in vegetative or fruiting condition in June 2000 (<5% were still in late flower).

Trends: Marriott (1989) estimated the total population at 25,000-40,000 plants in June 1989. These figures were based on ocular estimates of individual subpopulations that averaged 5000-10,000 plants each. Population counts from transect data in 1989, however, were comparable to those made by Welp, suggesting that Marriott's extrapolations may be too high. Whiskey Basin Consultants (1981) conducted a more detailed census of 5 subpopulations (one of

which may be extirpated) and estimated the total population at approximately 22,000 individuals in 1981 (of which an estimated 1482 were from the extirpated subpopulation).

Occurrence # 004 (1 colony)

Area: 0.1 acres

Number of Plants: 9 plants observed by Laura Welp in June 2000.

Density: 0.18 plants per square meter in June 2000.

Evidence of Reproduction: 95% in late flower in June 2000.

Trends: Population was relocated for the first time in 54 years in 2000. Overall trends are not known (original abundance not determined by Ripley and Barneby).

Occurrence # 007 (4 small colonies)

Area: < 2 acres.

Number of Plants: Total population estimated at 450 plants by Laura Welp in June 2000.

Density: 0.89 plants per square meter recorded at 2 roadside colonies by L. Welp, June 2000.

Evidence of Reproduction: Ca 70% of plants in late flower or fruit in June 2000.

Trends: Not known (population not known prior to 2000).

ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

Current Management: All known populations of *Astragalus proimanthus* are found on public lands managed by the BLM Rock Springs Field Office or the State of Wyoming. Additional populations may occur on private lands in the vicinity of McKinnon (Whiskey Basin Consultants 1981). The extensive population along the bluffs on the north side of the Henrys Fork River (Occurrence # 001) is entirely within a “Special Status Plant” Area of Critical Environmental Concern (ACEC) designated in the BLM’s 1997 Green River Resource Management Plan (Marriott 1989; USDI Bureau of Land Management 1997; Fertig et al. 1998). Comparable ACEC status does not presently exist for the newly discovered or rediscovered populations (Occurrences 004 and 007) located on BLM lands in June 2000. These latter areas are currently managed for multiple use, with an emphasis on mineral development, grazing, and recreation (USDI Bureau of Land Management 1997).

Existing and Potential Threats: Marriott (1989) identified six current or potential threats to the persistence of Precocious milkvetch at what was then the only known occurrence in the world: road construction, off-road vehicle recreation, oil and gas development, disturbance associated with a garbage dump, habitat modifications stemming from range improvement projects, and grazing. These threats were considered especially significant due to the plant’s limited geographic range (Fertig et al. 1998). Each of these factors remains a threat, although the direct impacts from grazing are probably less significant than once thought due to the plant’s low stature and palatability (secondary grazing impacts from trailing, soil compaction, erosion, and spread of noxious weeds may still be important, however). Habitat has been lost at several locations due to road construction in the past, and the entire range of the species is vulnerable to impacts from off-road recreation (there are no topographic barriers to limit use within the plant’s occupied habitat). Surveys in 1993 and 1994 by BLM personnel documented significant disturbances in the McKinnon Dump area from vehicles and livestock trailing and a 12% decline in the numbers of *A. proimanthus* (USDI Bureau of Land Management 1997, p. 199). Road construction and other disturbances associated with seismic exploration were taking place at the newly discovered population near the mouth of Cottonwood Creek (Occurrence # 007) in 2000. Expansion of the McKinnon dump could eliminate or degrade *A. proimanthus* habitat on the west side of Sweetwater County Highway 1. Managers need to consider possible impacts to this species from future range improvement or fuel reduction projects in this area.

Management Recommendations: In October 1997, the BLM Rock Springs District Office designated BLM lands along the north bluffs of the Henry’s Fork River as a Special Status Plant Species ACEC (USDI Bureau of Land Management 1997). This ACEC encompasses each known subpopulation of *Astragalus proimanthus* in Occurrence # 001 (and a small buffer area), but does not presently include the recently discovered or relocated populations along the tributary of Lane Meadow Creek or near the head of Cottonwood Creek (Occurrence # 004 and # 007, respectively). Under the RMP, however, “[a]s new populations [of target species] are identified, site boundaries and any ACEC designation on BLM-administered public lands will be expanded to cover any new or expanded sites” (USDI Bureau of Land Management 1997, p.34).

The management objectives of the Special Status Plant ACEC are to prevent the loss of important habitat for target species (presently limited to *Arabis pusilla*, *Astragalus proimanthus*, *Descurainia torulosa*, and *Thelesperma pubescens*) and provide sufficient protection to prevent these species from being listed as Threatened or Endangered under the Endangered Species Act. Specific management actions and restrictions for these ACECS include closure to off-road vehicle travel (except on designated trails and roads), no-surface occupancy stipulations, closure to the location of mining claims and mineral materials sales, prohibition of explosives and blasting, and closure to surface-disturbing fire suppression activities (USDI Bureau of Land Management 1997, p. 34). Grazing is not excluded, but modifications in management may be required to ensure that ACEC objectives are attained. Other land use activities that are compatible with management goals are allowable.

The BLM Wyoming State Office is currently considering *Astragalus proimanthus* for listing as a state sensitive species. Given its current protection within the Special Status Plant ACEC, this species probably does not warrant consideration as a candidate for listing under the Endangered Species Act. Continued monitoring and management by the BLM, however, is needed to prevent loss of suitable habitat or a marked decline in population size that might necessitate such a listing in the future.

SUMMARY

Precocious milkvetch (*Astragalus proimanthus*) is a narrow endemic, restricted to an area of less than 320 acres near the town of McKinnon in southwestern Sweetwater County, Wyoming. This species occurs in sparsely vegetated cushion plant/bunchgrass communities on dry, thin, rocky clay soils of benches and bluffs. Prior to 2000, Precocious milkvetch was known from one historical population (last observed in 1946) and one extant occurrence consisting of 4-5 main subpopulations. Surveys in 2000 resulted in the rediscovery of the historical population and the documentation of a new occurrence approximately 8.5 miles southeast of the nearest known colony. Based on limited sampling, these populations are currently estimated at 10,500-13,000 individuals, representing a possible decline from previous estimates of 20,000 or more plants made in 1989 and 1981. Density data from long-term monitoring plots, however, suggest a more stable population trend over the last decade, although individual plants appear to be shorter lived than commonly assumed for a mat-forming perennial. Little information still exists on the pollination biology and life history of this species. All known populations occur on lands managed by the BLM Rock Springs Field Office, one of which (bluffs of the Henry's Fork River) is managed as a Special Status Plant Area of Critical Environmental Concern (ACEC). Although protected from most surface disturbances under stipulations of the ACEC, this and other populations remain vulnerable to habitat loss stemming from road construction, off-road vehicle recreation, mineral exploration, and grazing. Due to its limited range and moderate degree of threat, *Astragalus proimanthus* should be considered for designation as "Sensitive" by the BLM Wyoming state office and recognized during the formulation of land management plans in the McKinnon area.

LITERATURE CITED

- Amidon, B. 1994. Special status plant species in the Rock Springs District. Updated List 9-30-1994.
- Ayensu, E.S. and R.A. DeFilipps. 1978. Endangered and Threatened Plants of the United States. Smithsonian Institution and World Wildlife Fund, Washington, DC.
- Barneby, R.C. 1964. Atlas of North American *Astragalus*. Memoirs of the New York Botanical Garden 13:1-1188.
- Barneby, R.C. 1989. Vol. 3 Part B. Fabales. In: A. Cronquist, A.H. Holmgren, N.H. Holmgren, J.L. Reveal, and P.K. Holmgren, eds. Intermountain Flora, Vascular Plants of the Intermountain West, USA. New York Botanical Garden, Bronx, NY.
- Dorn, R.D. 1992. Vascular Plants of Wyoming, second edition. Mountain West Publ., Cheyenne, WY.
- Dorn, R. and J. Dorn. 1980. Illustrated Guide to Special Interest Vascular Plants of Wyoming. US Fish and Wildlife Service and Bureau of Land Management.
- Fertig, W. and G. Beauvais. 1999. Wyoming Plant and Animal Species of Special Concern. Wyoming Natural Diversity Database, Laramie, WY.
- Fertig, W., C. Refsdal, and J. Whipple. 1994. Wyoming Rare Plant Field Guide. Wyoming Rare Plant Technical Committee, Cheyenne, WY.
- Fertig, W., L. Welp, and S. Markow. 1998. The status of rare plants in southwest Wyoming. Report prepared for the Bureau of Land Management Wyoming State Office by the Wyoming Natural Diversity Database, Laramie, WY.
- Isely, D. 1998. Native and Naturalized Leguminosae (Fabaceae) of the United States (exclusive of Alaska and Hawaii). Monte L. Bean Life Science Museum, Brigham Young Univ., Provo, UT.
- Lesica, P. 1987. A technique for monitoring nonrhizomatous, perennial plant species in permanent belt transects. Natural Areas Journal 7(2):65-68.
- Love, J. D. and A. C. Christiansen. 1985. Geologic Map of Wyoming. US Geological Survey.
- Martner, B. 1986. Wyoming Climate Atlas. Univ. of Nebraska Press, Lincoln, NE.
- Marriott, H.J. 1988. Draft habitat management plan for threatened, endangered and sensitive plant species and their habitats on the Rock Springs District, Bureau of Land Management. Prepared for the Bureau of Land Management by the Wyoming Natural Diversity Database, Laramie, WY.

Marriott, H. 1989. Inventory and monitoring of *Astragalus proimanthus* (Precocious milkvetch). Report prepared for the Bureau of Land Management Rock Springs Field Office by the Wyoming Natural Diversity Database, Laramie, WY.

Refsdal, C.H. 1996. A general floristic inventory of southwest Wyoming and adjacent northeast Utah, 1994-1995. Report prepared for the Bureau of Land Management Wyoming State Office, Bureau of Land Management Vernal Supervisor's Office, US Fish and Wildlife Service, and US Forest Service Region 4 by the University of Wyoming, Rocky Mountain Herbarium, Laramie, WY.

Roberts, M.L. 1977. Systematics of the *Orophaca Astragali*. Masters Thesis, Department of Botany, University of Wyoming, Laramie.

USDI Bureau of Land Management. 1997. Record of Decision and Green River Resource Management Plan. Bureau of Land Management Rock Springs District Office.

US Fish and Wildlife Service. 1993. Plant taxa for listing as Endangered or Threatened species; Notice of Review. Federal Register 58(188):51144-51190.

US Fish and Wildlife Service. 1996. Endangered and Threatened species, plant and animal taxa; Proposed rule. Federal Register 61(40):7596-7613.

Weynand, B., and B. Amidon. 1990. An illustrated field guide to the sensitive plants of the Rock Springs District. Bureau of Land Management.

Whiskey Basin Consultants. 1981. Final report: Threatened and Endangered species inventory. Report prepared for the Bureau of Land Management.

Appendix A.
Element Occurrence Records and Range Maps

WYOMING NATURAL DIVERSITY
DATABASE

-Element Occurrence Record-

ASTRAGALUS PROIMANTHUS
PRECOCIOUS MILKVETCH
Occurrence # 001

Status

Data Sensitive?: No

Identification verified: Yes

TNC Global Rank: G1

WYNDD State Rank: S1

Federal Status: None; former C2 candidate for listing under the Endangered Species Act; BLM Rock Springs Field Office Special Status plant; Proposed BLM State Sensitive (2001).

