

Sensitive and Rare Plant Species Inventory
in the Salt River and Wyoming Ranges,
Bridger-Teton National Forest

Prepared for

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ABSTRACT

Three sensitive and two other Wyoming species of concern were inventoried in the Wyoming and Salt River Ranges at over 20 locations. The results provided a significant set of trend data for Payson's milkvetch (*Astragalus paysonii*), expanded the known distribution of Robbin's milkvetch (*Astragalus robbinsii* var. *minor*), and relocated and expanded the local distributions of three calciphilic species at select sites as a springboard for expanded surveys. Results to date are presented with the rest of species' information for sensitive species program reference. This report is submitted as an interim report representing the format of a final report. Tentative priorities for 2012 work include new Payson's milkvetch surveys in major recent wildfires, and expanded Rockcress draba (*Draba globosa*) surveys, both intended to fill key gaps in status information that contribute to maintenance of sensitive plant resources and information on the Forest.

ACKNOWLEDGEMENTS

All 2011 field surveys of Payson's milkvetch (*Astragalus paysonii*) were conducted by Klara Varga. These and the rest of 2011 surveys built on the 2010 work of Hollis Marriott and the earlier work of she and Walter Fertig as lead botanists of Wyoming Natural Diversity Database. This project was initially coordinated by Faith Ryan (Bridger-Teton National Forest), with the current coordination and consultation of Gary Hanvey and Tyler Johnson. Lara Oles provided a Geographic Information System (GIS) layer of wildfires mapped on Bridger-Teton National Forest and collaborated in the survey of Payson's bladderpod (*Lesquerella paysonii*) on Deadline Ridge. The interest and support of Bridger-Teton NF staff and Teresa Prendusi (Intermountain Region of U.S. Forest Service) are acknowledged with appreciation. Joy Handley (Wyoming Natural Diversity Database) set up the GIS project used in planning and carrying out 2010-2011 field surveys. Tables of all species' record locations, associated species, and population data were constructed with the help of Victoria Pennington. The assistance of two strangers and three tire companies is also acknowledged. Use of Rocky Mountain Herbarium resources and facilities was essential to this project. This report is dedicated to Edwin and Lois Payson, who first discovered or described four of the five species addressed in this study.

Literature citation:

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Introduction

The purpose of the project was to systematically survey sensitive and other rare plant species targets in the Wyoming and Salt River Ranges, on the Big Piney, Kemmerer and parts of the Greys River Districts of the Bridger-Teton National Forest. The project began in 2009 by concerted updating and digitizing of rare plant records in the study area. In 2010, select areas and zones above 9000 feet were made the target of pilot surveys for a suite of species in the Sheep Pass, Cottonwood Creek, and Swift Creek areas (Marriott 2010). In 2011, four species in select places were identified as priorities for surveys based on existing documentation and information needs.

The sensitive plant list is that of the U.S. Forest Service – Intermountain Region (USFS R4 1994). The sensitive species lists and policies by USFS R4 have been developed to address management needs for plant species that might qualify for listing under the Endangered Species Act (USDA FS 1994) in order to prevent agency actions from leading to the further endangerment of sensitive species and subsequent need for listing them under the Act. Other rare species targets include all other Wyoming plant species of concern (Heidel 2007) known or suspected from the Wyoming and Salt River Ranges (Table 1), with 2011 priorities and other status information added.

The state of current knowledge about rare plants species in the study area draws from floristic documentation that provided information on the common and rare flora alike (Shultz and Shultz 1979, Hartman and Nelson 1993, 1994) and on earliest rare species surveys (Shultz and Shultz 1978). It also reflects the work of local expert, Orval Harrison (Harrison 2010), and builds on systematic surveys that were previously conducted in the area for three rare species for the Bridger-Teton National Forest: Payson's bladderpod (Fertig 1997), Payson's milkvetch (*Astragalus paysonii*) and Boreal draba (*Draba borealis*; Fertig and Marriott 1993) and other targets (Fertig 1999). Surveys in 1994 and 1997-1998 focused primarily on potential rare plant habitats in alpine calcareous sites outside the study area in the northern Wind River and Gros Ventre ranges and montane slopes in the Hoback Canyon area, with new data produced for Rockcress draba (*Draba globosa*) and Woolly fleabane (*Erigeron lanatus*), and negative data and new hypotheses for Soft aster (*Aster mollis*; *Symphotrichon molle*)(Fertig 1999). In 2000, status overview information was compiled on the 127 Wyoming plant species of concern known or suspected from the Intermountain Region of the U.S. Forest Service in Wyoming, including Bridger-Teton, Ashley, Caribou-Targhee and Wasatch-Cache National Forests (Fertig 2000). Finally, in 2004, a literature review of *Draba globosa* rangewide status was prepared for the U.S. Forest Service – Rocky Mountain Region (Ladyman 2004).

The overall project goal is to identify and address gaps in the status information among sensitive species in the Wyoming and Salt River Ranges in particular. This report is submitted as an interim document for review, highlighting the new information as it sheds light on the current species' status, and setting the balance of survey priorities in 2012. After the 2012 field season, the report will be updated and submitted as a final. Tentative priorities for 2012 surveys are presented in the Discussion section.

Table 1. Sensitive and rare plant species in the Bridger-Teton National Forest; known or potentially in the Wyoming or Salt River ranges¹

In Wyoming or Salt River ranges? ²	Scientific Name	Common Name	Forest Service status	2011 survey priority
N	<i>Agoseris lackschewitzii</i>	Pink agoseris	Sensitive	
Y	<i>Antennaria aromatica</i>	Aromatic pussytoes	None	
N	<i>Arceuthobium douglasii</i>	Douglas fir dwarf-	None	
N	<i>Astragalus diversifolius</i>	Meadow milkvetch	Sensitive	
N	<i>Astragalus leptaleus</i>	Park milkvetch	Sensitive	
Y	<i>Astragalus paysonii</i>	Payson's milkvetch	Sensitive	1
N	<i>Astragalus racemosus var. treleasei</i>	Trelease's racemose milkvetch	None	
Y	<i>Astragalus robbinsii var. minor</i>	Robbins milkvetch	None	3
Y	<i>Astragalus shultziorum</i>	Shultz's milkvetch	MIS	2
Y	<i>Boechea williamsii var. williamsii</i>	William's rockcress	None	
Y	<i>Carex infirmivervia</i>	Weakly-nerved sedge	None	
Y	<i>Draba borealis</i>	Boreal whitlow-grass	MIS	
Y	<i>Draba fladnizensis var. pattersonii</i>	White arctic whitlow-grass	None	
Y	<i>Draba globosa (Draba densifolia var apiculata)</i>	Rockcress whitlow-grass	Sensitive	1
Y	<i>Draba paysonii var. paysonii</i>	Payson's whitlow-grass	None	
Y	<i>Ipomopsis crebrifolia</i>	Compact ipomopsis	None	
Y	<i>Lesquerella paysonii</i>	Payson's bladderpod	Sensitive	2
Y	<i>Lomatium bicolor</i>	Wasatch biscuitroot	None	
Y	<i>Monardella odoratissima var. glauca</i>	Mountain wild-mint	None	
Y	<i>Orobanche corymbosa var. corymbosa</i>	Flat-top broomrape	None	
Taxonomic question	<i>Physaria integrifolia var. monticola</i>	Creeping bladderpod	Sensitive	
Y	<i>Polystichum lonchitis</i>	Northern Holly-fern	None	
Y	<i>Silene repens</i>	Creeping campion	None	
Y	<i>Stephanomeria fluminea</i>	Teton wire-lettuce	None	
Taxonomic question	<i>Symphotrichum molle (Aster mollis)</i>	Soft aster	Sensitive	
Y	<i>Triteleia grandiflora</i>	Large flower triteleia	None	

¹ Sensitive species status is based on USDA Forest Service (1994). Management indicator species information status was provided by Faith Ryan, USFS (personal communication 2009). All other species are Wyoming plant species of concern – tracked or watch (Heidel 2007)

² Extending as far north as Hoback Canyon and the Snake River Canyon.

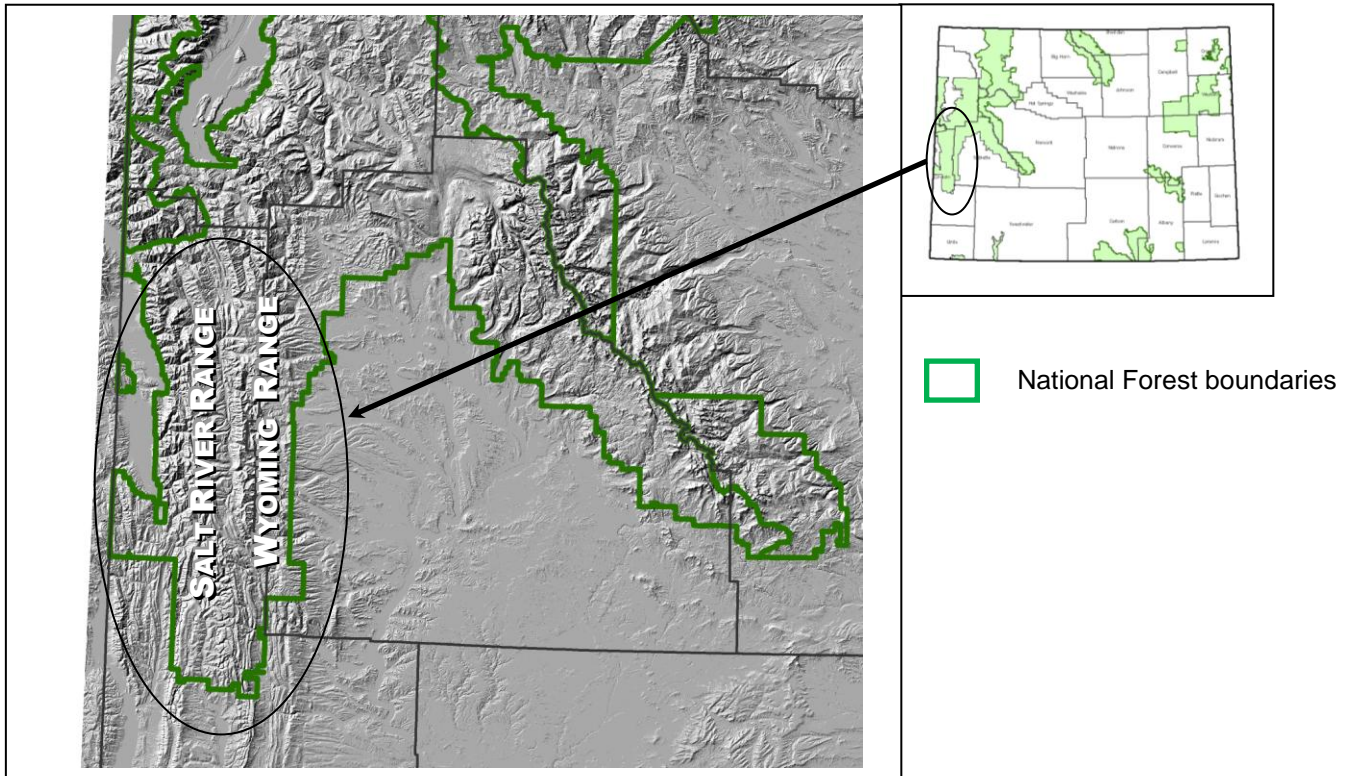


Figure 1. Study area in the Salt River and Wyoming Ranges, Bridger-Teton National Forest in west-central Wyoming

