

Survey for
Astragalus hyalinus M.E. Jones var. *glabratus* Evert ex Dorn
(Smooth Summer Milkvetch)
Park County, Wyoming



Prepared for the Bureau of Land Management State Office and Cody Field Office

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Abstract

Smooth summer milkvetch (*Astragalus hyalinus* M.E. Jones var. *glabratus* Evert ex Dorn) was described as a new taxon by Robert Dorn in 2014 (Dorn 2014). Preliminary surveys were conducted for it in 2014 on Cedar and Sheep Mountains. It was relocated and mapped on Cedar Mountain but was not found on Sheep Mountain. This work provides the basis for assigning ranks of G5T1/S1 to this taxon as known from one population occurrence.

Literature Citation:

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Introduction

Smooth summer milkvetch (*Astragals hyalinus* M.E. Jones var. *glabratus* Evert ex Dorn) was described as new to science by Robert Dorn in 2014 (Dorn 2014). Taxonomic work was pursued by Dorn after the death of Erwin Evert, the person who discovered it and brought it to the attention of the state botanical community. It was known from two specimens collected on Cedar Mountain (*Evert 3012* in flower on 7 July 1981, and *Dorn 5023* in flower on 30 June 1989). It has been recognized for over a decade as an unpublished taxon (*Astragalus* sp. nov. – undescribed taxon) in the current state flora (Dorn 2001).

The Dorn collection of *Astragals hyalinus* var. *glabratus* is from T52N R102W Sec. 8 and is deposited at the Rocky Mountain Herbarium (RM). The Evert collection, deposited at New York Botanical Garden (NY), has latitude-longitude coordinates assigned to it, perhaps based on the location description (5 miles southwest of Cody), that may also have been the basis for elevation (6500 ft.) and which falls close to the Dorn collection. Even though the NY on-line database (2015) does not include township and range information, it is likely that the Evert collection came from the same section as the Dorn specimen because Evert's next collection number (*Evert 3013*) is *Cryptantha spiculifera*, found growing with *A. hyalinus* var. *glabratus*, and that particular specimen is deposited at RM, for which the on-line database (2015) gives the location as T52N R102W Sec. 8 at 7800 ft.

In addition to Cedar Mountain, Evert (2010) reported “*Astragalus hyalinus* var. *glabratus* – undescribed variety” from Sheep Mountain but with no supporting voucher specimen or more location information. The federal lands on Cedar and Sheep Mountains are administered by the Bureau of Land Management (BLM) Cody Field Office and the state lands are State of Wyoming parcels administered by the Wyoming State Office of Lands and Investments.

Preliminary survey for smooth summer milkvetch were set as botany fieldwork priority by mutual agreement of BLM Cody Field Office and Wyoming Natural Diversity Database (WYNDD). The goals were to document the taxon and its habitat requirements, map its local distribution to the extent practical, compile initial status information for assigning conservation ranks and for preparing state species abstract information, and outline a study plan if expanded surveys were warranted.

Study Area

Cedar Mountain is about 5 air miles southwest of Cody, Sheep Mountain is about 11 air miles southwest of Cody and both are above Buffalo Bill Reservoir in Park County, Wyoming (Figure 1). Cedar Mountain bedrock and outcrops are Amsden Formation members, comprised of dolomite and red and green shales. Sheep Mountain bedrock and outcrops are Madison Limestone around much of the perimeter, but Wapiti Formation of andesitic volcanoclastic rocks covers most of the central area.