WY Distribution Note: State endemic

Location

County: Sweetwater

USGS Quad Names: Antelope Wash & McKinnon

Latitude: 410411N (centrum)

South Latitude: 410325N

North Latitude: 410457N

Longitude: 1095455W (centrum)

East Longitude: 1095150W

West Longitude: 1095800W

Map Accuracy: Precise; location is within a 75 foot radius of point on USGS topo map.

Town/Range/Section: T13N R111W S25 (S4 of NW4 & W2 of SE4 of SW4), S26 (SE4 of NE4 & E2 of SE4SE4), S27 (SE4 of SW4), S31 (SE4SE4 & NE4), S32 (S 3/4), S33 (SE4 & SE4NW4), S34 (E2), S35 (NW4 of SW4), S36 (E2, NW4, & S2); T13N R110W S31 (SW4 & NW4).

Location: Green River Basin, bluffs along the

north side of the Henry's Fork River, 2-3 miles north of McKinnon. Population consists of 5 main subpopulations (divided into 21 smaller colonies) and extends from ca 1.25 miles west of Sweetwater County Highway 1 east ca 5 air miles to the Big Hollow area (a distance of ca 6.25 miles). The five main subpopulations are: (1) bench bordering the first tributary of the Henry's Fork ca 1 mile east of Sweetwater County Highway 1 (3 colonies in T13N R111W S33-34); (2) bench 4-4.25 miles east of Highway 1 (1 colony in T13N R111W S36/T13N R110W S31); (3) first bench southwest of McKinnon dump (and vicinity), 0.1-1.25 miles west of Sweetwater County Highway 1 (11 colonies in T13N R111W S31-32); (4) bench along third main tributary branch of Henry's Fork east of Sweetwater County Highway 1 (3 colonies in T13N R111W S27 & 34-35); (5) Powerline ridge along upper reach of fourth tributary branch of Henry's Fork east of Sweetwater County Highway 1 (3 colonies in T13N R111W S25-26 & 35-36).

Population Data

Last Observed: 2000-06-13

First Observed: 1961-06-12

Data: 2000-06-13: Powerline Ridge colony (Sec 26): 583 vegetative or fruiting plants counted by Laura Welp and Jim Glennon (population estimated at 1500-2000).

Distribution spotty, but plants are abundant where they occur. 270 plants observed in 2 of 3 monitoring transects, with densities ranging from 2.02-3.38 plants per square meter. 87-95% of plants in flower or fruit. McKinnon Dump (Sec 32) colonies: 863 vegetative and fruiting plants counted at 5 of 11 known colonies (including one new colony in Sec 32

NW4 of SW4 of SE4) by Welp and Glennon (population estimated at 2500-3000). 154 live plants observed in 2 monitoring transects, with densities ranging from 1.75-2.05 plants per square meter. 19-32% of counted plants in flower or fruit. East side of Sweetwater County Highway 1 colonies (Sec 33): 836 vegetative or fruiting plants counted in 3 colonies by Laura Welp and Jim Glennon. Population estimated at 1500-2000.

1999-06-19: McKinnon Dump colonies (Sec 32): observed in vegetative condition by W. Fertig and participants in the 1999 WY Native Plant Society annual field trip.

1998-06-03: Powerline Ridge subpopulation (Sec 26): 223 live plants counted in 3 monitoring transects by Barbara Amidon of the Rock Springs BLM. Densities at these transects ranges from 1.26-1.62 plants per square meter. 66-77% of counted plants are in flower or fruit.

1998-06-01: McKinnon Dump subpopulation (Sec 32): 180 live plants counted at 2 monitoring transects by B. Amidon. Density ranges from 1.95-2.55 plants per square meter. 75-78% of counted plants in flower or fruit.

1996-04-28: McKinnon Dump colonies (Sec 32): Observed in flower and bud by Walter Fertig.

1995-06-18: McKinnon Dump colonies (Sec 32): Observed in flower by Ernie Nelson.

1994-summer: McKinnon Dump colonies (Sec 32): BLM personnel report a 12% population loss from preceding years (USDI Bureau of Land Management 1997, p. 199).

1993-summer: McKinnon Dump colonies (Sec 32): BLM personnel "noticed significant

surface disturbances of a portion of the habitat due to motorized vehicles and livestock trailing" (USDI Bureau of Land Management 1997, p. 199).

1989-06-10/12: Total population size estimated at 25,000-40,000 plants at 19 colonies in 4 of 5 main subpopulations by Hollis Marriott. Subpopulation at bench 4-4.25 miles east of Sweetwater County Highway 1 (T13N R111W S36/T13N R110W S31) could not be relocated. Plants reported as "abundant but intermittent through[out] site". Occurs with *Elymus spicatus*, *Haplopappus nuttallii*, *Arenaria hookeri*, *Cryptantha*, *Artemisia frigida*, and *Hymenopappus filifolius*. Powerline Ridge subpopulation (Sec 25-26,36): 5000-10,000 plants estimated at 3 colonies. Plants all vegetative or in late flower. Density at three monitoring transects ranges from 1.1-1.8 plants per square meter (Transect 3 was originally reported by Marriott as having a density of 1.8 plants/square meter, but this is based on a typo – the actual density is 1.08). East side of Sweetwater Highway 1 subpopulation (Sec 33-34): 5000-10,000 plants estimated in 3 colonies. McKinnon Dump subpopulation (Sec 31-32): 500 plants observed by Marriott; population estimated at 10,000+ vegetative plants in 10 colonies. Density of 2.02-3.8 plants per square meter recorded at 2 monitoring transects. Bench along third tributary draw of Henrys Fork subpopulation (Sec 27, 34-35): 20-100 plants observed at each of 3 colonies. Plants all widely scattered and less dense than other sites. Population size estimated at 5000-10000 plants.

1988-08-04: McKinnon Dump colonies (Sec 32): Observed in late flower and fruit by Jim Locklear. Occurs with *Cryptantha caespitosa*.

1981-05-08/10: 15218 plants counted in 5

main subpopulations by Whiskey Basin Consultants (R. Lichvar). Total population estimated to be ca 22000. Plants in fruit and flower. Occurs with *Hymenoxys*, *Elymus*, and *Cryptantha*. McKinnon Dump colonies (Sec 31-32): 7207 plants counted (9155 estimated) at 5 colonies. Ridge east of Sweetwater County Highway 1 (Sec 33-34): 3220 plants counted on 33 acres. Population estimated at 5367 plants. Mesa along third draw east of Sweetwater Highway 1 (Sec 27, 35-35): 2527 plants counted in 45 acres; total population estimated at 3487. Powerline Ridge (Sec 25-26,36): 1185 plants counted, population estimated at 2428. Bench 4-4.25 miles east of Sweetwater Highway 1: 1079 plants counted (population estimated at 1482).

1980-06-04: McKinnon Dump colonies (Sec 32): Observed in flower by Lichvar and R. Dorn. Reported as "frequent". Occurs with *Senecio*, *Elymus*, and *Gilia*.

1979-06-28: McKinnon Dump colonies (Sec 32): Observed In flower and fruit by R. Dorn. Occurs with *Cryptantha* and *Haplopappus*.

1979-05-24: Sec 33 colonies: Observed in flower by R. Lichvar. Occurs with *Cryptantha* and *Artemisia*.

1978-06-16: Sec 33 colonies: Observed in flower by Dorn and Lichvar. Population estimated at 500-600 individuals. Occurs with *Arenaria* and *Sphaeralcea coccinea*, *Cryptantha caespitosa*, *Atriplex confertifolia*, *Arenaria hookeri*, *Ipomopsis*, *Hordeum jubatum*, *Artemisia frigida*, and *A. tridentata*.

1976-07-22: Observed in fruit (with seeds) by Marvin Roberts.

1976-05-31: Collected in full flower by M. Roberts.

1976-04-30: Sec 32 or 33 colonies: Site visited by M. Roberts, plants just starting to flower.

1966-06-05: McKinnon population revisited by Rupert Barneby.

1961-06-12: Observed in late flower and fruit by R. Barneby.

Habitat

Habitat: Cushion plant/bunchgrass communities dominated by *Phlox hoodii*, *Haplopappus nuttallii*, *Cryptantha sericea*, and *Elymus spicatus* in openings within Big sagebrush or Utah juniper grasslands on summit flats, rims, and upper slopes of flat-topped bluffs and ridges. Soils pale, fine-textured white calcareous shale clays with coarser cobbles and volcanic rocks derived from the Bridger Formation.

Elevation: 6700-7100 feet

Size: 310 acres

Comments: This EO includes former EOR # 002, 003, 005, and 006 (included in Marriott's 1989 status survey). These have been combined because of their close proximity to each other and the absence of obvious discontinuities between populations. All are included in the area discussed for possible ACEC designation by Marriott.

Managed Area: BLM Rock Springs Field Office (Special Status Plant Species Area of Critical Environmental Concern) and State of Wyoming

Mgmt Comments: Monitoring program at 5 sites (3 along powerline ridge and 2 at McKinnon dump) established by Marriott in 1989 (see report for details).

Specimens:

Lichvar, R.W. (1712). 1979; (2767, 2769,

2967, 2969). 1980; (3967, 3968, 3969, 3970, 3971, 3975, 3978). 1981. RM.
Dorn, R. D. (3062). 1978; (3293). 1979. RM.
Barneby, R. (13185). 1961. CAS (Holotype), RM, GH, NY, US, RSA (Isotypes); (14372). 1966. US.
Roberts, M.L. (4511, 4583, 4700). 1976. RM.
Locklear, J. (117). 1988. RM.
Marriott, H. (11006, 11007). 1989. MSU (vouchers for DNA study).
Nelson, B.E. (35133). 1995. RM.

Sources:

Barneby, R. C. 1964. Atlas of North American *Astragalus*. Memoirs of the New York Botanical Garden 13(II):1-1188.

Fertig, W., L. Welp, and S. Markow. 1998. The status of rare plants in southwest Wyoming. Report prepared for the Bureau of Land Management by the Wyoming Natural Diversity Database, Laramie, WY.

Marriott, H.J. 1988. Draft habitat management plan for threatened, endangered and sensitive plant species and their habitats on the Rock Springs District, Bureau of Land Management. Prepared for the Bureau of Land Management by the Wyoming Natural Diversity Database, Laramie, WY.

Marriott, H.J. 1989. Inventory and monitoring of *Astragalus proimanthus* (Precocious

milkvetch). Prepared for the Bureau of Land Management, Rock Springs District by the Wyoming Natural Diversity Database.

Refsdal, C.H. 1996. A general floristic inventory of southwest Wyoming and adjacent northeast Utah, 1994-1995. Report prepared for the Bureau of Land Management Wyoming State Office, Bureau of Land Management Vernal Supervisor's Office, US Fish and Wildlife Service, and US Forest Service Region 4 by the University of Wyoming, Rocky Mountain Herbarium, Laramie, WY.

Roberts, M. L. 1977. Systematics of the *Orophaca* Astragali. Masters Thesis, Department of Botany, University of Wyoming, Laramie, WY.

USDI Bureau of Land Management. 1997. Record of Decision and Green River Resource Management Plan. Bureau of Land Management Rock Springs District Office.

Whiskey Basin Consultants. 1981. Threatened and Endangered Plants Inventory. Unpublished report prepared for the Wyoming Bureau of Land Management.