Study Area

The Salt River and Wyoming Ranges are major landforms in the Thrust Belt, part of the North American Overthrust Belt. The stratigraphy, structural style of deformation, and geologic history of the Thrust Belt differs from other mountains in the state. The Thrust Belt mountains were not formed as major uplifts in Precambrian basement core. Instead, the Thrust Belt contains a thick (more than 40,000 feet) sequence of Precambrian, Paleozoic, and Mesozoic sedimentary rocks with no crystalline basement involved in the deformation. Essentially, the Belt was formed "...during an episode of mountain building called the Sevier Orogeny, from 150 to about 55 million years ago. In it, continental crust on the westward-moving North American plate collided with oceanic crust of the eastward-moving Pacific plate forcing large sheets of rock eastward, deforming and uplifting them in a series of overlapping, low-angle thrust faults, arranged much like shingles on a roof" (Wyoming Geological Survey 2012). The resulting series north-south trending landforms comprised of resistant Paleozoic rocks, mainly shallow-water marine limestone, dolomite, and fine-grained sandstone, that are the dominant structural component of all major thrust sheets (Royse 1993). These are generally thrust over less resistant Mesozoic marine shales and sandstones in the footwall by the thrusts (Royse 1993). The Thrust Belt is comprised of five major thrust fault systems, and the three easternmost thrust fault systems, including the Darby, Absaroka and Crawford (east to west, youngest to older) make up the Wyoming and Salt River Ranges. A geologic map of the Afton Quadrangle (1:52,500; Rubey 1973) and the

bedrock geology of Wyoming (Love and Christianson 1984) represent the geology of both ranges. The Wyoming and Salt River Ranges extend as far north as the Snake River Canyon and Hoback Canyon, respectively; though for purposes of this project, the later was excluded.

The prevailing vegetation types are dominated by lodgepole pine (*Pinus contorta*) spanning much of the montane zone (7000-9000 ft). An overview of disturbance regimes in lodgepole pine systems of Wyoming is presented by Knight (1994). There are not studies available on fire return intervals in the study area but wildfire boundaries have been digitized by the Forest (USDA Forest Service 2011), and major recent fires (1991-2010) cover ca. 5 % of the study area as mapped. The history of fire suppression on one hand and the current spread of bark beetles and blister rust on the other potentially alter the natural disturbance regime.

The annual hydrologic budget of lodgepole pine systems in Wyoming is strongly influenced by snowfall, as also presented by Knight (1994). The mean annual precipitation ranges from 30.5-152.5 cm (12-60 in), increasing with elevation and in moving northward. There are very steep precipitation gradients and lower values on the east side of the Wyoming Range compared to the west side of the Salt River Range. There are no National Oceanic and Atmospheric Administration (NOAA) climate stations within the ranges, but there are ten standard SNOTEL sensors with the ranges, and the nearest NOAA stations at Afton and Big Piney provide an overview of foothills conditions and east-west contrasts (Table 2; USDI NOAA 2005).

Table 2. Climate conditions east and west of the Wyoming and Salt River Ranges

Climate variable	Afton (1957-2005)	Big Piney (1948-2005)
Mean annual precipitation cm (in)	50.5 (19.9)	19.1 (7.5)
Average total snowfall cm (in)	293.1 (115.4)	72.6 (28.6)
Mean % contribution of snowfall to total annual ppt.	94.5%	64.3%
Mean monthly temperature C° (F°)	3.9 (39.0)	1.7 (35.1)
January mean minimum temperature C° (F°)	-15.3 (4.5)	-20.7 (-5.3)
July mean maximum temperature C° (F°)	27.4 (81.4)	26.7 (80.0)

Methods

Surveys were conducted by two botanists working independently for a total of 15 days in July and August 2011. Each of the four species targets had a different slate of background information and survey objectives.

Payson's milkvetch (*Astragalus paysonii*) is a sensitive species of forested habitat that is currently known from two areas in the country, one being the study area. More than any other target species, it is almost restricted to the study area. It was first discovered in the Wyoming Range when it was collected in 1922 "from burned areas in forest." Surveys in 1992 documented that it was widespread in the study area but in extremely low numbers at all but a few places, and in an array of disturbed habitat (Fertig 1993). No subsequent information on it has come from the study area, though it was recently surveyed in the Snake River Canyon. It has been hypothesized that Payson's milkvetch is a successional species adapted to natural disturbances such as wildfire, such that its viability hinges on fire regime and on the interchangeability of man-made disturbance for natural disturbance.

Therefore, the 2011 objectives were to survey all the largest populations identified in previous survey sites, i.e., those reported as having more than 100 plants (Fertig and Marritt 1993), and all known records in the vicinity of recent wildfires. Information on Payson's milkvetch was compiled and Geographic Information System (GIS) shapefiles were incorporated representing all wildfire mapping in the study area for wildfires that had burned since the 1992 surveys. Surveys were conducted by Klara Varga from 12-18 July.

Rockcress draba (*Draba globosa*) is a sensitive species of alpine habitat that extends from southwestern Montana to northern Utah and central Colorado. It had not been systematically surveyed in the study area but was known from one collection made by Orval Harrison, who also provided detailed field notes describing the original locations. Rockcress draba is one of the few sensitive species in sheep allotments, and so this record was identified as a priority for relocating and surveying as basis for allotment management planning.

Therefore, the 2011 objective was to relocate the known locale and determine its extent in the surroundings for potential application elsewhere in the study area. Information on the one Rockcress draba record, including field notes from 2010 surveys (Appendix B in Marriott 2010), was compiled with GIS mapping of it. Rockcress draba is a calciphile, so digital information representing bedrock geology (Love and Christianson 1984, Rubey 1973) with known distribution was superimposed to help identify suitable habitat. Survey was conducted by Bonnie Heidel on 22 August.

Payson's bladderpod (*Lesquerella paysonii*) is a sensitive species of open montane to alpine habitat that is known from limited areas of Idaho and Wyoming, and the study area constitutes a large part of the latter. Many collections of it were made in the course of floristic documentation. The most recent surveys for it were conducted in the Teton Range of the Targhee National Forest where keeled bladderpod (*Lesquerella carinata* var. *carinata*) was found instead (Mancuso and Heidel 2008). Payson's bladderpod is one of the few sensitive species known in an area of the Forest currently being considered for prescribed burn treatment, where it was only known from a single collection record. So this area was made a test case priority for relocating and surveying it.

Therefore, the 2011 objective was to relocate the known record and determine its extent in the surroundings, using it as a springboard for evaluating the merit of expanded

surveys at other collection sites. Information on the Payson's bladderpod record on Deadline Ridge was compiled. Payson's bladderpod is a calciphile, so digital information representing bedrock geology (Love and Christiansen 1984) with known distribution was superimposed to help identify suitable habitat. Survey was conducted by Bonnie Heidel on 22-23 August.

Robbins' milkvetch (*Astragalus robbinsii* var. *minor*) is a taxon of riparian habitat with no USFS status. Though it extends from Alaska to New Mexico, it has a discontinuous range and is only known in Wyoming from the study area. It had not been systematically surveyed but documented by a few collections. Robbins milkvetch was identified by WYNDD as a state priority species to include in surveys.

Therefore, the 2011 objective was to conduct new surveys to expand its distribution within and between watersheds. Information on Robbins' milkvetch was compiled and incorporated with a Geographic Information System (GIS) shapefile representing National Wetland Inventory mapping (USDI Fish and Wildlife Service 2011). Survey was conducted by Bonnie Heidel on 23-26 July.

In preparation for fieldwork, the known distribution of the four species targets was superimposed on digital orthophotographs and printed out as quarter-quads at about the same scale as USGS topographic maps, along with other information (wildfire and geology mapping) for reference in field surveys. The survey form used to record species of concern information is presented in Appendix A. All 2011 survey routes are represented in Appendix B. Vouchers were collected of target species and associated species, and deposited in the Rocky Mountain Herbarium.

Results

New survey information was collected on the four target species, plus a fifth species of interest that was documented incidental to Rockcress draba surveys and among those addressed by Marriott (2010). All of the five species have been addressed in previous WYNDD reports, and the reader is referred to the earlier work for the original status interpretation and lengthier treatments in some cases. The following treatments for the five species are presented as Region 4 status compilations with emphasis on the Wyoming and Salt River ranges.

In addition, one field day was used to survey wetland habitat for sensitive species not currently known from the Wyoming and Salt River Ranges, including Pink agoseris (*Agoseris lackschewitzii*) and Park milkvetch (*Astragalus leptaleus*). Survey was concentrated in a series of wetlands near Poison Meadows. No target species were found.

The following pages present the most current available information on the identification, distribution and habitat information of the five documented species, highlighting their distribution and habitat in the study area, supported by tables and maps that provide status information at a glance. Printouts of all occurrences documented in 2011 surveys are presented in Appendix C.

PAYSON'S MILKVETCH
Astragalus paysonii (Rydb.) Barneby

Classification

Scientific name: *Astragalus paysonii* (Rydb.) Barneby

First described as *Hamosa paysonii* by Rydberg (1927) and transferred to the *Astragalus* genus by Barneby (1944).

Synonyms: none

Common name: Payson's milkvetch

Family: Fabaceae

Size of genus: There are 62 species of *Astragalus* reported for Wyoming in Dorn (2001), not including distinctions at the variety level. The *Astragalus* genus is comprised of 375 species (Barneby 1964) plus at least 20 more recent additions (Isely 1998). This does not include taxa below the species level.

Phylogenetic relationships: A member of sect. *Miselli* (Barneby 1964), most closely related to *A. umbraticus* of California and Oregon.

Present legal or other formal status

U.S. Fish & Wildlife Service: None (Former C2 candidate for listing under the Endangered Species Act.)