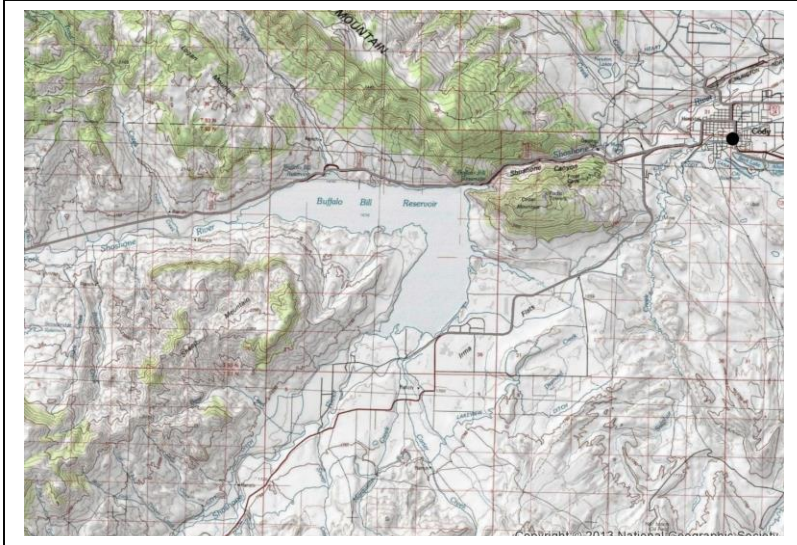


Figure 1. Sheep Mountain and Cedar Mountain study area

The section on Cedar Mountain where smooth summer milkvetch has been collected is delimited on Figure 2. As shown on aerial imagery, the section contains a mixture of open woodlands, grasslands, outcrops and incised topography. Access to Cedar Mountain was on foot from the south through Section 17, and to Sheep Mountain was on foot from the north.

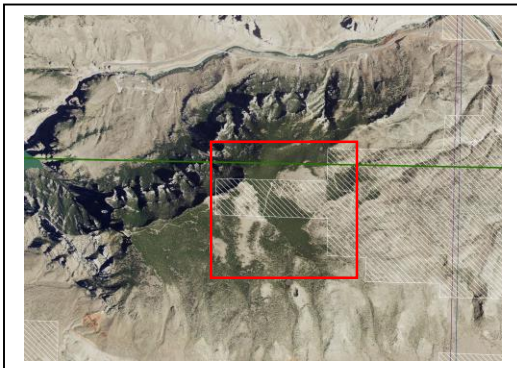


Figure 2. Cedar Mountain and surroundings, NAIP (Section 8 is highlighted in red)



Figure 3. Sheep Mountain and surroundings, NAIP (T52N R103W Sec 19 and T52N R104W Sec 24 are highlighted in red)

The Sheep Mountain areas that were surveyed in 2014 contain two of the largest local limestone outcrops, in two sections, as delimited on Figure 3. As shown on aerial imagery, the sections are mainly grasslands, outcrops and breaks below. Access was on foot from the trailhead to the north.

Methods

NAIP digital orthophotographs were printed out at the same scale as USGS topographic maps to discern limestone outcrops as a focus for surveys and navigation. The USGS topographic maps included the Irma Flats and Castle Rock Creek Quads (7.5'). Surveys were conducted first at Cedar Mountain because the location of smooth summer milkvetch collections were known to within one square mile. The section and the location label description correspond with the summit and mid- to upper-slopes of Cedar Mountain. Access to drive across private land in order to reach public land at the summit was not secured, so it was reached on foot from the bottom across public land.

Surveys were conducted on 30 June and 1 July, timed to locate it in flower, as gauged by phenology of the two prior collections, both of which were collected in flower. Smooth summer milkvetch, as the name implies, blooms late compared with most other tufted milkvetch species in Wyoming as indicated by the 7 July 1981 and 30 June 1981 collection dates of Evert and Dorn, respectively.

When smooth summer milkvetch was found, GPS coordinates were recorded, local extent was determined, approximate number of plants and associated species were recorded. Voucher specimens were collected at highest and lowest locations, and at select intermediate points. Photographs were taken of the taxon and its habitat.

Results

Smooth summer milkvetch was located at six places on Cedar Mountain ranging from 1920-2335 m (6300-7660 ft), from the summit to the lower slopes. The summit had higher numbers of plants than all the rest of the areas combined, with over 3000 plants (estimated) on the summit, and a total of 200 or less plants elsewhere. The plants on the summit appear to be the population core, and the plants downslope appear to be outliers.

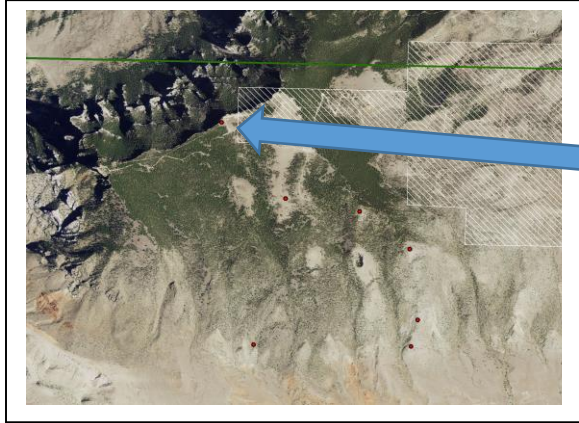


Figure 4. GPS points mark smooth summer Milkvetch locations on Cedar Mountain



Figure 5. GPS points were used to draw the polygon of the subpopulation on the Cedar Mountain summit