Author: Walter Fertig
Edition Date: 01-01-25

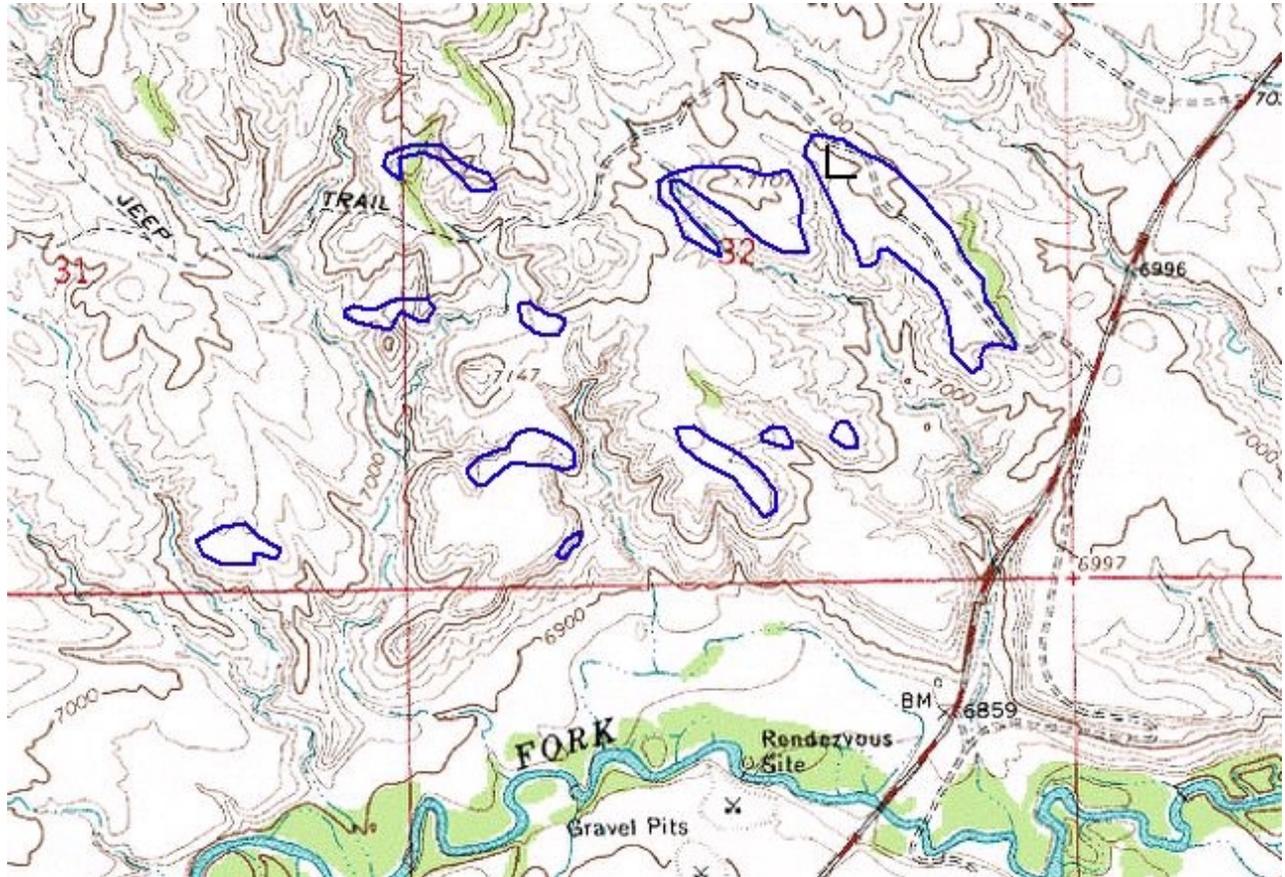
Astragalus proimanthus Occurrence # 001

McKinnon Quad

T13N R111W S31-32

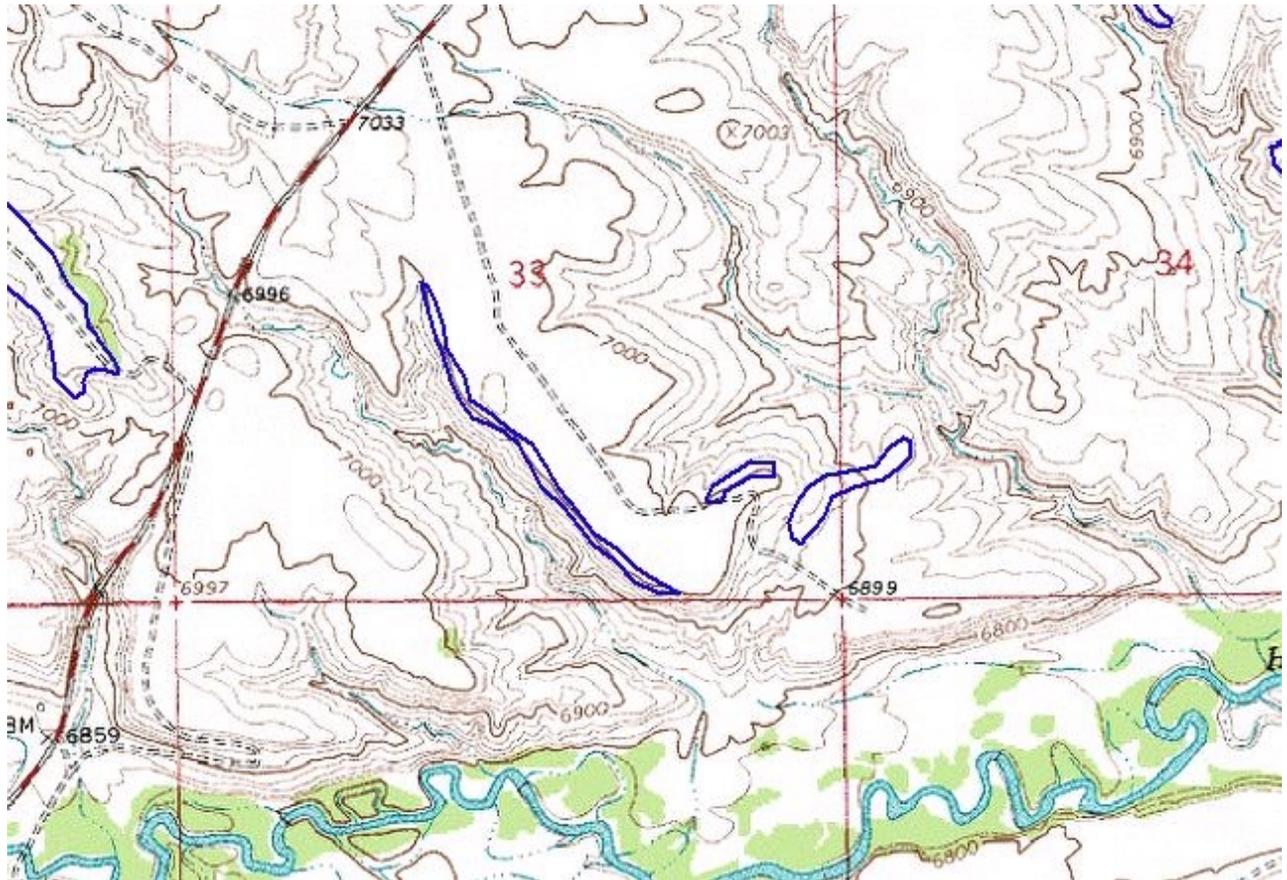
First bench southwest of McKinnon Dump.

Monitoring transects 4 (N-S) and 5 (E-W) are located at "L" in the NE corner of Sec 32



Astragalus proimanthus Occurrence # 001
McKinnon Quad
T13N R111W S33-34

Bench bordering the first tributary of the Henry's Fork, ca 1 mile E of Sweetwater County Rd 1.