U.S. Forest Service – Intermountain Region: sensitive

Global Heritage rank: G3

State Legal status: none

State Heritage rank: The more recent list update (Heidel 2007) reported a state rank of S2.

Wyoming contribution rank: Conservation of Payson's milkvetch as a regional endemic in a core part of its distribution is High. It was similarly identified as a high priority for USFS conservation attention by Fertig (2000) as a regional endemic under potential threats.

Description

Technical description: Payson's milkvetch is an upright, multi-stemmed perennial herb growing to 50 cm tall. Stem leaves are 4-9 cm long and pinnately compound with 7-15 oval to wedge-shaped leaflets. Stipules are free to the base. The small, pea-like flowers are white with a tinge of lilac and are borne in numerous, loose, axillary racemes. Fruit pods are crescent-shaped, 10-17 mm long, and glabrous or white-hairy. Each fruit has a distinct groove on the upper side and has two separate locules. At maturity, fruits are straw-colored and deflexed (Hitchcock and Cronquist 1961, USDA Forest Service 1991, Dorn 2001, Fertig and Marriott 1993, Fertig et al. 1994).

Similar species: *Astragalus agrestis* has a congested inflorescence and ascending fruits. *A. canadensis* has cream or pale yellow flowers, a congested inflorescence, and erect fruits. *A. alpinus* has black-haired fruit and fused stipules. In the absence of fruits or flowers, *Hedysarum* spp. can be distinguished by their united stipules and conspicuously veiny leaflets (Dorn 2001; Fertig and Marriott 1993; Fertig et al. 1994).

Prominent field characters: Thin textured, bi-colored leaflets with notched tips. White flowers and black hairs on the calyx. Crescent-shaped pendulous pods on slender stipes

(Shultz and Shultz 1978). The pods are flat-looking, even though they are triquetrous in cross-section.

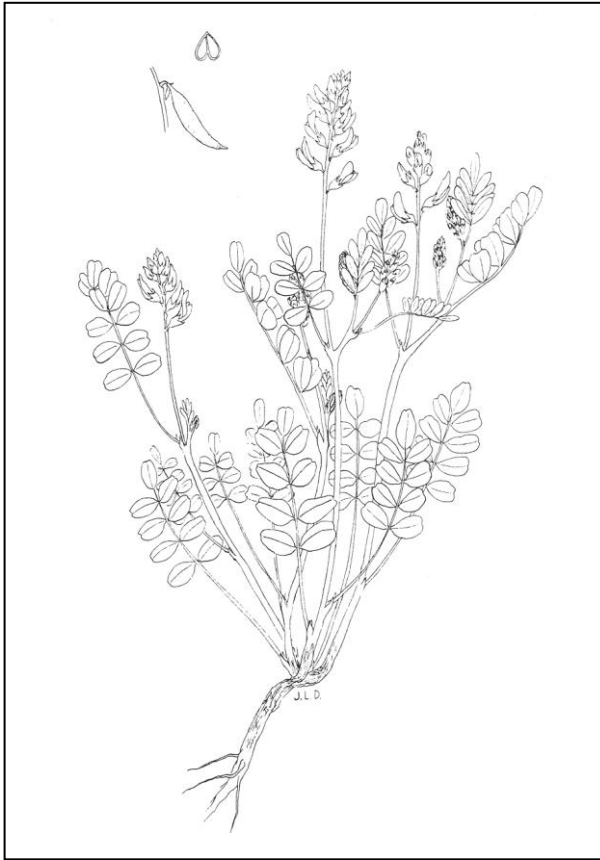


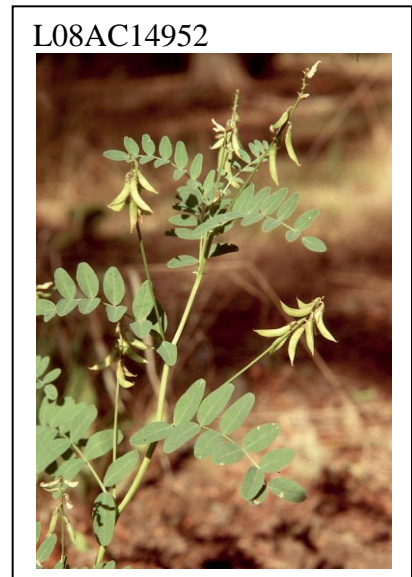
Figure 2. *Astragalus paysonii* illustration, by Jane Dorn, from Dorn & Dorn (1980)



Figure 3: *Astragalus paysonii* in flower, by K. Varga

Figure 4. (right) *Astragalus paysonii* in fruit, by B. Heidel

Phenology: Flowers from late June to early August. Fruits produced from July-October. The plant is most readily located when in flower. Fruits fall to the ground when they dry out and plants sometimes completely desiccate in the latter part of the growing season.



The phenology at any one place varies with setting and climate. In 2011, a particularly wet year, only flowering plants were found during the first half of July. However, in early July of 2007, only late fruiting plants were found in the Snake River population, representing a more typical year and the lowest-elevation Wyoming population (Mancuso and Heidel 2008).

Geographical distribution

Range: Regional endemic of the Clearwater Mountains of north-central Idaho, historically from the Palisades Reservoir area of east-central Idaho, and from western Wyoming, including the Wyoming, Salt River, Snake and Gros Ventre ranges (Lincoln, Teton, and Sublette counties; Barneby 1964, Rocky Mountain Herbarium 2011).

The Salt River and the Wyoming Ranges include most of species' distribution in Wyoming. Its discovery on the Gros Ventre Range was made in 1994, where it was found along Little Granite Creek. It might also be considered as extending to the Snake River Range because it is known from the Snake River corridor, where it was recently surveyed in 2007. There it appears to be completely restricted to roadsides and other zones of human disturbance. It may have been an upstream extension of the historic occurrences around the Palisades Reservoir area of Idaho.

All known Wyoming occurrences³ are on the Bridger-Teton National Forest, except for those that are located in a unit of the Targhee National Forest that is under management of Bridger-Teton National Forest, or extend into the federal highway corridor of U.S. Hwy. 26/89 in the Snake River Canyon. In Idaho, Payson's milkvetch has been documented from Nez Perce National Forest (Idaho Co.), Challis National Forest (Custer Co.) and Targhee National Forest (Bonneville CO.) as well as lands managed by the Couer d'Alene District of the BLM and the state (Lorain 1990; unpublished records of the Idaho Natural Heritage Program). The Challis and Targhee national forests are in Region 4 of the U.S. Forest Service. One occurrence is protected within the proposed Fall Creek Special Botanical Area (Bridger-Teton NF). All other occurrences are on National Forest lands managed for multiple use.

Extant sites: It is now known from 34 extant records documented since 1970 (Figure 5, Table 3), if we assume that all recent records are extant and exclude the two that could not be relocated in 2011. However, this successional species may be prone to local extirpation where present in low numbers. With this level of uncertainty, its state rank was calculated using different occurrence number tallies (4 large populations vs. 20 vs. 34 total extant populations). The outcome ranged from S1-S3, and the species' state rank remains ranked at S2. Thirty-three of the extant occurrences are on Bridger-Teton National Forest.

Of the two occurrences on the Targhee National Forest, one was on a highway right-of-way where there has since been widening, and it is considered extirpated (Mancuso and Heidel 2008).

In 2011, surveys targeted six of these recent occurrences and the one historic occurrence. Two of the six could not be relocated and may be extirpated, but the historic occurrence was relocated. This leaves the status of 28 occurrences unknown.

Historical sites: Prior to 2011, there was one record (#004) known only from a historical collection, representing the 1922 discovery and type locality collected by Edwin and Lois

³ The term occurrence refers to best professional approximation of a population, based on interpretations that integrates information sources over time and space.

Payson. The location was described as North Horse Creek, about 7 miles west of Merna. The setting was described as “burned areas in forest”. The first attempt to search for it was made in 1978 by John and Leila Shultz, who reported:

“In searching for the very place where Payson collected *Astragalus paysonii* in 1922, we were guided by the type description itself. Early on we realized that the road crossing of North Horse Creek had been changed and in fact the fill for the new road might possibly have over-covered the exact site. However, we were able to find the traces of the old road as it approached the river. Following the type description and focusing on the granitic soil and burned site destruction, we devoted three days to searching the general area but with no success. We concluded with considerable confidence that this locality was no longer a site for *Astragalus paysonii*” (Shultz and Shultz 1978).

In 2011, a GIS layer mapping of recent wildfires (1991-2010; USDA Forest Service 2011) was provided by the Forest and it was determined that part of the North Horse Creek landscape had burned (Mule Fire of 2003 and Horse Creek Fire of 2007). The area was therefore included among those targeted for 2011 survey, where Payson’s milkvetch was successfully documented at scattered North Horse Creek drainage locations within areas that had burned by crownfire.

Unverified/Undocumented reports: None known.