Most plants surveyed in 2014 are in T52N R102W Sec 7 in the NE ¼ of the SE ¼ of the NE ¼. There are downslope locations in Section 8 (SE ¼ of NW ¼ of SW ¼; SW ¼ of SE ¼ of SE ¼; NW ¼ of SW ¼ of SE ¼; and S ½ of NW4) and in Section 17 (SW ¼ of NE ¼ of NE ¼). The points and polygon that represent 2014 distribution mapping are shown in Figures 4 and 5. The downslope outliers are mapped as isolated points, most of which are associated with small limestone outcrop areas. One of the points is in the middle of a dry, south-facing grassland opening with shallow soils and limestone gravel at the surface. In this grassland, the taxon was sparsely scattered, and though in very low numbers, was more extensive than the other places.

The summit habitat is north-edge rim covered by limestone pavement. The taxon was mainly on flat or gently-sloping settings and did not extend into crevice and shady settings below the rim. The rest of the results section provides basic information for presenting smooth summer milkvetch in state species abstracts.

SPECIES ABSTRACT: ASTRAGALUS HYALINUS VAR. GLABRATUS

SMOOTH SUMMER MILKVETCH

Family: Fabaceae

Status:

US Fish & Wildlife Service: None.

Agency Status: None.

Heritage Rank:

Global (proposed): G4T1

(The “T” rank pertains to the taxonomic level below species, and the “1” indicates that the variety is critically imperiled throughout its range.)

State (proposed): S1

(The “S” rank pertains to the rarity rank in Wyoming, and the “1” indicates that the variety is critically imperiled in the state.)

WYNDD Plant List: State endemic (Very High Conservation Priority)

Description: Smooth summer milkvetch is a densely-matted perennial herb with a branching caudex. Leaves are divided into three leaflets that are oblanceolate to obovate, and silvery pubescent with pick-shaped hairs. The leaf stalk is 3.5 cm or less, with overlapping stipules at the base obscured by long hairs. The calyx tube is over 5.5 mm long. Petals are predominantly white, usually lined or tinged with lavender, often drying yellowish. The pea-like flowers are sessile or on short stalks bearing 1-2 flowers. The upper petal (banner) is fiddle-shaped and 12 mm or longer. The petals are glabrous dorsally, sometimes with a short tuft of hairs at the very base. The fruits are upright, elliptical pods that are often hidden among the leaf bases. Fruits have 6-8 ovules, though often only one or two seeds are produced (Dorn 2001, 2014, Heidel 2015) (Figures 6-9).

Similar Species: *Astragalus hyalinus* var. *hyalinus* has petals villous on the back, and generally more ovules (8-9). It usually has solid white petals, rather than lined or tinged with lavender. *A. hyalinus* differs from other 3-leaflet species of *Astragalus* that grow in mats or tufts by either the long calyx tube, 5.5 mm or more long, or the fiddle-shaped banner. It generally blooms later than the other species (Dorn 2014). Note: The shape of the banner cannot be discerned readily without dissecting the flower.

There are five other *Astragalus* species on Cedar Mountain, but they do not form dense mats. They include *A. kentrophyta* var. *tegetarius* and *A. spatulatus* (in or near occupied habitat), and *A. gracilis*, *A. miser* var. *decumbens* and *A. purshii* in other habitats (as noted in 2014 surveys and from RM on-line database 2015).

Flowering/Fruiting Period: Very late June-early July.

This is based on collection dates of smooth summer milkvetch ranging from 30 June – 7 July when it was collected in flower, the slight degree of phenological stage differences observed at different elevations in 2014, the synchrony of flowering within plants, and the expectation that phenology may shift at least slightly between years.

The phenology of common summer milkvetch (*Astragalus hyalinus* var. *hyalinus*) was checked for comparison with smooth summer milkvetch using the RM on-line database and was found to be much broader, ranging from mid-June through mid-August with earlier and later outliers. It was also checked against elevation and there are no clear patterns. In addition, there are collections made in late August of common summer milkvetch that

introduce the possibility the type variety may have a postponed flowering or a second flowering as dictated by weather.

The variety *Astragalus hyalinus* var. *hyalinus* is known from within 75 km (47 mi) to the east of smooth summer milkvetch (Dorn 2014), and at lower elevation. This spatial separation may confer reproductive isolation with or without phenology differences.