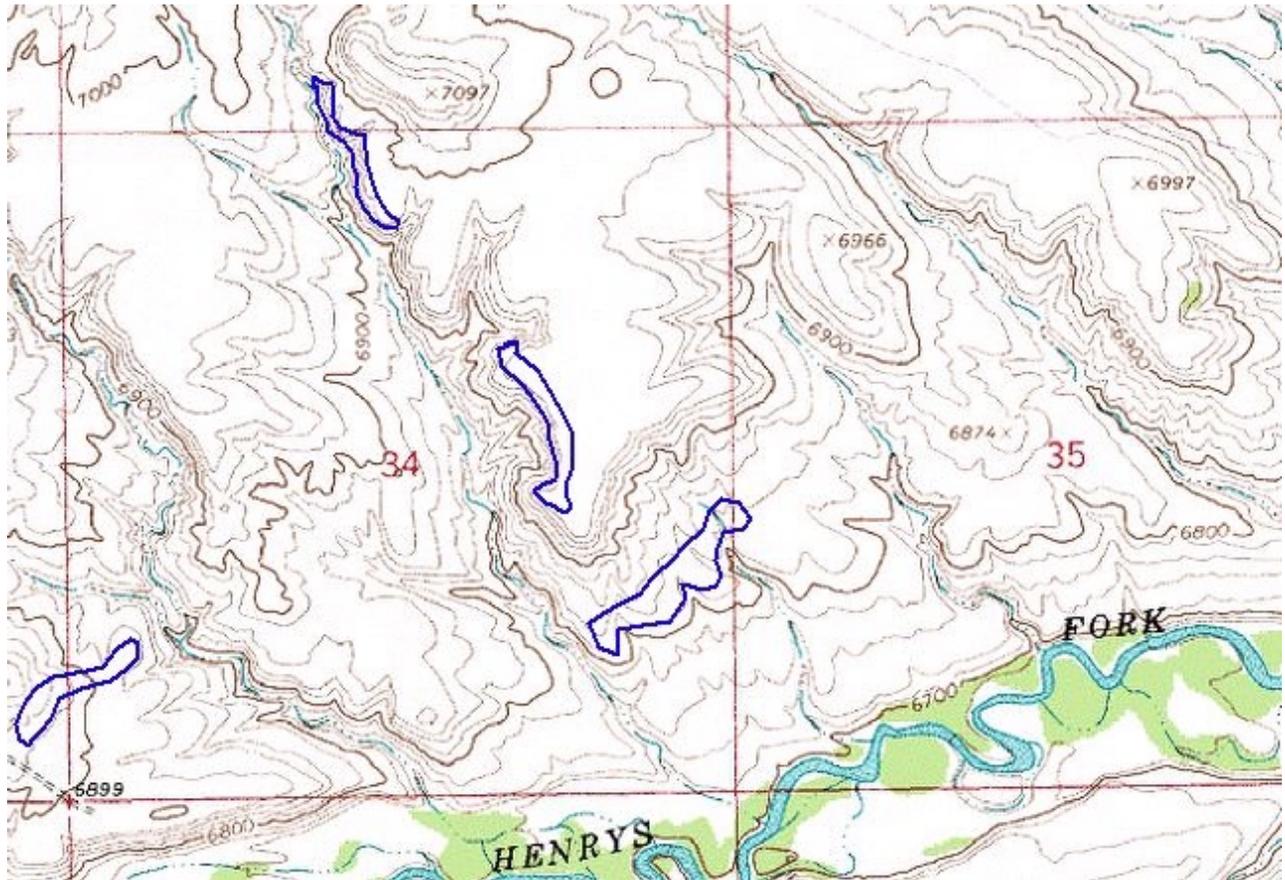


Astragalus proimanthus Occurrence # 001

McKinnon Quad

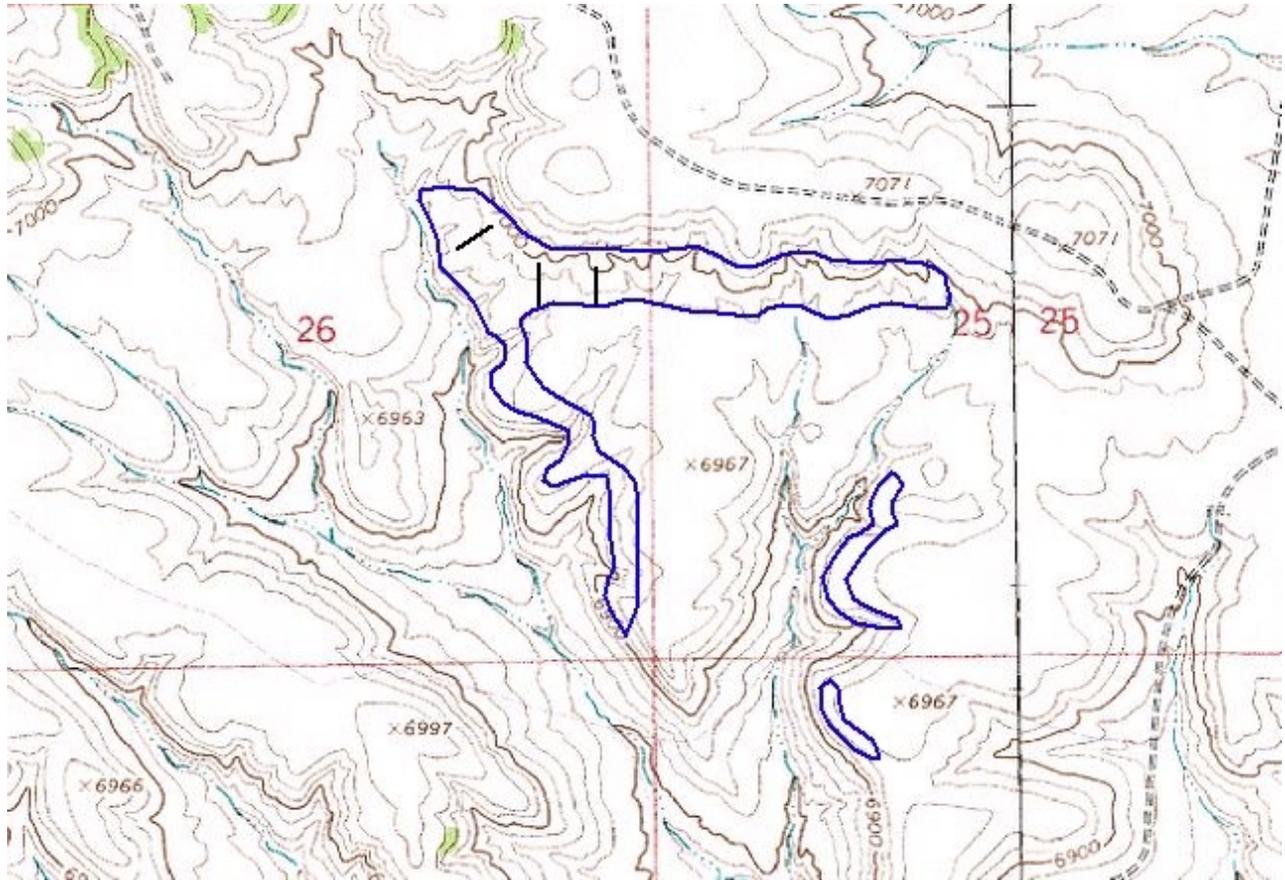
T13N R111W S27, 34-35

Bench along third major tributary of the Henry's Fork, E of Sweetwater County Rd 1.

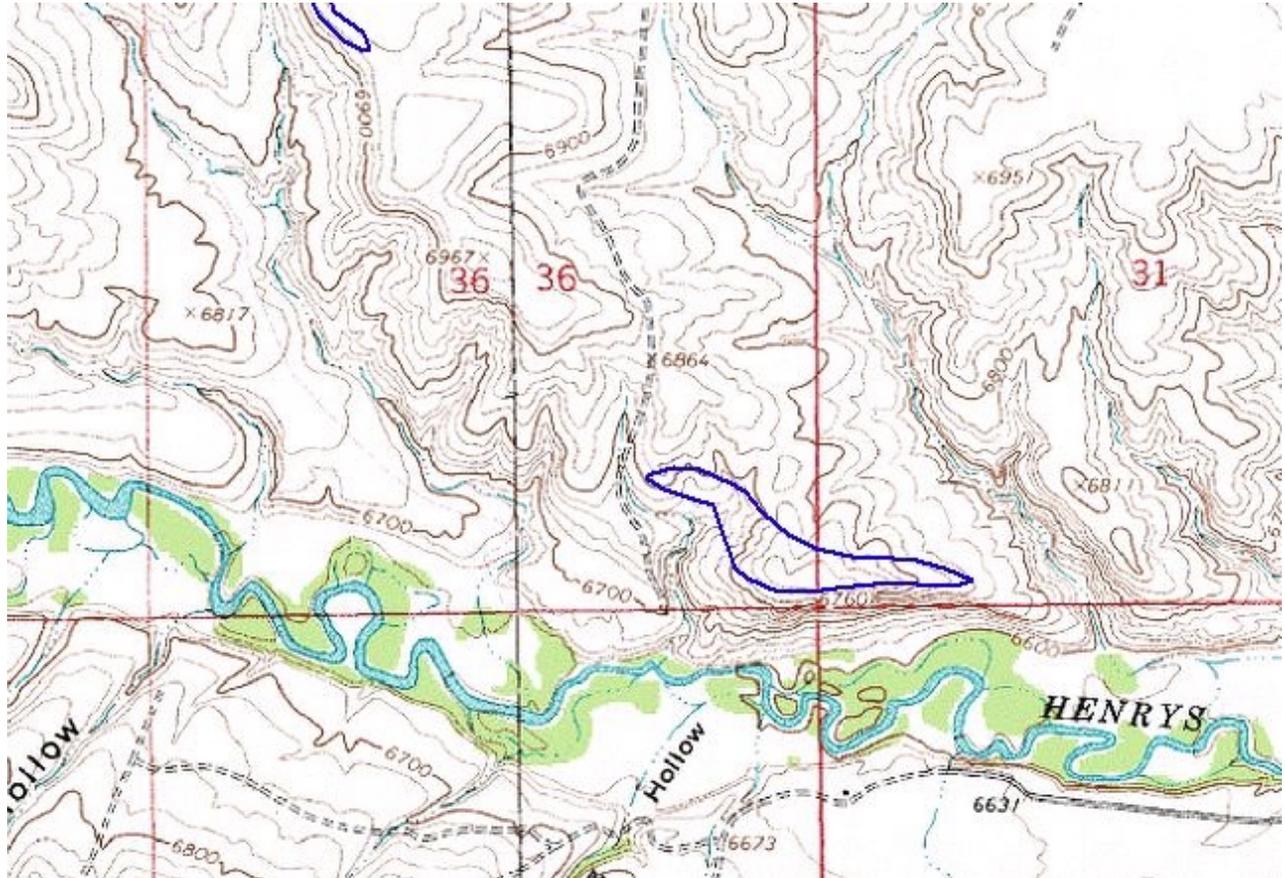


Astragalus proimanthus Occurrence # 001
McKinnon and Antelope Wash Quads
T13N R111W S25-26, 35-36
Powerline Ridge along upper reach of fourth tributary of the Henry's Fork,
E of Sweetwater County Rd 1.

Monitoring Transects 1, 2, 3 are located in NE4 of Sec 26. Transect 1 is the westernmost, and
Transect 3 is the easternmost



Astragalus proimanthus Occurrence # 001
McKinnon and Antelope Wash Quads
T13N R111W S36; T13N R110W S31
Bench 4-4.25 miles E of Sweetwater County Rd 1.



WYOMING NATURAL DIVERSITY
DATABASE

-Element Occurrence Record-

ASTRAGALUS PROIMANTHUS
PRECOCIOUS MILKVETCH
Occurrence # 004

Status

Data Sensitive?: No

Identification verified: Yes

TNC Global Rank: G1

WYNDD State Rank: S1

Federal Status: None; former C2 candidate for listing under the Endangered Species Act; BLM Rock Springs Field Office Special Status plant; Proposed BLM State Sensitive (2001).

WY Distribution Note: State endemic

Location

County: Sweetwater

USGS Quad Name: McKinnon

Latitude: 410604N

Longitude: 1095311W

Map Accuracy: Precise; location is within a 75 foot radius of point on USGS topo map.

Town/Range/Section: T13N R111W S14 (SE4SE4SE4).

Location: Southern Green River Basin, ca 0.1 air miles south of the South Fork of the North Fork of Lane Meadow Creek and ca 0.5 air miles southeast of Sweetwater County Highway 1, about 6 miles north-northeast of McKinnon.

Population Data

Last Observed: 2000-06-13

First Observed: 1946-06-13

Data: 2000-06-13: Nine plants counted by Laura Welp (95% in late flower and 5% vegetative) in an area ca 5m x 10m.

Associated species include *Hordeum jubatum* and *Artemisia frigida*. Absent from adjacent

0.5 miles radius.

1946-06-13: Observed in late flower by Ripley and Barneby.

Habitat

Habitat: Base of gentle slope on edge of black sagebrush/greasewood flat with scattered juniper and *Grayia spinosa*. Soil is fine, rocky and derived from the Bridger Formation.

Elevation: 6950 feet

Size: 0.1 acres

Managed Area: BLM Rock Springs Field Office.

Comments: This occurrence represents the first collection site for this species since 1946. Surveyors in 1979-81 and 1989 were unable to relocate the population. This occurrence is in the vicinity of EO # 001, but is in a separate drainage and is not connected by suitable habitat.

Specimens:

Ripley, H.D. and Barneby, R.C. (7913). 1946. RSA.

Welp, L. (8002). 2000. RM.

Sources:

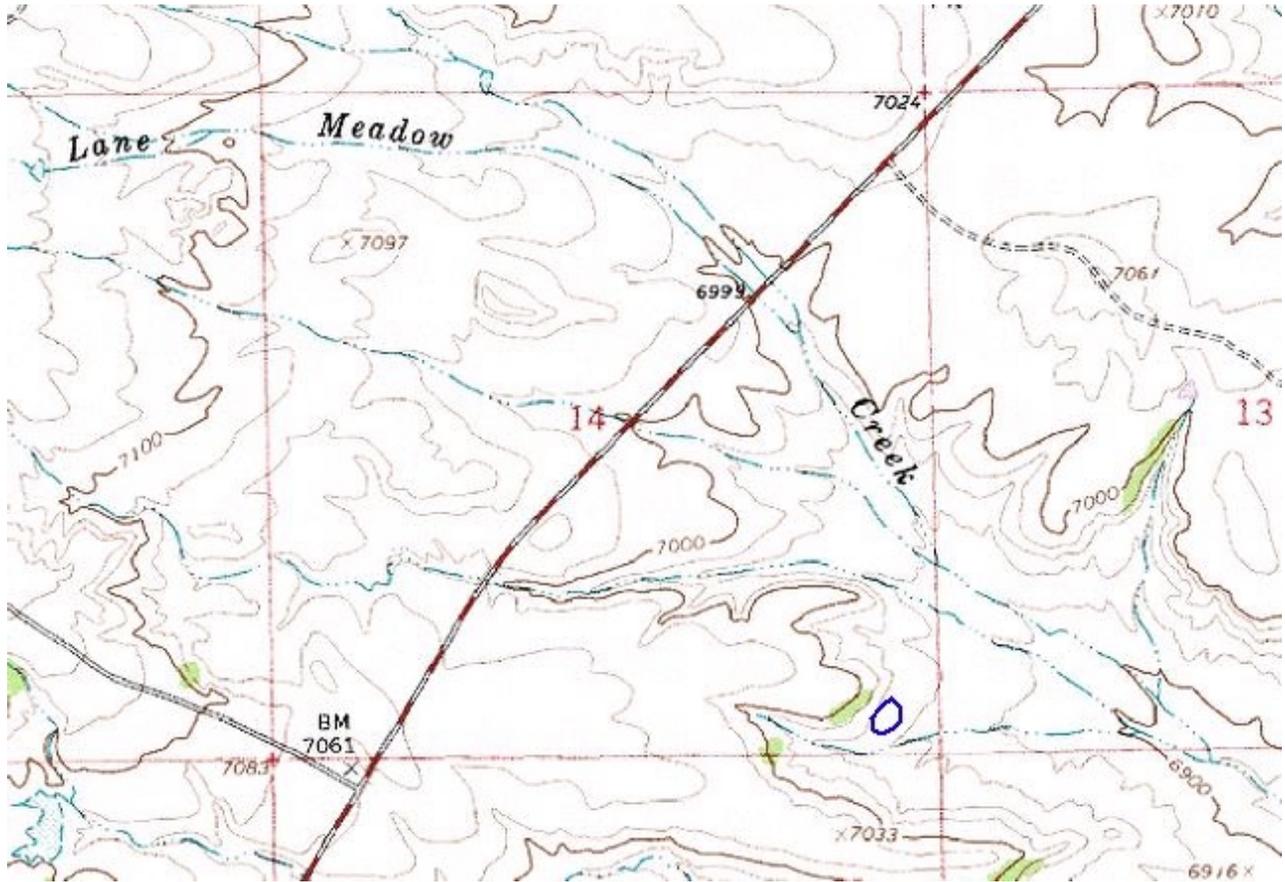
Barneby, R. C. 1964. Atlas of North American *Astragalus*. Memoirs of the New York Botanical Garden 13(II):1-1188.