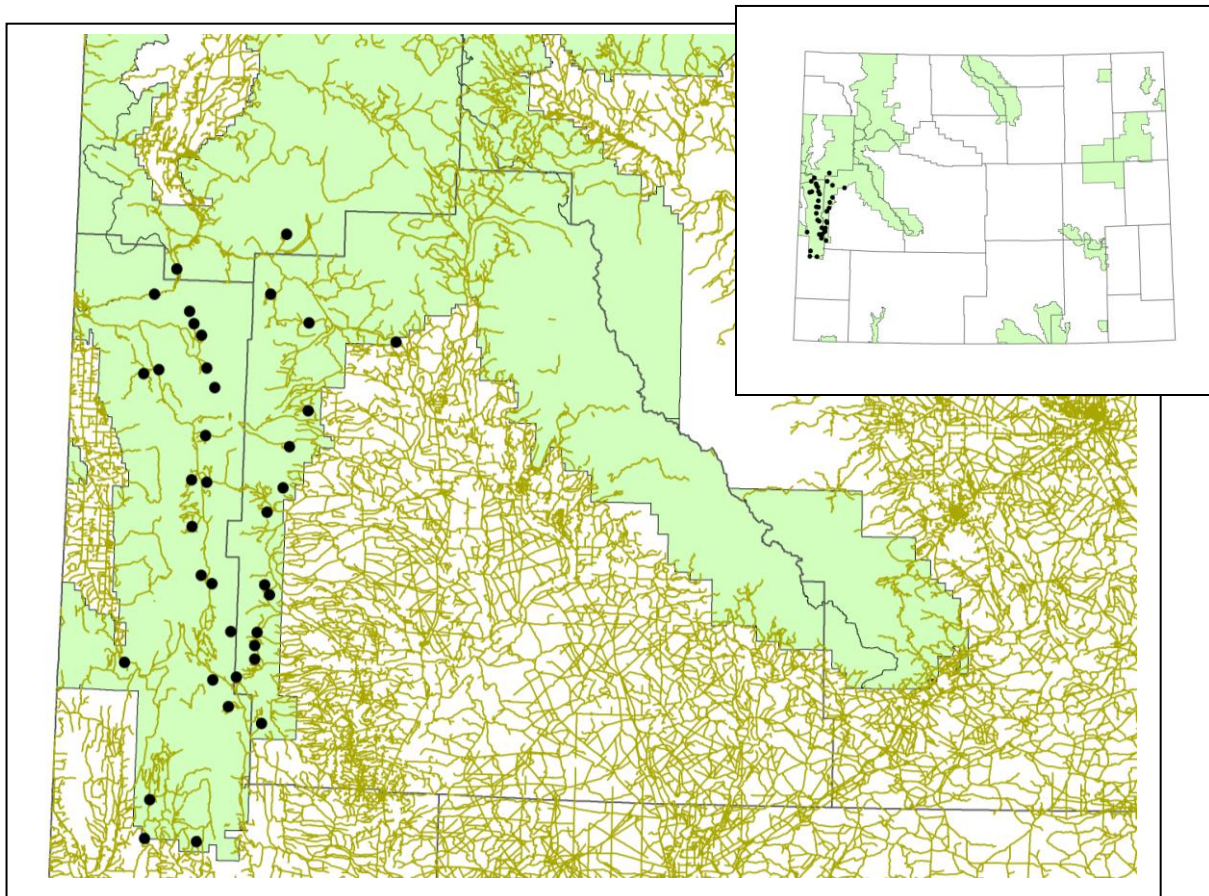


Figure 5. Distribution of Payson’s milkvetch (*Astragalus paysonii*) in Region 4 of the U.S. Forest Service (Wyoming)

Table 3. Occurrences of Payson's milkvetch (*Astragalus paysonii*) in Wyoming

EO#	Directions	County	Legal Description	Elevation m (ft)	USGS 7.5' Quad	Public Land
BRIDGER-TETON NATIONAL FOREST						
001	Wyoming Range; Darby Creek Basin, adjacent to Forest Service Road 10141, ca 1.5 miles east of south summit of Mount Darby, ca 22 air miles west of Big Piney.	Sublette	T29N R115 Sec. 4, 9	2499-2611 (8200-8565)	Wyoming Peak	Big Piney RD
002	East slope Wyoming Range; foothills due north of Edwards Creek, ca 1 mile east of summit of Mount Schidler, ca 22.5 air miles west of Big Piney.	Sublette	T31N R115W Sec. 22, 23, 26, 27	2591-2731 (8500-8960)	Mount Schidler	Big Piney RD
003	Wyoming Range; Middle Fork Creek.	Lincoln, Sublette	T30N R115W Sec. 19, 30; T30NR116W Sec. 13, 23, 24, 25, 26	2926 (9600)	Wyoming Peak	Big Piney RD
004	Wyoming Range; along slopes just east of Prospect Peak, along North Horse and Pass creeks, ca 4-7.5 miles west of Merna.	Sublette	T34N R114W Sec. 8, 9, 11, 17	2438-2560 (8000-8400)	Prospect Peak	Big Piney RD
005	Wyoming Range; Clear Creek.	Lincoln	T29N R116W Sec. 14, 15, 16, 20, 21, 22, 23, 26, 27, 28	2195-2804 (7200-9200)	Graham Peak, Mount Thompson	Kemmerer RD
006	Wyoming Range; Thompson Pass, ca 1 mile south of summit of Mount Thompson, ca 24 air miles west of Big Piney.	Lincoln, Sublette	T29N R115W Sec. 19, 30; T29N R116W Sec. 24, 25	2621 (8600)	Mount Thompson	Big Piney RD, Kemmerer RD
007	East slope Wyoming Range; east slope of Mount Darby, 0.1-0.5 miles west of Coal Creek Road, ca 22 air miles west of Big Piney.	Sublette	T29N R115W Sec. 4; T30N R115W Sec. 28, 33	2530-2682 (8300-8800)	Wyoming Peak	Big Piney RD
008	Northern Wyoming Range; Bailey Creek drainage, 1-1.5 miles south of south shore of Bailey Lake, 1.75 miles north of McCain Guard Station, ca 15 air miles east of Alpine.	Lincoln	T37N R116W Sec. 23, 26, 27	2042-2256 (6700-7400)	Bailey Lake	Greys River RD
009	East slope Salt River Range; ca 0.5 air miles east of Murphy Lakes, ca 0.75 miles north of Star Peaks, ca 11 air miles southeast of Alpine.	Lincoln	T35N R117W Sec. 6; T35N R118W Sec. 1; T36N R118W Sec. 36	2048-2073 (6720-6800)	Deer Creek	Greys River RD
010	Northern Wyoming Range; around Water Dog Lake and lake to the southwest and along trail ca 0.3 mile west of the lake, ca 1 mile north of McCain Guard Station, ca 16 air miles east of Alpine.	Lincoln	T36N R116W Sec. 5; T37N R116W Sec. 36	2134-2256 (7000-7400)	Bailey Lake, Pickle Pass	Greys River RD

011	Northern Wyoming Range; west and southeast shore of Bailey Lake, ca 14 air miles east of Alpine.	Lincoln	T37N R116W Sec. 14, 15	1981- 2225 (6500- 7300)	Bailey Lake	Greys River RD
012	Sublette Range; Smith Fork Road, ca 0.4 mile west of CCC Camp, ca 15.8 air miles south of Afton, ca 8.8 air miles south of Smoot.	Lincoln	T29N R118W Sec. 15, 16	2399 (7870)	Mount Wagner, Porcupine Creek, Salt Flat, Smoot	Greys River RD
013	Salt River Range; Bear Creek, ca 1.3 miles west of Greys River, ca 15 air miles northeast of Afton.	Lincoln	T33N R116W Sec. 4, 5, 6, 7, 8, 9, 16, 17, 18, 19	2210 (7250)	Blind Bull Creek, Park Creek	Greys River RD
014	West slope Wyoming Range; Blind Bull Creek drainage, ca 1.75 air miles east of Greys River, ca 19 air miles northeast of Afton.	Lincoln	T34N R116W Sec. 9	2134 (7000)	Blind Bull Creek	Greys River RD
015	East slope Salt River Range; South Three Forks Creek, ca 1.5 air miles west of Greys River, ca 11 air miles east-northeast of Afton.	Lincoln	T32N R117W Sec. 12, 13	2316 (7600)	Park Creek	Greys River RD
016	East slope Wyoming Range; Prospect Canyon, ca 1.5 miles east of summit of Fish Creek Mountain, ca 22 air miles west of Big Piney.	Sublette	T30N R115W Sec. 21	2646 (8680)	Wyoming Peak	Big Piney RD
017	East slope Wyoming Range; Dutch Dans Gulch Road, ca 3.5 air miles northeast of Middle Piney Lake Campground, ca 21 air miles west-northwest of Big Piney.	Sublette	T31N R115W Sec. 26	2658- 2670 (8720- 8760)	Mount Schidler	Big Piney RD
018	East slope Wyoming Range; Irene Creek drainage, upper northeast slopes and lower southeast slopes of peak 8627, ca 1.5 mile northeast of summit of Lander Peak, ca 27 air miles northwest of Big Piney.	Sublette	T33N R115W Sec. 25	2560- 2621 (8400- 8600)	Triple Peak	Big Piney RD
019	East slope Wyoming Range; ridge 0.5 miles south of Maki Creek, ca 31 air miles northwest of Big Piney.	Sublette	T33N R114W Sec. 8	2591- 2621 (8500- 8600)	Maki Creek	Big Piney RD
020	Tunp Range; adjacent to Nugent Park Road (Forest Service Road 10069), 2 locations (1) ca 0.6 miles west of Big Spring, ca 1.5 miles south of Kelley Guard Station, (2) ca 0.6 miles southwest of Big Spring, ca 2 air miles south of Kelley Guard Station, ca 13.5 air miles northeast of Cokeville.	Lincoln	T26N R117.5W Sec. 13; T26N R118W Sec. 13	2512- 2524 (8240- 8280)	Nugent Park	Kemmerer RD
021	East slope Salt River Range; Greys River Valley, slopes ca 0.5 mile south of Corral Creek, ca 1	Lincoln	T31N R116W Sec. 17	2377 (7800)	Box Canyon Creek	Greys River RD

	air mile west-southwest of Corral Creek Guard Station, ca 13 air miles east-southeast of Afton.					
022	West slope Wyoming Range; ridge between Greys River and Box Canyon Creek, 1.5 air miles south of Corral Creek Guard Station.	Lincoln	T31N R116W Sec. 21	2560 (8400)	Box Canyon Creek	Greys River RD
023	Wyoming Range; northern end of Absaroka Ridge, ca 1 miles west of Scaler Guard Station, ca 26 air miles west-southwest of Big Piney.	Lincoln	T28N R116W Sec. 9	2743 (9000)	Mount Thompson	Kemmerer RD
024	East slope Wyoming Range; South Beaver Creek and ridge to the south, ca 3.5 air miles northwest of Sherman Guard Station, ca 19.5 air miles west-northwest of Daniel Junction.	Sublette	T35N R114W Sec. 14, 23	2512-2602 (8240-8536)	Prospect Peak	Big Piney RD
025	Wyoming Range; 2 locations (1) Deadman Mountain Trail, 1-2 miles south of trailhead, 3-3.5 air miles north-northwest of Deadman Mountain summit, (2) adjacent to Little Greys River, ca 0.25 miles northwest of Hunting Camp, ca 2 miles southeast of Steer Creek.	Lincoln	T36N R116W Sec. 21, 22, 27, 28, 33, 34	2134-2256 (7000-7400)	Pickle Pass	Greys River RD
026	Wyoming Range; Deadman Mountain Trail, ca 1.5-2.5 air miles north of Deadman Mountain summit.	Lincoln	T35N R116W Sec. 2, 3, 9, 10, 11, 14, 15; T36N R116W Sec. 34, 35	2469-2804 (8100-9200)	Pickle Pass	Greys River RD
027	Wyoming Range; "The Rim" and area to southwest, ca 13 air miles southeast of Bondurant.	Sublette	T36N R112W Sec 3; T37N R111W Sec 31, 32	2426-2451 (7960-8040)	Pass Peak, Signal Hill	Big Piney RD
028	Wyoming Range; Stump Lake, ca 12 air miles southeast of Alpine Junction.	Lincoln	T36N R117W Sec. 32, 33	2036-2109 (6680-6920)	Deer Creek	Greys River RD
029	Wyoming Range; at the fork of Clark Draw, ca 3 air miles south of Bondurant, ca 36 air miles northwest of Pinedale.	Sublette	T37N R113W Sec. 20	2195 (7200)	Bondurant	Big Piney RD
030	Wyoming Range; ridge between Buck and Sheep creeks, adjacent to Buck Creek logging road, 1.9 road miles east-northeast of Greys River Road.	Lincoln	T33N R116W Sec. 9, 10, 15, 16	2256 (7400)	Park Creek	Greys River RD
031	Tump Range; 0.2-1 road miles north of National Forest boundary, ca 9 air miles northeast of Cokeville.	Lincoln	T25N R118W Sec. 12	2493-2512 (8180-8240)	Nugent Park	Kemmerer RD
032	Salt River; southwest flank	Lincoln	T25N R116W	2499-	Pole Creek	Kemmerer