Figure 6, left:
Astragalus
hyalinus var.
glabratus
(close-up) by
B. Heidel



Figures 7 and 8, above: *Astragalus hyalinus* var. *glabratus* (whole plant), including vegetative plant to far right, by B. Heidel

A table of distinguishing characteristics among tufted milkvetches in Wyoming has been developed (Heidel 2011), based on Dorn (2001), Isely (1998) and Barneby (1989). It is printed on the following pages, replacing “undescribed taxon” in Dorn (2001) with *Astragalus hyalinus* var. *glabratus*.



Figure 9, left: Older flowers of *Astragalus hyalinus* var. *glabratus* fade to yellow by B. Heidel

Distribution: Endemic to northwestern Wyoming (Park County).

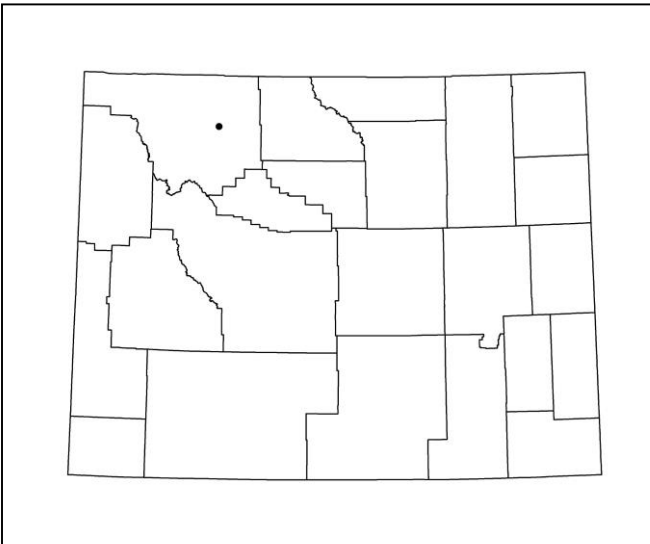


Figure 10, above: Wyoming distribution of *Astragalus hyalinus* var. *glabratus*

Occurrences in Wyoming: Known from 1 extant occurrence and 1 report that cannot be mapped (Figure 10).

Abundance: Total numbers estimated at over 3000 plants, concentrated at the summit and with downslope outliers having low numbers. The photo in Figure 11 is taken from the property line looking across a view that contains nearly the entire summit population segment as found on public land.

Range: The known occurrence and unvouchered report are on Cedar and Sheep Mountains, respectively, in foothills of the Absaroka Range above the North Fork of the Shoshone River.

Table 1. Distinguishing characteristics among tufted milkvetches in Wyoming (after Heidel 2011)

Species	Leaves	Growth form	No. of flowers	stipule pubescence	peduncle length	calyx length (mm)	banner length (mm)	banner color	banner pubescence	banner shape	wing length (mm)	keel length (mm)	ovules	pod	Phenology (WY)
<i>A. barrii</i>	compound, 3 lflets	dense cushion	2-5	ciliate on margins, sometimes glabrous dorsally	7-24 mm	3.6-6.5	10-16	purple with light purple veins*	very sparse dorsally to glabrous*	spathulate	9-13	7.5-10.5	(1-3)	lanceoloid w/ long beak, compressed, turgid	late April-early June
<i>A. calycosus</i>	compound (5 lflets present)	tufted or cushion	1-17	glabrous dorsally	(pedicel)	3.6-6.5	9.5-15	variable; whitish, pale blue or pink, bright purple	glabrous	spathulate	7-11.6	67.5-10.5	13-28	oblong-ellipsoid, trigonously compressed	late May-early June
<i>A. drabelliformis</i>	simple	loose mat	1-5	glabrous	(pedicel)	2.5-5	5-7	pink-purple	glabrous dorsally	spathulate	gap	gap	7-10	trigonous, turgid, grooved dorsally	June
<i>A. gilviflorus</i> var. <i>gilviflorus</i>	compound, 3 lflets	loose mat	2 (rarely 1 or 3)	glabrous dorsally except at base	obsolete or nearly so	9.3-20 (10-15)	16-28	white or ochroleucus; sometimes tipped with purple	glabrous dorsally	oblanceolate to spathulate; tapering evenly to base	12.2-24.2	10.4-21.8	gap	ovoid-ellipsoid, 6-10 x 2.5-5.	May-early June
<i>A. gilviflorus</i> var. <i>purpureus</i>	compound, 3 lflets	loose mat	2	ciliate, nearly glabrous	obsolete or nearly so	9-14.5 (7-11)	12-22	purple	glabrous dorsally	oblanceolate to spathulate; tapering evenly to base	18.7-22	16-19	15-19	ovoid-ellipsoid, 6.8-11.5 x 2.8-4.	(late May) June-early July (Fremont Co.)
<i>A. hyalinus</i> var. <i>hyalinus</i>	compound; 3 lflets	dense mat	1-2 (3)	ciliate on margins	none - 3.5 mm	5.5-7	12-18	whitish corolla with purplish tips	villous dorsally	fiddle-shape	10-17 mm	10-13 mm	8-9	ovoid-ellipsoid, 5-6	late June-early Aug
<i>A. hyalinus</i> var. <i>glabratus</i> ["Undescribed taxon" in Dorn 2001]	compound, 3 lflets	dense mat	1-2	gap	gap	5.5+	12+	white, usually lined or tinged w/ lavender, drying yellowish	glabrous dorsally	fiddle-shape	gap	gap	6-8	gap	late June – early July
<i>A. proimanthus</i>	compound; 3 lflets	dense mat	gap	glabrous	obsolete or nearly so	8-10.5	gap	predom. yellow; sometimes white w/ purplish markings	glabrous dorsally	fiddle-shape	11.1-16	11.1-12.8	11-14	narrowly ellipsoid, straight or slightly decurved, ~laterally compressed	late April-early June