Marriott, H.J. 1989. Inventory and monitoring of *Astragalus proimanthus* (Precocious milkvetch). Prepared for the Bureau of Land Management, Rock Springs District by the Wyoming Natural Diversity Database, Laramie, WY.

Author: Laura Welp

Edition Date: 01-01-08

Astragalus proimanthus Occurrence # 004
McKinnon Quad
T13N R111W S14



WYOMING NATURAL DIVERSITY
DATABASE

-Element Occurrence Record-

ASTRAGALUS PROIMANTHUS
PRECOCIOUS MILKVETCH
Occurrence # 007

Status

Data Sensitive?: No
Identification verified: Yes
TNC Global Rank: G1
WYNDD State Rank: S1
Federal Status: None; former C2 candidate for listing under the Endangered Species Act; BLM Rock Springs Field Office Special Status plant; Proposed BLM State Sensitive (2001).
WY Distribution Note: State endemic

Location

County: Sweetwater
USGS Quad Name: Linwood Canyon
Latitude: 410100N (centrum)
South Latitude: 410058N
North Latitude: 410112N
Longitude: 1094248W (centrum)
East Longitude: 1094233W
West Longitude: 1094249W
Map Accuracy: Precise; location is within a 75 foot radius of point on USGS topo map.
Town/Range/Section: T12N R109W S16 (SW4), S17 (NE4NE4 OF SE4).
Location: Green River Basin, east end of ridge on south side of BLM road paralleling the south bank of the Henrys Fork River, ca 1.5 air miles west of the mouth of Cottonwood Creek, ca 3 air miles northwest of Linwood Bay, ca 11 air miles east of McKinnon and 1.3 miles north of Manila.

Population Data

Last Observed: 2000-06-14

First Observed: 2000-06-14

Data: 2000-06-14: Population consists of 4 small colonies in an area of 0.3 x 0.2 miles. Total population estimated at 450 plants. Ridge populations (farthest from road): 174 plants observed by Laura Welp (250 estimated), with 70% in late flower and fruit and 30% vegetative. Roadside populations: 179 plants observed (200 estimated) in a 20 x 10 meter area. Distribution patchy, and not all suitable habitat is occupied. Occurs with *Cryptantha caespitosa*, *Gutierrezia sarothrae*, *Eriogonum umbellatum*, and *Haplopappus nuttallii*.

Habitat

Habitat: Openings in *Artemisia tridentata* var. *wyomingensis*/*Juniperus osteosperma* community mostly on rims, flats, and low south-facing slopes. Soil shallow and banded red and brown, with a high percentage of clay and surface gravel and derived from the Laney member of the Green River Formation. Elevation: 6400-6600 feet
Size: 2 acres.

Comments: This occurrence is located nearly 8.5 miles southeast of the main population along the bluffs of the Henry's Fork River north of McKinnon.

Mgmt Comments: Area was staked for seismic exploration in June 2000.

Managed Area: BLM Rock Springs Field Office

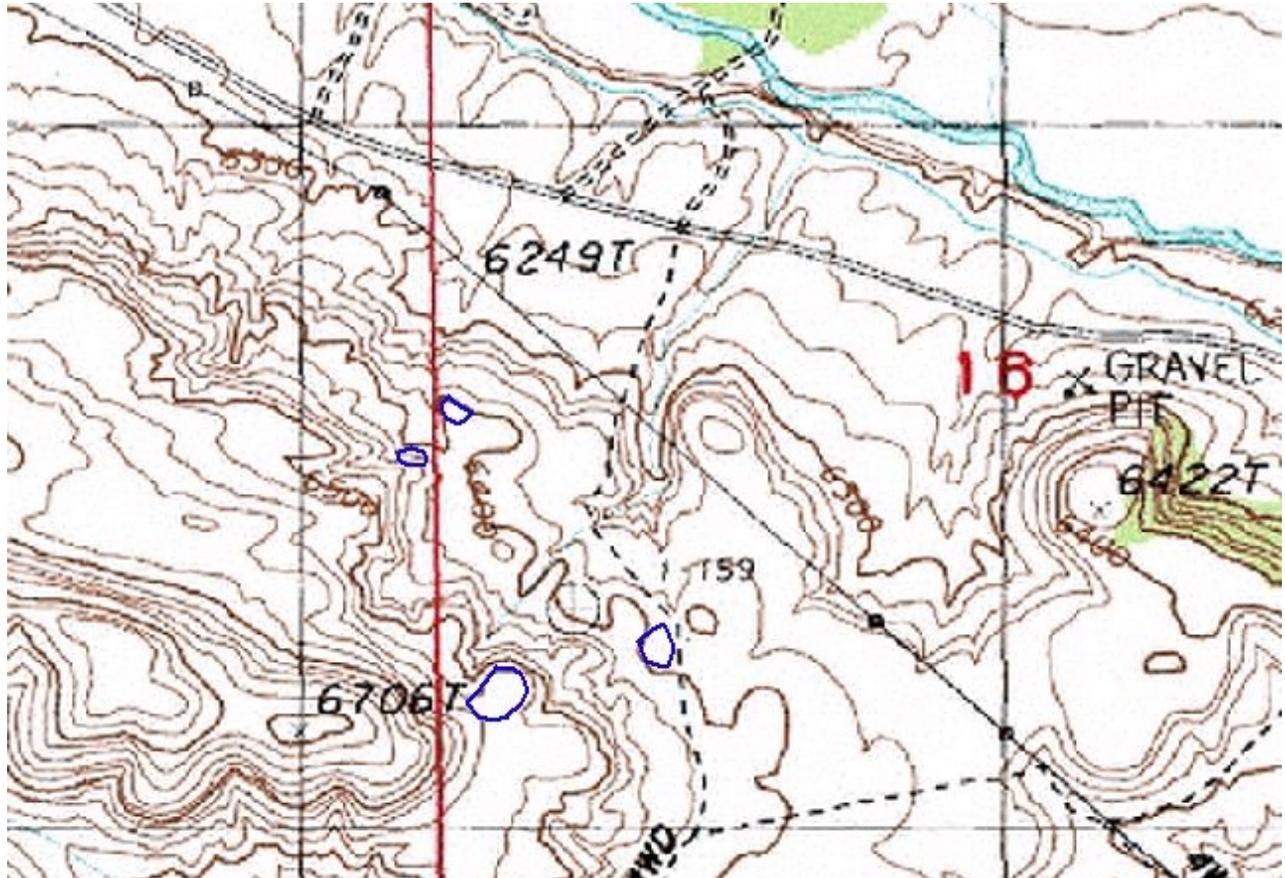
Specimens:

Welp, L. (8005). 2000. RM.

Author: Laura Welp

Edition Date: 01-01-08

Astragalus proimanthus Occurrence # 004
Linwood Canyon Quad
T12N R109W S16-17



Appendix B.

Survey Routes

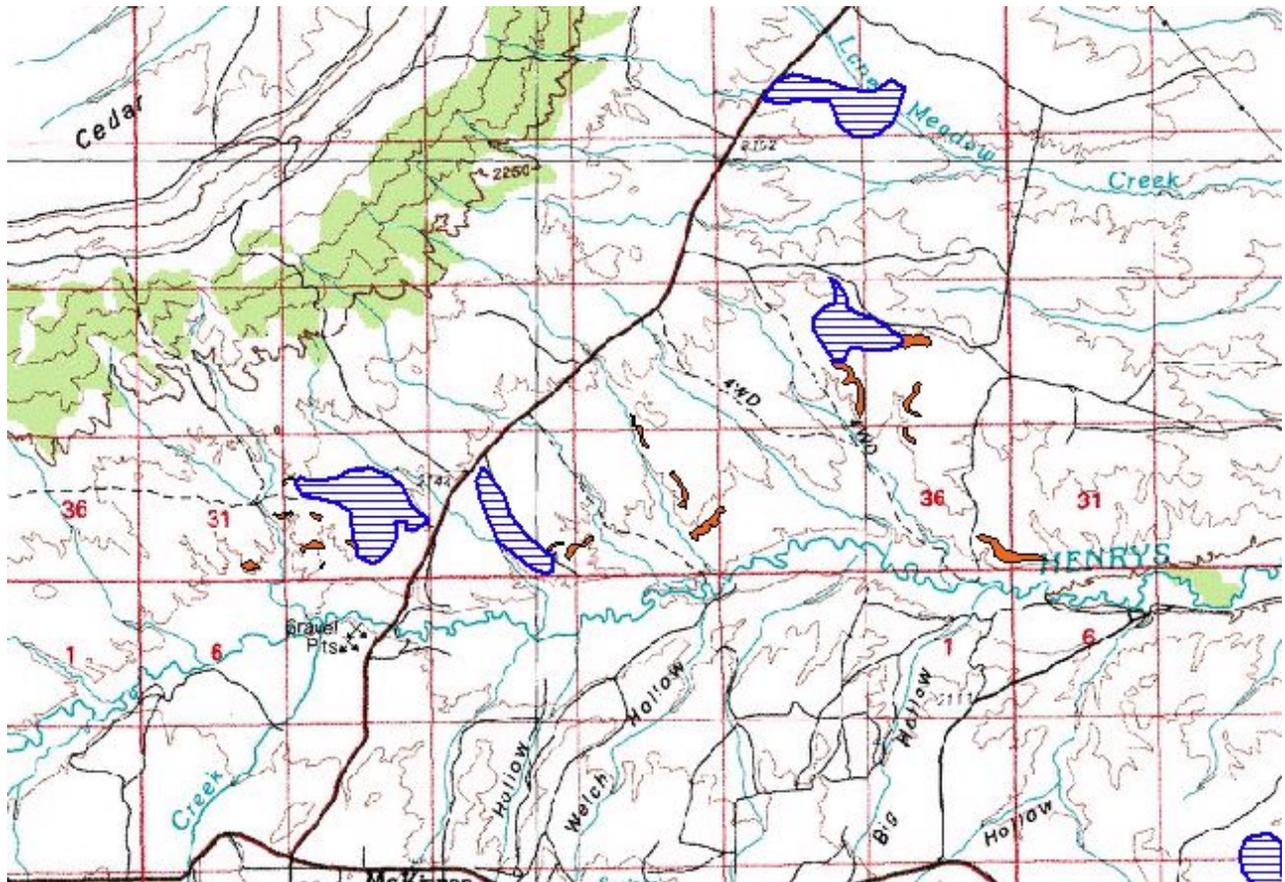
Surveys for Precocious milkvetch were conducted by Laura Welp in June 2000. Potential areas for survey were determined from BLM land management maps and USGS topographic maps based on the presence of suitable habitat on accessible public lands. Surveyed locations are depicted on the accompanying maps and are summarized below:

Surveyed Sites 2000 (see the following maps for exact locations)

DATE	SURVEYOR	COORDINATES	<i>A. PROIMANTHUS</i> FOUND?
11 June 2000	Laura Welp	T12N R111W S23-24	No
12 June 2000	Laura Welp	T12N R110W S18-20	No
12 June 2000	Laura Welp	T12N R110W S17, 20	No
12 June 2000	Laura Welp	T12N R110W S9, 16	No
12 June 2000	Laura Welp	T12N R109W S7, 18	No
12 June 2000	Laura Welp	T12N R110W S8, 17	No
12 June 2000	Laura Welp	T12N R110W S18	No
12 June 2000	Laura Welp	T13N R111W S13-14	Yes
13 June 2000	Laura Welp	T13N R111W S25-26	Yes
13 June 2000	Laura Welp	T13N R111W S33	Yes
13 June 2000	Laura Welp	T13N R111W S32	Yes
13 June 2000	Laura Welp	T12N R110W S18	No
13 June 2000	Laura Welp	T12N R111W S15-16	No
14 June 2000	Laura Welp	T12N R110W S16-17	No
14 June 2000	Laura Welp	T12N R109W S16-17	Yes

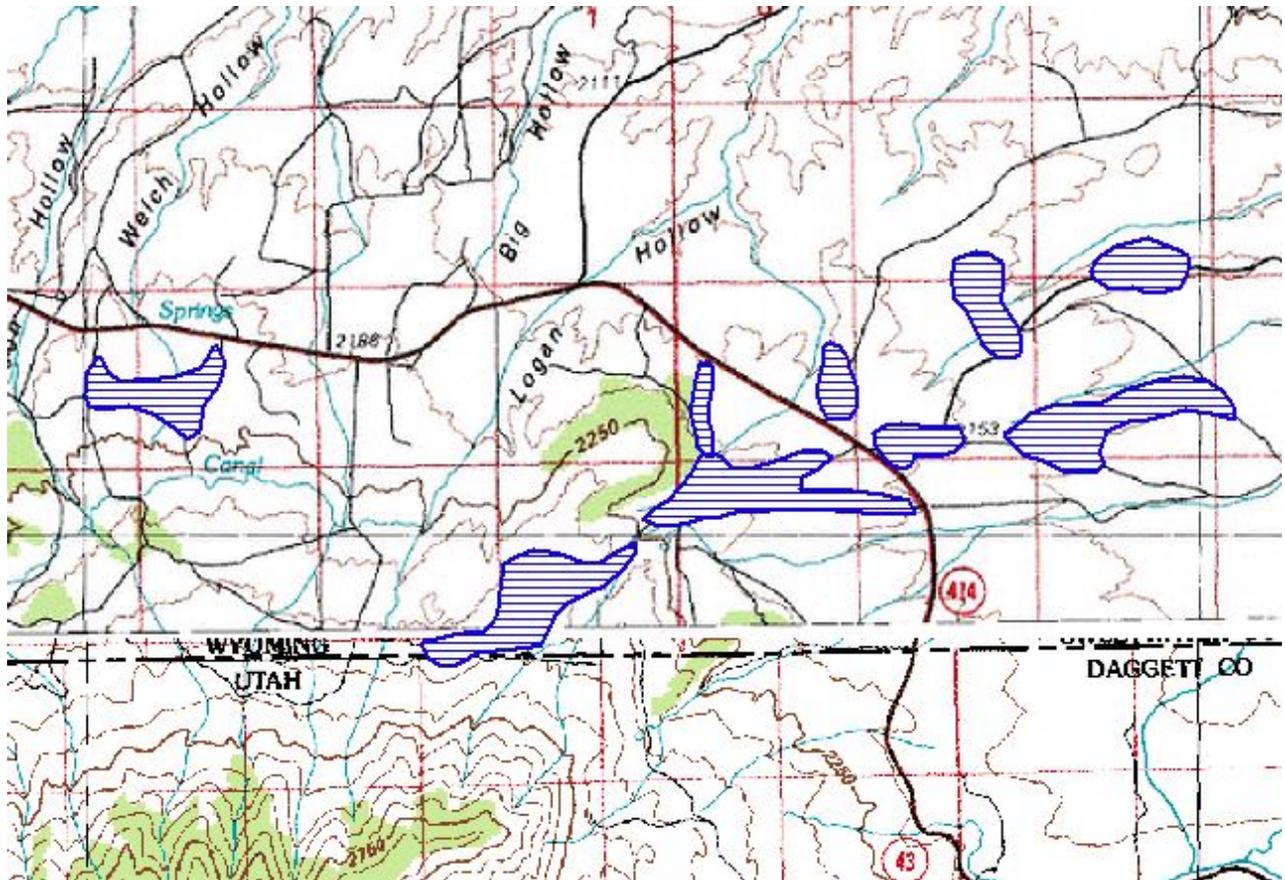
2000 Survey Routes
Firehole Canyon BLM 1:100,000 Quad
T12-13N R110-112W

Blue hatching = 2000 survey route
Orange polygons = colony of *Astragalus proimanthus*



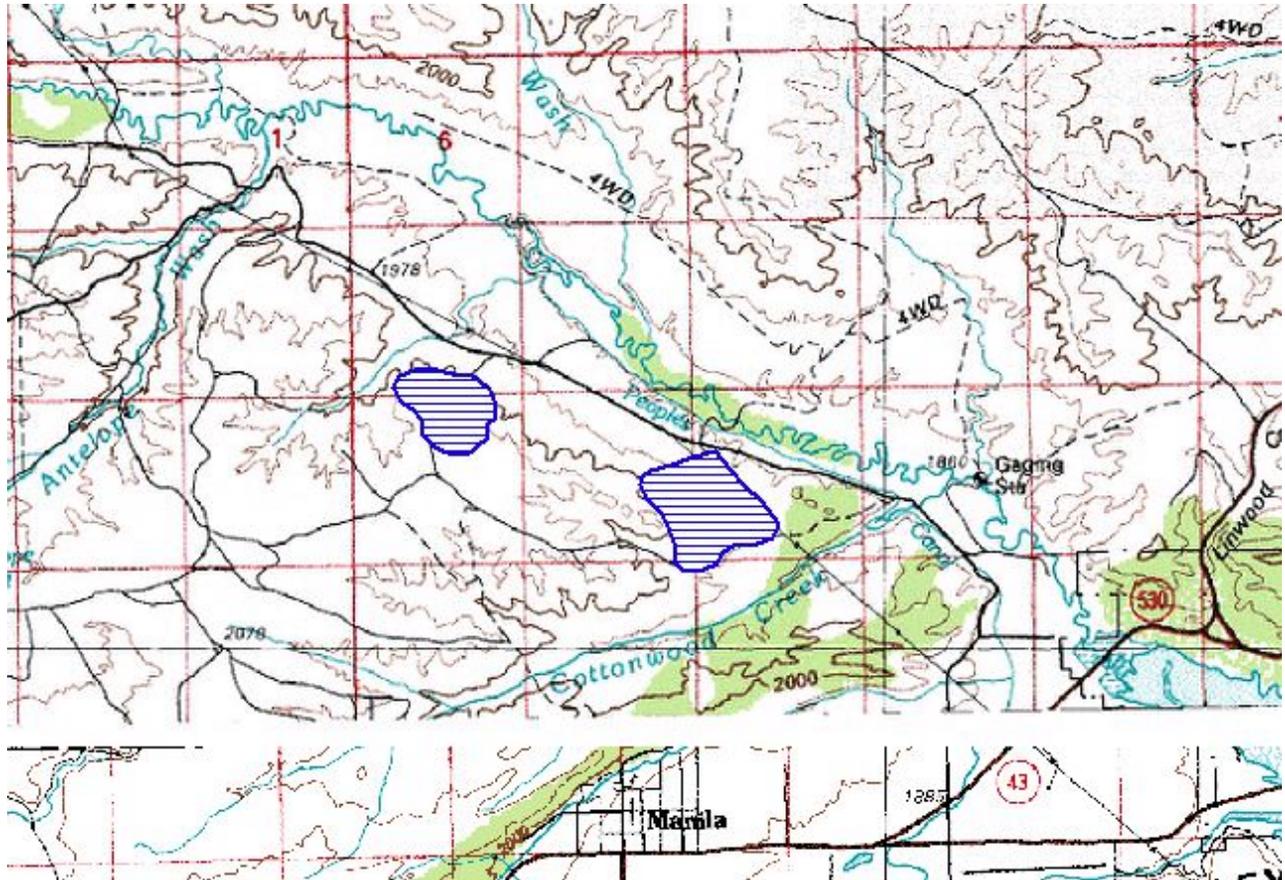
2000 Survey Routes
Firehole Canyon and Manila (Utah) BLM 1:100,000 Quads
T12N R110-111W

Blue hatching = 2000 survey route
Orange polygons = colony of *Astragalus proimanthus*



2000 Survey Routes
Firehole Canyon and Manila (Utah) BLM 1:100,000 Quads
T12-13N R109-110W

Blue hatching = 2000 survey route
Orange polygons = colony of *Astragalus proimanthus* (4 small colonies in T12N R109W S16-17
are difficult to see at this scale)



Appendix C.

2000 Demographic Monitoring Data for *Astragalus proimanthus*

Transect Locations:

Transect # 1

County: Sweetwater.

Occurrence: # 001 (map page 27).

Legal Description: T13N R111W S26 SE4 of NE4 (Powerline Ridge subpopulation).

Transect Bearing (from 0 towards 50 m): 220.5° magnetic north.

USGS Quad: McKinnon.

Directions: Follow 2-track that leaves east side of Sweetwater Highway 1 ca 5 road miles north of junction with WY State Highway 414 (on ridge between southernmost draw of Lane Meadow Creek and head of 5th tributary draw of Henry's Fork River). Proceed along 2-track, taking the first left after ca 0.5 miles, and the second right after the next 0.5 miles. Continue to point in road where the 2-track swings abruptly south. Proceed on foot to the SW to the rim of this ridge. Transects 1, 2, and 3 are all located along the south-facing slopes of this ridge (transect 1 is the westernmost of the three). Lat 41° 04' 55" N; Long 109° 53' 20" W.

Habitat: Cushion plant-bunchgrass community on pale, fine-textured calcareous shale on rim.

Comments: This site could not be relocated in June 2000, possibly because the marker stakes had been removed.

Transect # 2

County: Sweetwater.

Occurrence: # 001 (map page 27).

Legal Description: T13N R111W S26 SE4 of NE4 (Powerline Ridge subpopulation).

Transect Bearing (from 0 towards 50 m): 205° magnetic north.

USGS Quad: McKinnon.

Directions: See above. Transect 2 is between transects 1 and 3. Lat 41° 04' 51" N; Long 109° 53' 15" W. Photo page 38.