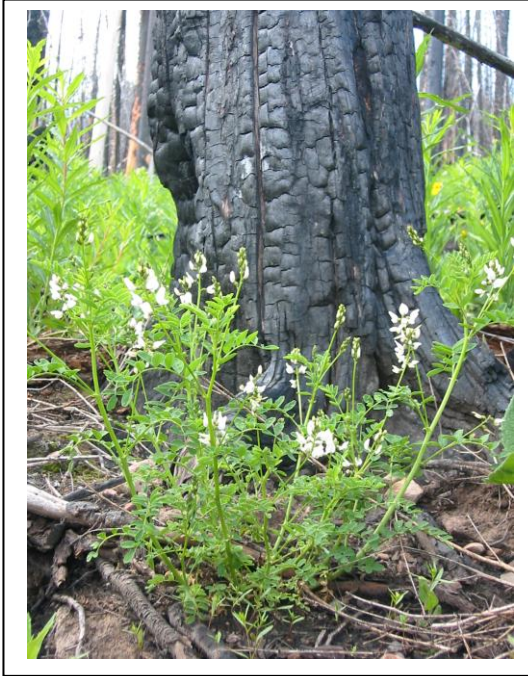
	Comissary Ridge and ridge between Pole and East Fork Pole creeks.		Sec. 6, 7, 8, 17, 18; T25N R117W Sec. 1, 12, 13	2591 (8200-8500)		RD
033	Gros Ventre Mountains; (1) along the Little Granite Creek Pack Trail, between trailhead and Gros Ventre Wilderness boundary, (2) west-facing ridge near Boulder Creek and Gros Ventre Wilderness boundary, ca 3-4.5 miles north of U.S. Highway 189 at the confluence of Little Granite Creek and the Hoback River.	Teton	T39N R114W Sec. 13, 14, 15, 22, 23, 24, 26, 27	2042-2200 (6700-7218)	Bull Creek, Granite Falls	Jackson RD
034	Southern Wyoming Range; ridge on east side of Big Fall Creek along 2-track logging road to abandoned clearcut just below the summit rim, ca 1.8 air miles north of the Bridger-Teton National Forest boundary, ca 2 air miles northeast of confluence of Big Fall Creek and LaBarge Creek.	Sublette	T28N R115W Sec. 20, 29	2621 (8600)	Mount Thompson	Kemmerer RD
037	Salt River/Wyoming Ranges; Cliff Creek [ca 6 miles west of Bondurant].	Sublette	T37N R114W Sec. 3, 4, 5, 8, 9, 10; T38N R114W Sec. 21, 27, 28, 29	2073-2499 (6800-8200)	Clause Peak	Big Piney RD
OUTSIDE OF BRIDGER-TETON NATIONAL FOREST						
035	Snake River Range; west bank of the Snake R along US Hwy 26/89 from mouth of Cabin Cr Canyon north ca 1 mile, ca 5 air miles southwest of Hoback Junction.	Teton	T38N R116W Sec. 17, 20	1780-1786 (5840-5860)	Munger Mountain, Pine Creek	Targhee NF
036	Snake River Range; Grand Canyon of the Snake River, on north side of US Highway 26/89 across from turnout to the Station Creek Campground.	Lincoln	T37N R117W Sec. 2	1768 (5800)	Pine Creek	Targhee NF

Sites where present status not known: It is not known whether the 28 sites that have not been collected or surveyed since 1992 persist.

Habitat

Settings and associated vegetation: Occurs primarily in disturbed areas such as recovering burns, clear cuts, road cuts, and blow downs. Usually found on sandy soils with low cover of forbs and grasses. Elevation 5850-9600 feet (Fertig and Marriott 1993, Mancuso and Heidel 2008).

Most of the past Wyoming surveys for this species have focused on man-made disturbance (Shultz and Shultz 1978, Dorn 1978, Fertig and Marriott 1993)(Figure 10). The 2011 surveys provided an initial opportunity to address fire response (Figures 6 and 7).



Figures 6 and 7. Wildfire habitat of *Astragalus paysonii* on North Horse Creek, by K. Varga

Figure 8. Clearcut habitat of *Astragalus paysonii*, by Jane & Robert Dorn, from Fertig et al. (1994)

Note: *Astragalus paysonii* plants in dense patches in foreground



Geology of *Astragalus paysonii* habitats vary widely within the study area. It generally decays to coarse sediment, often sandy, and appears to include the following mapping units:

- Ankareh Formation, Thaynes Limestone, Woodside Shale and Dinwoody Formation
- Aspen Shale Formation
- Blind Bull Formation
- Gannet Group
- Nugget sandstone, Chugwater and Dinwoody Formations
- Stump Formation, Preuss Sandstone or redbeds, and Twin Creek Limestone
- Wasatch Formation
- Quaternary deposits including: Glacial; Gravel pediment and fan; and Landslide deposits.

Without precise location information, some of these geological units remain to be confirmed, but they collectively represent large segments of the landscape and indicate that its distribution is not limited by substrate.

Frequently associated species: Common associates of *Astragalus paysonii* are reported in Table 4, as cited in three studies that represent different times and places of survey. It appears to be associated more closely with environmental conditions than with a consistent guild of species.

Table 4. Plants associated with Payson's milkvetch (*Astragalus paysonii*) in Wyoming

Scientific name	Common name	Exotic/ Native	Reported in 2011	Reported in 1960	Reported in 1978 surveys
<i>Achillea millefolium</i>	Common yarrow	Native	X	X	X
<i>Astragalus agrestis</i>	Cock's-head [Field milkvetch]	Native			
<i>Astragalus miser</i> var. <i>hylophilus</i>	Timber milkvetch	Native			
<i>Bromus inermis</i>	Smooth brome	Exotic		X	X As <i>B. anomalus</i> ?
<i>Bromus carinatus</i>	Large mountain brome [California brome]	Native			X
<i>Calamagrostis rubescens</i>	Pinegrass [Pine reedgrass]	Native	X		
<i>Carduus nutans</i>	Musk thistle	Exotic	X	X	
<i>Cirsium arvense</i>	Canada thistle	Exotic	X	X	
<i>Cirsium foliosum</i>	Elk thistle	Native			X
<i>Cirsium vulgare</i>	Bull thistle	Exotic			X
<i>Collinsia parviflora</i>	Blue-eyed Mary	Native	X		
<i>Epilobium angustifolium</i>	Fireweed	Native	X		
<i>Eriophlym lanatum</i>	Common woolly sunflower	Native	X		
<i>Geranium viscosissimum</i>	Sticky geranium	Native	X		X
<i>Hedysarum occidentale</i>	Western sweet-vetch	Native		X	
<i>Iliamna rivularis</i>	Streambank globemallow	Native	X	X	
<i>Koeleria macrantha</i> (K.	Junegrass	Native			X
<i>Lupinus argenteus</i>	Silver-stem lupine	Native	X	X	X As <i>L. caudatus</i> ?
<i>Mahonia repens</i>	Oregon grape	Native			X
<i>Monarda pectinata</i>	Plains beebalm	Native			X
<i>Poa compressa</i>	Flat-stem bluegrass [Canada bluegrass]	Exotic	X		
<i>Poa pratensis</i>	Kentucky bluegrass	Exotic			X
<i>Senecio integerrimus</i>	Western groundsel [Lamb-tongue ragwort]	Native			X
<i>Taraxacum officinale</i>	Common dandelion	Exotic	X		X
<i>Thalictrum fendleri</i>	Fendler's meadow-rue	Native		X	
<i>Trisetum spicatum</i>	Narrow false oat [Spike trisetum]	Native		X	
<i>Vaccinium scoparium</i>	Grouseberry [Grouse whortleberry]	Native	X		

It appears to be negatively-correlated with *A. miser* var. *hylophilus*, another legume adapted to disturbed sites in the Wyoming/Salt River ranges (Shultz and Shultz 1978), which has been characterized as a more successful competitor, particularly in open canopy sites (Fertig and Marriott 1993).

Topography: Found mainly on gentle to moderate, well-drained slopes and benches.

Water and soil relationships: On North Horse Creek, which was the largest population surveyed in 2011, it was noted as almost always present in microhabitats where the ground was very bare and there were uncompacted mineral soils without duff (Varga survey notes). However, it is not consistently found where there is bare ground, and may be present at only 5% of the places with apparently suitable substrate (Varga survey notes). The soils are often sandy, derived from a variety of bedrock and deposits (discussed in Geology).

Population biology

Population size and condition: Average occurrences are extremely small and restricted in area, often with fewer than 20 plants in 1/2 acre of habitat. Up until 1992, only four Wyoming occurrences have ever been reported as containing over 100 plants (Table 5; Fertig and Marriott 1993).