<i>A. serioleucus</i> var. <i>aretioides</i>	compound; 3 lflets	dense cushion	(2) 3-5	glabrous dorsally except upper margin	(pedicel)	2.5- 4.2	5-8	vivid pink, magenta, reddish violet	glabrous dorsally	spatulate	(5-7)	4-4.5	6-11	Ovoid- ellipsoid, slightly compressed	June
<i>A. serioleucus</i> var. <i>serioleucus</i>	compound; 3 lflets	stems often elongate- creeping	2	pilose dorsally	1-2.5, gen exserted above lvs	2.5- 4.2	5-8	dark purple	Gap	spatulate	5-6	5-5.8		ovoid- acuminate to lanceolate, laterally compressed but turgid, 4-6.5	June
<i>A.</i> <i>simplicifolius</i>	simple	dense cushion	1-4	ciliate on margins	0.5-1.8	4.5-7	10.5- 16	pink-purple	Gap	spatulate	9.8-11.6	7-9.6	11-14	laterally compressed, 6-13 mm long	May-mid June
<i>A. spatulatus</i>	simple	variable	1-11	gap		2.5-5	6-9.5	pink-purple	gap	spatulate	6-8	4.5-6	gap	laterally compressed	May-June
<i>A.</i> <i>tridactylicus</i>	compound; 3 lflets	tufted or prostrate cushion	2-4	lower stipules pilose dorsally	2-10	1.5- 3.8	7-9	pink-purple	glabrous dorsally	1.8-3.5	gap	4.5-7.2	gap	ellipsoid and turgid	June
Marriott 11545 (reported in Heidel and Marriott 1996)	compound; 3 lflets	gap	gap	ciliate on margins	none to very short	5	10.5	yellowish- cream with purple veins	strigose dorsally	gap	slightly <10 mm	8.5 mm	gap	gap	gap

Habitat: Cushion plant community on shallow, stony calcareous soils associated with limestone outcrops and exposed grassland opening at 1920-2316 m (6300-7600 ft) (Figure 11). The more common species in its sparsely-vegetated habitat include *Eremogone hookeri*, *Eriogonum flavum*, *Poa secunda*, *Musineon divaricatum* and *Shoshonea pulvinata*.

The original habitat description of *Astragalus hyalinus* var. *glabratus* in Dorn (2001) is: “rocky calcareous slopes and ridges.” The habitat description provided by Evert (2010) is: “limestone outcroppings and pavements on Cedar and Sheep Mountains in limber pine-juniper woodlands from 6500-7500 ft.” It is virtually absent from red shale substrate except within 10 m of limestone outcrop; this red shale setting is shown in Figure 12.



Figure 11, left: Habitat of *Astragalus hyalinus* var. *glabratus* in cushion plant community with shallow, stony calcareous soils of limestone outcrops and pavement on the summit at the northern rim of Cedar Mountain by B. Heidel



Figure 12, left: *Astragalus hyalinus* var. *glabratus* is virtually absent from red shale substrate except within 10 m of limestone outcrop, as shown here by B. Heidel

Trends: Dead and partially-dead plants of *Astragalus hyalinus* var. *glabratus* were observed on the summit. The summit had the highest numbers of plants and the highest density was found on the most exposed and perhaps the driest setting. Dead plants were not included in population size estimates. From the state of decay, they appear to have been dead for over a year. Despite mortality, there are still summit areas of high density and thriving plants (Figure 15).