Habitat: Cushion plant-bunchgrass community on pale, fine-textured calcareous shale on rim.

Transect # 3

County: Sweetwater.

Occurrence: # 001 (map page 27).

Legal Description: T13N R111W S26 SE4 of NE4 (Powerline Ridge subpopulation).

Transect Bearing (from 0 towards 50 m): 176° magnetic north.

USGS Quad: McKinnon.

Directions: See description for Transect # 1. Transect 3 is the easternmost of the three transects on this ridge. Lat 41° 04' 47" N; Long 109° 53' 07" W.

Habitat: Cushion plant-bunchgrass community on pale, fine-textured calcareous shale on rim.



Above: View of Transect # 2 (Powerline Ridge) from terminus (red flag at center) to northeast (origin), T13N R111W S26 SE4 of NE4. Photo by Hollis Marriott, 15 June 1989.

Transect # 4

County: Sweetwater.

Occurrence: # 001 (map page 24).

Legal Description: T13N R111W S32 SW4 of NE4 (McKinnon dump subpopulation).

Transect Bearing (from 0 towards 50 m): 2° magnetic north.

USGS Quad: McKinnon.

Directions: Follow the 2-track adjacent to the corral on the west side of Sweetwater County Highway 1, located ca 0.75 road miles north of the Henry's Fork River. Continue up the hill (past the single switchback) for ca 0.45 miles. Transects are located just south of the 2-track near a gentle bend. Lat 41° 03' 49" N; Long 109° 56' 48" W. Photo page 39.

Habitat: Cushion plant-bunchgrass community on pale, fine-textured calcareous shale on rim.

Transect # 5

County: Sweetwater.

Occurrence: # 001 (map page 24)

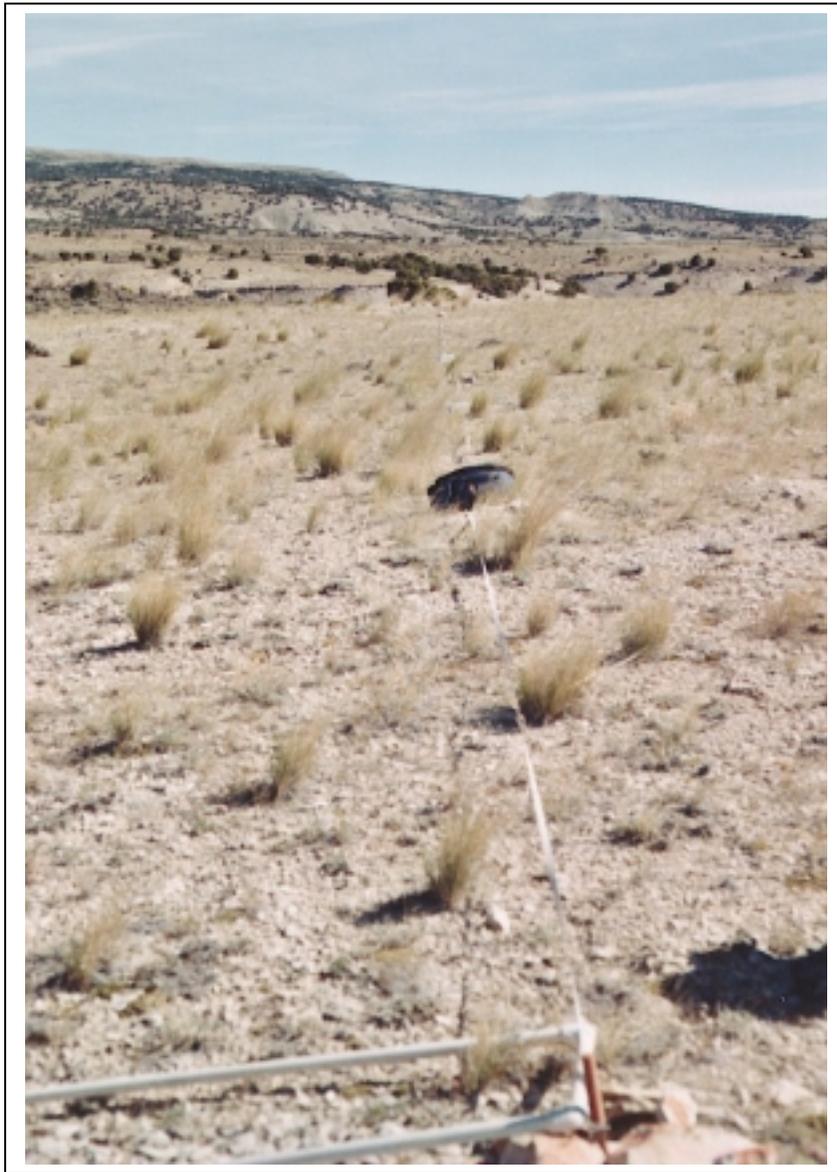
Legal Description: T13N R111W S32 SW4 of NE4 (McKinnon dump subpopulation).

Transect Bearing (from 0 towards 50 m): 63° magnetic north.

USGS Quad: McKinnon.

Directions: See directions for Transect # 4.

Habitat: Cushion plant-bunchgrass community on pale, fine-textured calcareous shale on rim.



Above: Transect 4 from origin to north, on bench southwest of McKinnon dump (T13N R111W S32 SW4 of NE4). Photo by Laura Welp, 13 June 2000.

Sampling Method: Five permanent 50 x 1 meter belt transects were established by Hollis Marriott (1989) following the protocol of Lesica (1987). Plots were selected subjectively at known *A. proimanthus* colonies to reflect “typical” density and habitat conditions. Starting points were marked by re-bar and low rock piles, with 3 located along the Powerline Ridge and 2 near the McKinnon Dump. For each transect, 50 1 x 1 meter plots were framed by meter sticks and read from the left side of the baseline tape. In each plot, data were collected on the number of living and dead rosettes. This method is not intended to derive population estimates, but rather to elucidate density, trend, and survivorship patterns and to serve as an early-detection system for possible management changes if there are rapid and significant declines (Marriott 1989).

Summary of Results: At the Powerline Ridge site, 2 of 3 transects have shown a long-term increase in numbers and density, while a third (#1) declined 7% from 1989-1998 and could not be relocated in 2000. Frequency data show shifts in distribution within transects, with some areas being abandoned, and new areas being colonized. These data suggest that the longevity of individual plants may be shorter than predicted. Short-term oscillations in population size can be seen at Transect # 2, where numbers and frequency dropped significantly between 1989-1998, but then increased sharply by 2000 (this transect showed a net increase of 9% in density and 4% in frequency over a 12-year span). Transect 3 has shown the greatest increase in numbers, nearly tripling in size and frequency in 12 years.

The McKinnon dump transects show declines in abundance over time. BLM personnel first reported a 12% decline in 1993-94 at this site. Transect # 4 in particular has been showing a steady decline over 12 years, with overall numbers down 43% and frequency down 14%. Transect 5 has shown more of an oscillating pattern, with numbers increasing between 1989-1998 and then decreasing by 2000. Long-term numbers in this transect show a decline in density of 8.5%, but a net increase in frequency of 13.5%.

Recommendations: Monitoring data from 5 permanent plots over a 12 year period reflects both localized increases and decreases in population size, density, and frequency of *A. proimanthus* at Powerline Ridge and the McKinnon Dump area. Frequency data show a surprising degree of variability in spatial distribution in this species, something unexpected in a supposedly long-lived mat-forming perennial. Individual rosettes should be tagged in the future to assess their longevity. Continued monitoring is desirable to detect continued changes in population trend that might indicate a need for different management approaches. Transects or qualitative monitoring should be established at the two new sites documented by Laura Welp in 2000 (Occurrences 004 and 007).

Astragalus proimanthus
Transect # 1 Census Data

June 2000
Plot could not be relocated

3 June 1998
Surveyor: Barbara Amidon

15 June 1989
Surveyor: Hollis Marriott

Plot #	# Live	# Dead	Plot #	# Live	# Dead	Plot #	#Live	# Dead
1	X	X	1	3	0	1	2	0
2	X	X	2	4	0	2	0	0
3	X	X	3	3	0	3	0	0
4	X	X	4	3	0	4	1	0
5	X	X	5	4	0	5	2	0
6	X	X	6	2	0	6	1	0
7	X	X	7	3	0	7	0	0
8	X	X	8	3	0	8	0	0
9	X	X	9	3	0	9	1	1
10	X	X	10	5	0	10	0	0
11	X	X	11	5	0	11	4	0
12	X	X	12	2	0	12	1	0
13	X	X	13	5	0	13	4	0
14	X	X	14	4	0	14	3	0
15	X	X	15	2	0	15	1	0
16	X	X	16	1	0	16	3	0
17	X	X	17	2	0	17	3	0
18	X	X	18	3	0	18	0	0
19	X	X	19	1	0	19	2	1
20	X	X	20	1	0	20	2	0
21	X	X	21	2	0	21	2	0
22	X	X	22	3	0	22	6	0
23	X	X	23	0	0	23	6	1
24	X	X	24	1	0	24	4	1
25	X	X	25	0	0	25	1	0
26	X	X	26	0	0	26	5	0
27	X	X	27	0	0	27	3	1
28	X	X	28	2	0	28	0	1
29	X	X	29	1	0	29	1	2
30	X	X	30	1	0	30	3	0
31	X	X	31	0	0	31	0	0
32	X	X	32	0	0	32	0	0
33	X	X	33	0	0	33	0	0
34	X	X	34	0	0	34	1	0
35	X	X	35	0	0	35	0	0
36	X	X	36	0	0	36	0	0
37	X	X	37	0	0	37	0	0
38	X	X	38	0	0	38	0	0
39	X	X	39	0	0	39	4	2
40	X	X	40	0	0	40	2	0
41	X	X	41	0	0	41	2	0
42	X	X	42	0	0	42	1	1
43	X	X	43	4	0	43	1	0
44	X	X	44	0	0	44	1	0
45	X	X	45	1	0	45	0	0

46	X	X	46	3	0	46	7	0
47	X	X	47	4	0	47	6	1
48	X	X	48	0	0	48	0	0
49	X	X	49	0	0	49	0	0
50	X	X	50	0	0	50	1	0
TOTAL	X	X	TOTAL	81	0	TOTAL	87	12
Plants per sq. Meter	X	X	Plants per sq. meter	1.62	0*	Plants per sq. meter	1.74	0.24
Freqncy	X	X	Freqncy	60%	X	Freqncy	66%	X

* Dead plants may not have been counted in 1998 survey. Note on data sheet says "50% dead" in plots 1 and 2.

Note: "X" indicates plots not surveyed in 2000.

Amidon reported 61 of 81 plants in flower or fruit on 3 June 1998 (75.3%).