Table 5. Population information for Payson’s milkvetch (*Astragalus paysonii*) in Wyoming

EO#	Population size	Documentation	Last Observed Date
BRIDGER-TETON NATIONAL FOREST			
001	2 subpopulations of app. 200 plants spanning ca. 1 mile in 1992; persisting at essentially 3 points of at least 12 plants in 2011. 2011-07-12: This area has been logged. (Sec 4, 9; line) 25% in flower, 75% vegetative. 12 plants. (Sec 9 S2) Failed to find. Surveyed by K. Varga. 1992-07-22: (both polygons) In fruit. 47 Plants observed in SW4 on west fork of road. 115 plants observed in open site along road and clearcut in NE4. 25 plants found in wooded site in NE4 and 10 plants observed in new clearcut debris in NE4. Spread thinly over entire area. Does not occur in areas with high cover of grasses or in sagebrush. Some evidence of grazing (topped stems). Surveyed by W. Fertig. 1979-06-26: (Sec 9 S2) In flower. Corolla white tinged with pink. Collected by R. Dorn. 1978-08-30: (Sec 9 E2) In flower and fruit. Most abundant species in new clearcut. Collected by J.S. Shultz. 1978-08-16: (Sec 9 E2) Collected by F. Smith.	Survey	12 July 2011
002	1 main subpopulation with at least 3000 plants in 1992, persisting as one point with 2 plants in 2011. 2011-07-12: (Sec 22) 100% in flower. 2 plants. This area has been logged. Surveyed by K. Varga. 1992-07-27: (Sec 22) In flower and fruit. Minimum of 3000 plants. Very abundant along sandy banks of logging	Survey	12 July 2011

	roads. Also present in low numbers in open patches in mature lodgepole pine forest and in young pine stands. Sparsely populated in open meadows and recently logged sites. Surveyed by W. Fertig. 1979-06-26: (Sec 26) In flower and fruit. Corolla white tinged with pink. Collected by R. Dorn.		
003	1978-08-31: Collected by A. Holmgren.	Specimen	31 August 1978
004	4 subpopulations in ca 3.5 miles, >250 plants. 2011-07-14: (Sec 11) 75% in flower, 25% vegetative. 55 plants. Surveyed by K. Varga. 2011-07-13: (3 subpopulations) (Sec 8, 17) 25% in flower, 75% vegetative. 60 plants. (Sec 8 NE4) 15% in flower, 85% vegetative. 33 plants. (Sec 9) 70% in flower, 30% vegetative. 108 plants. Surveyed by K. Varga. 1922-07-18: Collected by E. and L. Payson.	Survey	14 July 2011
005	1980-07-03: In flower. Collected by R. Lichvar.	Specimen	3 July 1980
006	1 plant found in 1992, in the vicinity of a 1980 collection.	Survey	22 July 1992
007	Ca 65 plants in 5 patches found in 1992, in the vicinity of a 1980 collection.	Survey	21 July 1992
008	4 subpopulations in ca 1 mile over 1979 and 1992. Only 1 of 3 subpopulations persisting in 2011. 2011-07-17: (Sec 23) 100% in flower. 1 plant. 2011-07-17: (Sec. 26 - both) Failed to find. Surveyed by K. Varga. 1992-07-29: (all subpopulations) In flower and fruit. Subpopulations very small. Surveyed by W. Fertig. 1979-08-06: (Sec 27) In fruit. Collected by L. and J. Shultz. 1979-07-19: (Sec 26 W2) In flower and fruit. Rare. Collected by L. and J. Shultz.	Survey	17 July 2011
009	2 subpopulations in ca 0.5 mile. 1992-07-24: (Sec 6) 9 plants (4 in fruit) adjacent to road, (Sec 1-36) 20 plants (10 in fruit, 5 with heavy loss of branches due to grazing by unknown herbivore) in semi-shade adjacent to road. Surveyed by W. Fertig.	Survey	24 July 1992
010	2 subpopulations in ca 1 mile estimated at 600-1000 plants in 1992; 2 additional subpopulations located and population censused at 234 plants in 2011. 2011-07-16: (all subpopulations) (Sec 36 SW4) No plants found in meadow. (Sec 36 W2) 100% in flower. 32 plants. (east side Waterdog Lake) 100% in flower in south; 90% in flower, 10% vegetative in north. 3 plants in south; 9 plants in north. (west side Waterdog Lake) Most of this subpopulation is gone. (Sec 36, 5) 80% in flower, 20% vegetative on east side; 100% in flower on west side. 128 plants on east side, 62 plants on west side. Surveyed by K. Varga. 1992-07-29: (SW4 and west side of Waterdog subpopulations) In flower and fruit. Estimated population of 600-1000. (SW4) 130 plants observed in meadow at edge of trail with high vegetative cover (100%). Many plants were chlorotic and several dead. Site may be becoming overgrown in absence of recent disturbance. Absent from adjacent from aspen groves. Surveyed by	Survey	16 July 2011

	<p>W. Fertig. 1986-06-30: (SW4) In bud, flower, and fruit. 24 plants. Loose clumps with few stems, widely scattered. Surveyed by O. Harrison. 1979-07-19: (west side of Waterdog) In flower and fruit. Collected by L. and J. Shultz.</p>		
011	<p>2 subpopulations in ca 0.5 mile. 1992-07-29: (Sec 14) 3 plants observed only at edge of trail. Not found in tall, thick vegetation on hillside. Surveyed by W. Fertig. 1979-08-25: (Sec 15) In fruit. Collected by L. and J. Shultz.</p>	Survey	29 July 1992
012	<p>1985-07-06: In flower and fruit. Only a few plants. Surveyed by O. Harrison.</p>	Survey	6 July 1985
013	<p>1982-07-17: In flower and fruit. Only 10 plants in large clumps of many stems. Surveyed by O. Harrison.</p>	Survey	17 July 1982
014	<p>1992-07-24: In flower and fruit. 13 large plants observed at edge of roadcut. Total population estimated at 30-40 plants. Many plants with grazed tops. No plants observed in adjacent undisturbed pine forest nor in areas of active cutting and road-building. Surveyed by W. Fertig.</p>	Survey	24 July 1992
015	<p>1992-07-25: (3 patches along roadside) (1) 4 plants in fruit and 2 immature, 1 plant badly grazed. (2) 19 plants, most producing good fruit, none grazed. (3) 13 plants, many grazed. Surveyed by W. Fertig.</p>	Survey	25 July 1992
016	<p>1992-07-20: In flower and fruit. Only 2 plants observed. Numerous <i>Astragalus miser</i> var. <i>hylophilus</i> plants. Surveyed by W. Fertig.</p>	Survey	20 July 1992
017	<p>1992-07-27: (2 patches) In flower and fruit. (1) 4 plants near slash pile. No evidence of grazing. (2) 3 plants scattered in 10-12 year old lodgepole pine grove. Surveyed by W. Fertig.</p>	Survey	27 July 1992
018	<p>1992-07-28: (2 subpopulations) In flower and fruit. Total estimated at 50-100 plants. (1) 14 plants observed in overgrown roadbed of old logging road. (2) 6 plants observed at edge of main logging road. Surveyed by W. Fertig.</p>	Survey	28 July 1992
019	<p>1992-07-28: 2 immature plants found in area of timber salvage in recent burn. No plants found in adjacent burned sites. Some <i>Astragalus miser</i> also present. Surveyed by W. Fertig.</p>	Survey	28 July 1992
020	<p>1992-08-07: (2 subpopulations) In flower and fruit. (1) 28 plant in ca 1 acre. 1 large clump of 12 plants covering 5 square feet observed. Densest patch yet seen. (2) 11 plants scattered in roadbed in clearcut and among slash. Total numbers probably higher. Slash has been burned at both sites. Surveyed by W. Fertig and J. Struttmann.</p>	Survey	7 August 1992
021	<p>1992-08-09: In flower and fruit. 35 plants observed at one small site covering ca 1 acre. Potential habitat is extensive, but underpopulated. Most plants chlorotic and with evidence of being grazed (some cattle grazing does occur near this site). No <i>Astragalus miser</i> in area. Surveyed by W. Fertig.</p>	Survey	9 August 1992
022	<p>1992-08-09: Poor fruit production. 4 sickly-yellow plants, observed on west-facing slope, all heavily grazed.</p>	Survey	9 August 1992

	Surveyed by W. Fertig and J. Struttmann.		
023	1992-08-09: In fruit. 9 plants observed in ca 60 feet along road. Many plants in poor condition (pale & chlorotic) due to dry conditions. No Astragalus miser at this site. Surveyed by W. Fertig and J. Struttmann.	Survey	9 August 1992
024	Ca 2 subpopulations in ca 0.6 mile, the 1992 subpopulation of 4 plants not found in 2011, but a new subpopulation of 28 plants added. 2011-07-14: (Sec 14) failed to find. (Sec 23) 75% in bud and flower, 25 % vegetative. 28 plants. Surveyed by K. Varga. 1992-08-10: (Sec 14) In fruit. 4 plants found along 50 feet of roadside in full sun or partial shade. Plants found in shade in better health. No Astragalus miser at this site. Surveyed by W. Fertig and J. Struttmann.	Survey	14 July 2011
025	2 subpopulations in ca 1 mile. 2011-07-15: (Sec 21) Failed to find. Surveyed by K. Varga. 1992-07-22: (Sec 28) In flower and fruit. 12-15 individuals observed. Collected by R. Hartman. 1989-08-05: (Sec 21) In bud, flower, and fruit. Loose clumps of few to many stems. Observed by O. Harrison.	Specimen	22 July 1992
026	1992-07-22: In flower and fruit. 10-12 individuals observed. Scattered over area. Collected by R. Hartman.	Specimen	22 July 1992
027	1992-07-28: In fruit. 12-15 Individuals observed scattered in understory. Collected by R. Hartman.	Specimen	28 July 1992
028	2011-07-18: Failed to find. Surveyed by K. Varga. 1992-06-12: In flower and fruit. Collected by B. Embury.	Specimen	18 July 2011
029	1992-07-08: In flower and fruit. Collected by B.E. and R. Nelson.	Specimen	8 July 1992
030	1991-06-30: In bud and flower. Abundant in limited areas. Observed by O. Harrison.	Observation	30 June 1991
031	1993-08-02: In fruit. Collected by R. Hartman.	Specimen	2 August 1993
032	1993-08-20: In fruit. Ca 50 plants scattered in openings and along trail. Collected by R. Hartman.	Specimen	20 August 1993
033	2 subpopulations in ca 1.5 miles. 2003-08-05: (Sec 24) 10% in flower, 90% in fruit. Ca 200 plants. Observed by D. Scott. 1994-07-07: (Sec 22) In flower and fruit. 8 plants. Collected by R. Hartman.	Specimen	5 August 2003
034	1995-08-09: In flower and fruit. 25 plants observed. Surveyed by W. Fertig. 1995-07-04: Vegetative. Population small, limited to roadbank. Surveyed by W. Fertig.	Survey	9 August 1995
037	1977-06-27: Collected by R. Steele.	Specimen	27 June 1977
OUTSIDE OF BRIDGER-TETON NATIONAL FOREST			
035	2007-07-07: 80% in fruit or late flower, many plants past fruit and desiccated. Ca 200-500 plants (170 counted at 12 points). Most extensive on west side above highway, but most numerous in abandoned campground on east side. Surveyed by B. Heidel. 1995-08: 13 subpopulations located within 60 meters of centerline of highway. At least 41-43 plants observed along 0.9 mile stretch of highway, with individual subpopulations ranging in size from 2-5 plants. Surveyed	Survey	7 July 2007

	by J. Ozenberger. 1995-06: Observed by J. Ozenberger.		
036	2007-07-07: Not found on either side of highway; both east and west of campground entrance, at trailhead, and east and west of boat ramp access. Surveyed by B. Heidel. 1995-08: 6 individuals observed on north side of highway within 20 meters of the roadside, the scattered individuals spreading to the east. Surveyed by J. Ozenberger.	Survey	7 July 2007

Trends: Historically, this species is probably in decline due to fire suppression in western national forests (Fertig and Marriott 1993). Most populations are very small and probably are unable to persist over long periods of time without some form of disturbance. In 1992, the plants were found to thrive best in human-disturbed sites, such as road cuts and recovering clear-cuts. According to Shultz and Shultz (1978), the age of clear-cut appears to influence population size and density. Plants are most numerous in cuts that are more than 15 years old and which have semi-open canopies with exposed sand or mineral soils. Populations are progressively smaller in younger cuts with open canopies and in older cuts with dense growth of grasses or herbs.