Figures 13-14, above and left: Dead and partially dead *Astragalus hyalinus* var. *glabratus* plants (dead plants marked by arrows)

Figure 15, left: *Astragalus hyalinus* var. *glabratus* plants in extremely high density (ca 24 plants in an area of ca 2 m²)

Protection status: The one known population is on public lands managed for multiple use, with no motorized public access.

The population reaches private land boundaries and may extend onto private land.

Threats: The largest subpopulation is located at the summit of Cedar Mountain among radio towers. There is one tower on BLM-administered land located within what may have been suitable habitat, and the taxon extends right up to the road that leads to the tower. The rest of the summit towers are built on private land.

Public access to the summit via the Spirit Mountain Road is cut off by a gate at the start of private property. If public access were to be provided in the future, then all of the rim

subpopulation might be under high threat from vehicles pulling off the radio tower access road into the level habitat occupied by the taxon. The flat, rim habitat would be easy to drive across, as scenic overlook to a dramatic vista.

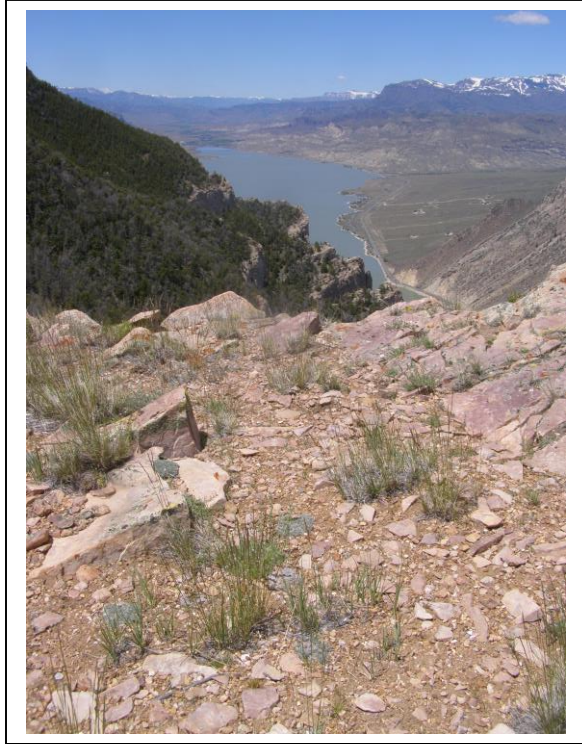


Figure 16, above: Buffalo Bill Reservoir from west end of *Astragalus hyalinus* var. *glabratus* habitat by B. Heidel

Managed Areas: Found on lands managed by the BLM Cody Field Office.

Discussion

Astragalus hyalinus var. *glabratus* occupies much the same habitat as Shoshonea (*Shoshonea pulvinata*), a species that was first collected by Evert in 1979, found by him at Cedar Mountain in 1981, and then described (Evert and Constance 1982). There are no other records or reports of *Astragalus hyalinus* var. *glabratus*.

There may be related taxa elsewhere around the foothills bordering the Big Horn Basin. In the first status report prepared for Shoshonea in Wyoming, Dorn (1989) listed “*Astragalus sericoleucus*” (silky milkvetch) as an associated species. It is possible that this is based on the first status report prepared for Shoshonea in Montana (Shelly 1988) that lists *Astragalus aretioides* (cushion milkvetch) as occurring in the same habitat as Shoshonea in the Pryor Mountains. Cushion milkvetch is treated by some as a variety of silky milkvetch, and both are tufted milkvetches are present in Wyoming, but only known from the southern half of the state. The south-central Montana locations for cushion milkvetch is the only ones in Montana (Lesica 2012), disjunct locations at northern range limits.

Elsewhere, there are collections of *Astragalus hyalinus* var. *hyalinus* at similar or higher elevations, e.g., one collected at 8000 ft from the Owl Creek Mountains (*Lichvar 5379*).

These geographic and elevation range limits of tufted milkvetchs may hold clues to the taxonomic relationships of *A. h.* var. *glabratus* and other tufted milkvetches.

The results of this survey are preliminary under the circumstances. The priorities for fieldwork on public lands are to expand the survey effort at Cedar and Sheep Mountains, spot-test other limestone rim settings in the eastern Absarokas using aerial photointerpretation, and distribute this information to other botanists working in the area.

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