Astragalus proimanthus
Transect # 2 Census Data

13 June 2000
Surveyor: Laura Welp

3 June 1998
Surveyor: Barbara Amidon

15 June 1989
Surveyor: Hollis Marriott

Plot #	# Live	# Dead	Plot #	# Live	# Dead	Plot #	#Live	# Dead
1	10	0	1	3	0	1	1	0
2	4	0	2	1	0	2	0	1
3	5	0	3	0	0	3	1	0
4	1	0	4	1	0	4	1	0
5	1	0	5	1	0	5	3	0
6	0	0	6	0	0	6	2	0
7	3	0	7	2	0	7	0	0
8	3	0	8	0	0	8	1	0
9	1	0	9	3	0	9	1	0
10	3	0	10	0	0	10	1	1
11	4	0	11	0	0	11	0	0
12	1	0	12	2	0	12	1	0
13	7	0	13	1	0	13	0	0
14	2	0	14	0	0	14	0	0
15	0	0	15	0	0	15	1	0
16	1	0	16	1	0	16	2	0
17	6	0	17	0	0	17	1	0
18	1	0	18	3	0	18	2	0
19	1	0	19	0	0	19	3	0
20	3	0	20	3	0	20	5	0
21	1	0	21	1	0	21	1	0
22	2	0	22	1	0	22	4	0
23	3	0	23	0	0	23	3	0
24	2	0	24	2	0	24	1	0
25	1	0	25	2	0	25	4	0
26	2	0	26	1	0	26	7	0
27	1	0	27	4	0	27	2	0

28	2	0	28	3	0	28	2	0
29	4	0	29	3	0	29	10	0
30	1	0	30	4	0	30	5	0
31	0	0	31	7	0	31	3	0
32	0	0	32	2	0	32	0	0
33	1	0	33	5	0	33	1	0
34	0	0	34	0	0	34	0	0
35	1	0	35	0	0	35	1	0
36	0	0	36	0	0	36	0	0
37	0	0	37	0	0	37	1	0
38	1	0	38	1	0	38	0	1
39	1	0	39	1	0	39	2	0
40	4	0	40	0	0	40	3	0
41	3	0	41	0	0	41	2	0
42	2	0	42	0	0	42	0	0
43	2	0	43	0	0	43	2	0
44	2	0	44	0	0	44	1	1
45	0	0	45	0	0	45	2	0
46	2	0	46	1	0	46	0	0
47	4	0	47	1	0	47	1	1
48	1	0	48	1	0	48	2	0
49	1	0	49	0	0	49	2	0
50	0	0	50	2	0	50	2	1
TOTAL	101	0	TOTAL	63	0	TOTAL	90	6
Plants per sq. meter	2.02	0	Plants per sq. meter	1.26	*	Plants per sq. meter	1.80	0.12
Freqncy	82%	X	Freqncy	58%	X	Freqncy	78%	X

* Dead plants may not have been counted in 1998 survey. Note on data sheet says "50% dead" in plot 27.

Notes: Amidon reported 42 of 63 plants in flower or fruit on 3 June 1998 (66.6%). Welp observed 88 of 101 plants in flower or fruit on 13 June 2000 (87.1%).

Astragalus proimanthus
Transect # 3 Census Data

13 June 2000
Surveyor: Laura Welp

3 June 1998
Surveyor: Barbara Amidon

15 June 1989
Surveyor: Hollis Marriott

Plot #	# Live	# Dead	Plot #	# Live	# Dead	Plot #	#Live	# Dead
1	1	0	1	0	0	1	1	0
2	3	0	2	0	0	2	0	0
3	0	0	3	0	0	3	0	0
4	1	0	4	1	0	4	0	0
5	3	0	5	1	0	5	3	3
6	2	0	6	3	0	6	3	1
7	3	0	7	1	0	7	1	0
8	4	1	8	2	0	8	2	0
9	3	0	9	2	0	9	1	1
10	3	0	10	0	0	10	5	2

11	1	0	11	1	0	11	0	0
12	3	0	12	2	0	12	0	0
13	2	0	13	0	0	13	0	0
14	4	3	14	0	0	14	0	1
15	0	0	15	1	0	15	0	0
16	5	2	16	4	0	16	1	3
17	1	0	17	4	0	17	0	0
18	7	0	18	2	0	18	0	1
19	7	0	19	2	0	19	2	1
20	3	2	20	2	0	20	1	0
21	6	0	21	1	0	21	1	2
22	7	0	22	3	0	22	1	0
23	4	0	23	2	0	23	1	0
24	3	0	24	0	0	24	1	0
25	1	0	25	0	0	25	1	0
26	2	0	26	0	0	26	1	1
27	3	0	27	2	0	27	2	0
28	5	0	28	2	0	28	0	1
29	4	1	29	4	0	29	0	0
30	2	0	30	1	0	30	1	0
31	1	0	31	0	0	31	2	3
32	4	0	32	3	0	32	1	1
33	8	0	33	3	0	33	5	1
34	2	0	34	4	0	34	0	0
35	2	0	35	2	1	35	0	0
36	3	0	36	5	0	36	0	0
37	3	0	37	3	0	37	0	0
38	10	0	38	2	0	38	1	2
39	10	0	39	0	0	39	1	2
40	2	0	40	2	0	40	1	0
41	3	0	41	1	0	41	3	0
42	3	0	42	2	0	42	0	0
43	5	0	43	0	0	43	1	0
44	7	1	44	3	0	44	6	1
45	8	0	45	4	0	45	3	0
46	2	0	46	0	0	46	1	0
47	1	0	47	1	0	47	0	0
48	0	0	48	0	0	48	0	0
49	1	0	49	0	0	49	0	0
50	1	0	50	1	0	50	0	0
TOTAL	169	10	TOTAL	79	1	TOTAL	54	27
Plants per sq. meter	3.38	0.20	Plants per sq. meter	1.58	0.02*	Plants per sq. meter	1.08	0.54
Freqncy	94%	X	Freqncy	70%	X	Freqncy	58%	X

* Dead plants may not have been monitored at this site in 1998.

Notes: Amidon reported 61 of 79 plants in flower or fruit on 3 June 1998 (77.2%). Welp observed 161 of 169 plants in flower or fruit on 13 June 2000 (95.2%).

Astragalus proimanthus
Transect # 4 Census Data

13 June 2000
Surveyor: Laura Welp

1 June 1998
Surveyor: Barbara Amidon
& "LeAnn R."

15 June 1989
Surveyor: Hollis Marriott

Plot #	# Live	# Dead	Plot #	# Live	# Dead	Plot #	#Live	# Dead
1	1	0	1	0	0	1	1	0
2	0	0	2	0	0	2	0	0
3	0	0	3	0	0	3	0	0
4	0	0	4	0	0	4	1	0
5	0	0	5	0	0	5	1	0
6	0	0	6	1	0	6	0	0
7	0	1	7	1	0	7	2	0
8	0	0	8	0	0	8	0	0
9	1	1	9	0	0	9	0	0
10	1	0	10	3	0	10	1	0
11	1	2	11	7	0	11	1	0
12	3	2	12	5	0	12	2	0
13	7	4	13	0	0	13	4	1
14	3	3	14	1	0	14	6	1
15	3	0	15	2	0	15	1	0
16	3	0	16	0	0	16	5	0
17	2	0	17	2	0	17	0	0
18	0	0	18	2	0	18	0	0
19	3	0	19	2	0	19	0	0
20	2	0	20	10	0	20	2	0
21	0	0	21	7	0	21	0	0
22	1	0	22	9	0	22	1	1
23	0	0	23	5	0	23	0	0
24	0	0	24	4	1	24	2	0
25	0	0	25	4	0	25	0	0
26	3	0	26	1	0	26	1	0
27	3	0	27	2	0	27	6	0
28	2	0	28	4	0	28	12	0
29	4	0	29	1	0	29	9	0
30	7	2	30	1	0	30	6	0
31	6	2	31	0	0	31	15	0
32	1	0	32	0	0	32	6	0
33	1	0	33	1	0	33	3	0
34	0	0	34	0	0	34	0	0
35	1	0	35	0	0	35	0	0
36	0	0	36	2	0	36	0	0
37	0	0	37	0	0	37	1	0
38	0	0	38	1	0	38	4	0
39	0	0	39	0	0	39	5	1
40	3	0	40	0	0	40	10	0
41	10	2	41	X	X	41	3	1
42	X	X	42	X	X	42	9	1
43	X	X	43	X	X	43	12	0
44	X	X	44	X	X	44	18	1

45	X	X	45	X	X	45	9	0
46	X	X	46	X	X	46	12	0
47	X	X	47	X	X	47	3	1
48	X	X	48	X	X	48	7	0
49	X	X	49	X	X	49	4	0
50	X	X	50	X	X	50	9	0
TOTAL	72	20	TOTAL	78	1	TOTAL	194	8
Plants per sq. meter	1.75	0.49	Plants per sq. meter	1.95	0.025*	Plants per sq. meter	3.88 (2.70 for first 40 meters)	0.16
Freqncy	58.%	X	Freqncy	60%	X	Freqncy	72%	X

* Dead plants may not have been fully monitored at this site in 1998.

Note: "X" indicates plots not surveyed in 1998-2000.

Amidon reported 61 of 78 plants in flower or fruit on 1 June 1998 (78.2%). Welp observed 23 of 72 plants in flower or fruit on 13 June 2000 (31.9%).

Astragalus proimanthus
Transect # 5 Census Data

13 June 2000
Surveyor: Laura Welp

1 June 1998
Surveyor: Barbara Amidon

15 June 1989
Surveyor: Hollis Marriott

Plot #	# Live	# Dead	Plot #	# Live	# Dead	Plot #	#Live	# Dead
1	0	0	1	0	0	1	2	0
2	1	0	2	0	0	2	0	0
3	1	0	3	0	0	3	2	0
4	0	0	4	0	0	4	0	0
5	0	0	5	1	0	5	0	0
6	0	0	6	0	0	6	1	0
7	1	0	7	1	0	7	0	0
8	0	0	8	0	0	8	0	0
9	0	0	9	2	0	9	0	0
10	2	2	10	1	0	10	3	0
11	6	2	11	3	0	11	9	1
12	5	0	12	6	0	12	5	0
13	1	0	13	11	1	13	0	0
14	1	0	14	7	0	14	1	0
15	2	0	15	3	0	15	1	0
16	2	0	16	2	0	16	0	0
17	2	0	17	1	0	17	2	0
18	4	1	18	1	0	18	3	0
19	2	0	19	2	0	19	11	0
20	4	3	20	3	0	20	16	0
21	7	0	21	1	0	21	10	0
22	8	0	22	1	0	22	7	0
23	7	0	23	0	0	23	5	0
24	3	1	24	0	0	24	5	0
25	8	0	25	1	0	25	5	0

26	3	0	26	1	0	26	3	0
27	3	1	27	2	0	27	0	1
28	4	0	28	6	0	28	0	0
29	1	1	29	5	0	29	1	0
30	1	0	30	10	0	30	0	0
31	1	0	31	5	1	31	2	0
32	0	0	32	2	0	32	1	0
33	1	0	33	5	0	33	0	0
34	0	0	34	1	0	34	0	0
35	0	0	35	0	0	35	0	0
36	0	1	36	0	0	36	1	0
37	1	0	37	0	0	37	1	0
38	0	0	38	4	0	38	0	0
39	0	0	39	6	0	39	0	0
40	0	0	40	8	0	40	0	0
41	X	X	41	X	X	41	0	0
42	X	X	42	X	X	42	1	0
43	X	X	43	X	X	43	0	0
44	X	X	44	X	X	44	0	0
45	X	X	45	X	X	45	0	0
46	X	X	46	X	X	46	1	0
47	X	X	47	X	X	47	0	0
48	X	X	48	X	X	48	0	0
49	X	X	49	X	X	49	1	0
50	X	X	50	X	X	50	1	0
TOTAL	82	12	TOTAL	102	2	TOTAL	101	2
Plants per sq. meter	2.05	0.3	Plants per sq. meter	2.55	0.05*	Plants per sq. meter	2.02 (2.42 for first 40 meters)	0.04
Freqncy	67.5%	X	Freqncy	72.5%	X	Freqncy	54%	X

* Dead plants may not have been monitored at this site in 1998.

Note: "X" indicates plots not surveyed in 1998-2000.

Amidon reported 77 of 102 plants in flower or fruit on 1 June 1998 (75.5%). Welp observed 16 of 82 plants in flower or fruit on 13 June 2000 (19.5%).