The surveys conducted in 2011 were revisits to prior survey sites to document trend. They provide some evidence that the species' persistence is not entirely contingent on human-disturbed sites, but that it also thrives in recent wildfires and in heterogenous landscapes with a complex of both upland and wetland openings. Three of the four populations that have ever been documented as large (over 100 plants) were revisited, and all were relocated. However, two of the three had declined in population size by one or two orders of magnitude and appeared to have much less than 100 plants in 2011. This included the Darby Mountain area population (#001) where the species was reported as "the most abundant species in new clearcut, rapidly decreasing with time" (Shultz and Shultz 1978), later reported as having 187 plants in three locations (Fertig and Marriott 1993), which by 2011 had 12 plants despite recent new logging in the area. The one large occurrence that had not declined was in the Waterdog Lake area (#010), where portions of the occurrence had disappeared, but occurrence boundaries were expanded with the expanded scope of survey in 2011.

Three populations previously reported as small were revisited in 2011, and only one was found to have the species persisting. The most significant update is that the species was discovered in a population of over 250 plants in the area of the type locality on North Horse Creek (last observed in 1922), despite the apparent absence of the species in 1978 surveys (Shultz and Shultz 1978). Results from these seven surveys support the hypothesis that the species declines with succession and only three populations have recently been documented to have over 100 plants. Though not all small populations are viable, the North Horse Creek discovery suggests that the species has a seed bank or else has a capacity to persist in low numbers between disturbance cycles.

The other "large" population was surveyed in 2007, confined to highway right-of-way and abandoned roads and campground pads (Mancuso and Heidel 2007). With rediscovery of a

large population on Horse Creek, there are still at least three “large” populations (over 100 plants) on the Forest although none are known to have more than 1000 plants.

Trend might be further evaluated in surveys and in controlled experiments. The scope of survey would ideally be expanded, possibly at the Horse Creek and Mule fires, and at the four other major wildfires in recent years. .” It might also be expanded at select heterogenous landscapes with multiple upland and wetland opening ecotones that resemble Waterdog Lake. It might also be expanded to include what may had been “intermediate” size populations, including the two populations that were reported as having numbers over 50 plants and a third where it was reported as “locally abundant”. Previous researchers have also recommended that a monitoring program be built into logging and prescribed burn treatments and wildfire response strategies in the vicinity of known populations. Perhaps some of the greatest unknowns are species’ response to the dual disturbances of bark beetle and blister rust that are spreading in the study area. They might be added to controlled experiment research. In any case, the elevated levels of bark beetle and blister rust are likely to have bearing on the fire regime for decades to come and hence on *Astragalus paysonii* viability. It bears repeating that no survey results to date address the interchangeability of man-made disturbance with wildfire disturbance. This would be better analyzed in controlled experiments than in surveys.

Threats

Astragalus paysonii is threatened primarily by succession which makes habitats unsuitable for long-term persistence. This species requires periodic disturbances to create new habitat and keep competing late-seral species and weeds at bay. It has been speculated that forest succession associated with years of fire suppression contributed to the extirpation of several occurrences in north-central Idaho (Lorain 1990). Seed production appears to be low, at least in some years, but seed bank dynamics and fire response are unknown (Lorain 1990). The 2011 surveys similarly indicate that two Wyoming populations may have become extirpated, but they were small and associated with human disturbance as best we know.

More importantly, the 2011 surveys support the hypothesis that fire can continue to play a role in the species’ distribution. Furthermore, it is possible, but not proven, that increased levels of bark beetle and blister rust infestations can also play a role in the species’ distribution. But there are several management issues associated with wildfire, pests and pathogens. Salvage logging, allotment management changes, and calls for soil stabilization or replanting may all arise in the wake of wildfire and such. *Astragalus paysonii* is generally restricted to exposed mineral soil and is likely a nitrogen-fixer in its early seral habitats (Clark and Dorn 1981). The specific action may not be as important as the magnitude of vegetation shift and competition that results among native or non-native plants. Noxious weeds are sometimes in the vicinity, and on Horse Creek, they were noted as present on lower, flatter areas where cattle use is high. Noxious weeds may also spread along the same corridors that mark habitat for *Astragalus paysonii*. Weed invasion has the potential to become a more serious threat than current extent would indicate.

ROBBINS' MILKVETCH
Astragalus robbinsii (Oakes) Gray var. *minor* (Hook.) Barneby

Classification

Scientific name: *Astragalus robbinsii* (Oakes) Gray var. *minor* (Hook.) Barneby

Synonyms: none

Common name: Robbins' milkvetch

Family: Fabaceae

Size of genus: There are 62 species of *Astragalus* reported for Wyoming in Dorn (2001), not including distinctions at the variety level. The *Astragalus* genus is comprised of 375 species (Barneby 1964) with at least 20 more recent additions (Isely 1998), not including taxa below the species level.

Phylogenetic relationships: The variety *minor* is the most widespread variety of the species, with a disrupted range that suggests fragmentation of a once widely-distributed taxa, thought to resemble the ancestral form of the taxon (Isely 1998).

Present legal or other formal status

U.S. Fish & Wildlife Service: None

U.S. Forest Service: none

Note: *Astragalus robbinsii* var. *occidentalis* (Lamoille Canyon milkvetch) is endemic to Nevada and is designated sensitive on the U.S. Forest Service Intermountain Region list.

Global Heritage rank: G5T5

State Legal status: none

State Heritage rank: The more recent list update (Heidel 2007) reported a state rank of S1.

Current status information supports a change in rank to S2 with the latest information.

Wyoming contribution rank: Conservation of Robbins' milkvetch as a widespread species at the edge of its range appears to be Low. It was likewise placed in a low conservation priority category by Fertig (2000).

Description

Technical description: Robbins milkvetch is a perennial forb with weakly erect, leafy stems 10-45 cm long. Leaves are 4.5-10 cm long and once-pinnately compound with 7-13 ovate-elliptic leaflets. Leaflets are finely pubescent with straight, basally-attached hairs below and glabrate above. Stipules are 1.5-6 mm long, mostly connate-sheathing, and often have ciliate margins. The inflorescence is a loose raceme of 5-25 purple or whitish, drooping, pea-like flowers. The calyx is 4-6.8 mm long and has black and white appressed hairs. The banner petal is 7.5-11 mm long. Wing petals are obtuse at the tip and shorter than the keel. Fruits are densely pubescent, drooping, 3-sided pods 10-25 mm long with an elongate basal stalk (stipe) up to 2.5 mm long that often exceeds the calyx tube (Barneby 1989; Welsh et al. 2008).

Similar species: *Astragalus eucosmus* has a keel that is 6 mm or less long and sessile pods that are 2.3-5.5 mm wide and less than 13 mm long. *A. australis* has notched wing petals and stipules that are hairy on the back. *A. alpinus* has a keel that is longer than the wing petals (Dorn 2001).

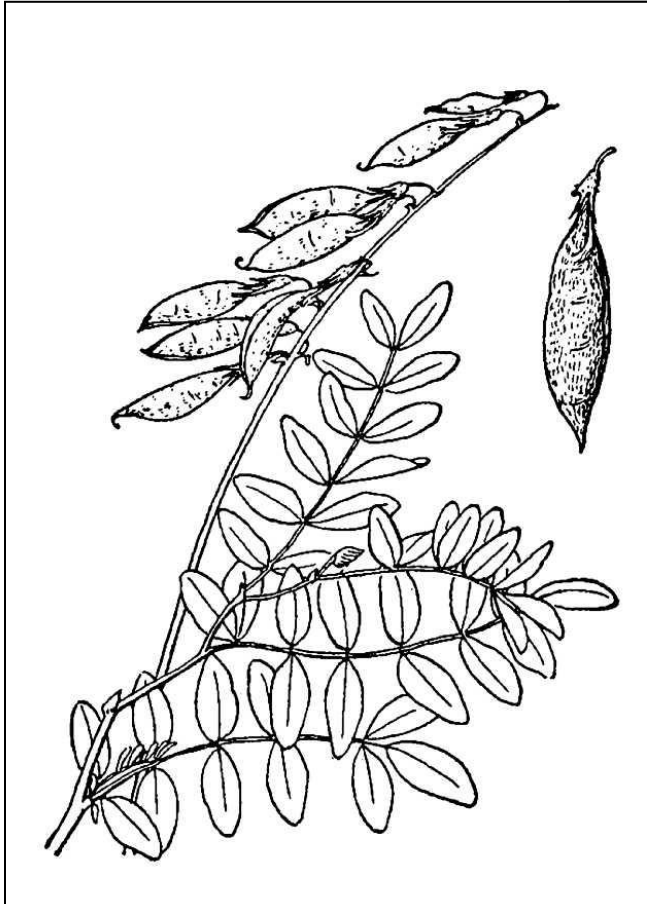


Fig. 9 (above). *Astragalus robbinsii* var. *minor* from: Britton, N.L., and A. Brown. 1913. An illustrated flora of the northern United States, Canada and the British Possessions. 3 vols. Charles Scribner's Sons, New York. Vol. 2: 382. Courtesy of [Kentucky Native Plant Society](#). Scanned by [Omnitek Inc](#).

Figure 10 (upper right): *Astragalus robbinsii* var. *minor*, in flower, by B. Heidel

Figure 11 (lower right): *Astragalus robbinsii* var. *minor*, whole plant in fruit, by B. Heidel



There are many other legumes that grow in riparian zones in the study area, and some of them are directly associated with *A. robbinsii*. The one that might be most readily confused is *A. eucosmus*. Others present include *Astragalus agrestis*, *A. canadensis* var. *brevidens*, *Astragalus miser* var. *hylophilus*, *Lupinus pusillus* var. *intermonatnus*, and *Oxytropis deflexa* var. *sericea*.

Prominent field characteristics: Purple flowers and black hairs on the calyx. Open elongate inflorescence. Drooping pods.

Phenology: Flowers from July to August. Fruit produced is most readily located when in flower.

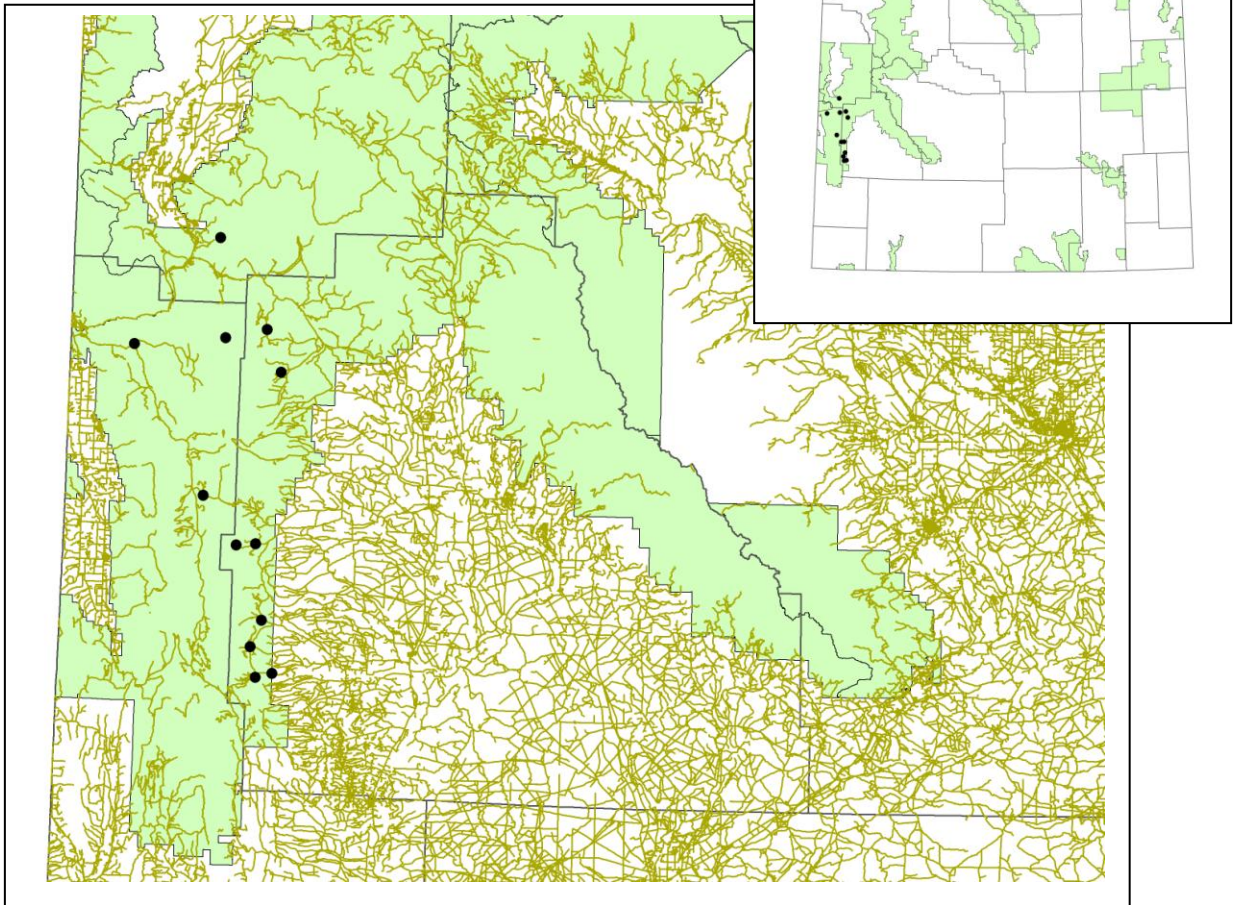


Figure 12. Distribution of Robbins' milkvetch (*Astragalus robbinsii* var. *minor*) in Region 4 of the U.S. Forest Service (Wyoming)

Geographical distribution

Range: Var. *minor* occurs from Alaska and the Yukon Territories to northern Utah and New Mexico, and with an isolated distribution in eastern North America from Labrador to Vermont (Barneby 1964, NatureServe 2011). In Wyoming, this taxon is found in the Gros Ventre and Wyoming ranges in Lincoln, Teton, and Sublette counties.

Extant sites: There are 11 extant sites (Figure 12, Table 6). All occurrences are on Bridger-Teton National Forest.

One occurrence is found within the Gros Ventre Research Natural Area (formerly named Horse Creek RNA), established in 1996 (Fertig and Jones 1994a).

Historical sites: None.

Unverified/Undocumented reports: None known.

Table 6. Occurrences of Robbins' milkvetch (*Astragalus robbinsii* var. *minor*) in Wyoming

EO#	Directions	County	Legal Description	Elevation m (ft)	USGS 7.5' Quad	Public Land
BRIDGER-TETON NATIONAL FOREST						
001	Wyoming Range; South Piney Creek at base of Riley Ridge, ca 0.5 mile E of Snider Basin Guard Stn., upstream from Darby Cr., downstream S of fishing access, ca 21 air miles W of Big Piney.	Sublette	T29N R115W Sec. 15	2408- 2420 (7900- 7940)	Mount Thompson, Wyoming Peak	Big Piney RD
002	Wyoming Range; along Sheep Creek, 0.25 mile east of Bug Cr., ca 16 air miles NE of Afton.	Lincoln	T33N R116W Sec. 10	2128 (6980)	Park Creek	Greys River RD
003	Wyoming Range; Forks of Greys River above bridge [vicinity of the junction of the main stem of the Greys R. and the Little Greys R.].	Lincoln	T37N R117W Sec. 21, 22, 26, 27, 28, 29, 32, 33, 34, 35	1707- 1829 (5600- 6000)	Ferry Peak, Pine Creek	Greys River RD
004	Gros Ventre Range; Big Horse Creek Valley, ca 5 air miles northeast of Hoback Jct.	Teton	T39N R115W Sec. 4, 5, 8, 9	1951 (6400)	Camp Davis	Jackson RD
005	Wyoming Range; Hunter Creek, a tributary of Willow Cr., ca 10.6 miles south of confluence with Hoback R., ca 12 air miles SSE of Hoback Jct.	Lincoln	T37N R115W Sec. 14, 15, 16, 21, 22, 23, 27, 28	2109 (6920)	Bailey Lake, Clause Peak	Jackson RD
006	Wyoming Range; along Kilgore Creek, ca 5 air miles east-northeast of Hoback Peak, ca 7.5 air miles SSW of Bondurant.	Sublette	T36N R114W Sec. 8, 9, 17	2225- 2286 (7300- 7500)	Noble Basin	Jackson RD
007	Wyoming Range; South Cottonwood Cr. at confluence of South Fk South Cottonwood Cr., ca 28 air miles SW of Daniel Jct.	Sublette	T32N R115W Sec. 7, 17, 18, 19;T32N R116W Sec. 13, 24	2560- 2591 (8400- 8500)	Triple Peak	Big Piney RD
008	Wyoming Range; along Cliff Creek East of Burnt Creek, ca 40 air miles northwest of Pinedale.	Sublette	T37N R114W Sec. 3, 9, 10, 11, 14, 15, 16, 22	2073 (6800)	Bondurant, Clause Peak	Jackson RD
009	Wyoming Range; on South Cottonwood Cr., directly NE of northeastern-most lake in Soda Lake area.	Sublette	T32N R115W Sec. 15	2524 (8280)	Triple Peak	Big Piney RD
010	Wyoming Range; Middle Piney Cr. below Sacajawea	Sublette	T30N R115W Sec. 2, 3, 12	2469- 2536	Springman Creek,	Big Piney RD

	Campground and on lower Indian Cr., south of FS Rds. 10024 and 10046, ca. 19-21 air miles WNW of Marbleton.			(8100-8320)	Wyoming Peak	
012	Wyoming Range; South Piney Cr. at Forest boundary, south of FS Rd 10128, mainly east of jack-legged fence, ca 18.5 air miles WSW of Marbleton.	Sublette	T29N R115W Sec. 7, 12	2371 (7780)	Springman Creek	Big Piney RD and BLM Pinedale
OUTSIDE OF BRIDGER-TETON NATIONAL FOREST						
	None					

Sites where present status not known: None known.

Areas surveyed but species not located: The confluence between South Cottonwood Creek and the South Forth of South Cottonwood Creek was surveyed without relocating it. The prior collection record was vague and the river covered parts of upland habitat in the area at the time of survey (late July), and so the timing may not have been suitable in the wet 2011 growing season. Habitats were generally searched upstream and downstream from known occurrences. It was located several miles downstream (#009) without finding any intervening locations. The only drainages that were surveyed where it was not found were on Coal Creek and Fish Creek.



Figures 13 and 14. Riparian habitat of *Astragalus robbinsii* var. *minor* in the Bridger-Teton National Forest, on the Middle Piney and South Piney creeks, respectively.

Habitat

Settings and associated vegetation: Wyoming populations are found in broad montane valleys on gravel or sand alluvium, often at the edge of willow thickets or streambanks, at 5600-8000 feet.

The surface geology varies widely but the riparian wetland habitat is generally mapped as Forested/ Shrubland Wetland (PSSA) in the National Wetlands Inventory (USFWS 2011). Frequently associated species: Common associates of *Astragalus robbinsii* var. *minor* are presented in Table 7.

Table 7. Plants associated with Robbins' milkvetch (*Astragalus robbinsii* var. *minor*) in Wyoming

Scientific name	Common name	Native/ Exotic
<i>Antennaria anaphaloides</i>	Tall pussytoes	Native
<i>Antennaria microphylla</i>	Small-leaf pussytoes	Native
<i>Astragalus agrestis</i>	Cock's-head [Field milkvetch]	Native
<i>Astragalus canadensis</i> var. <i>brevidens</i>	Canadian milkvetch	Native
<i>Astragalus miser</i> var. <i>decumbens</i>	Timber milkvetch	Native
<i>Betula glandulosa</i>	Swamp birch [Bog birch]	Native
<i>Carex pellita</i>	Woolly sedge	Native
<i>Carex utriculata</i>	Northwest Territory sedge [Beaked sedge]	Native
<i>Castilleja miniata</i>	Great red Indian-paintbrush [Scarlet paintbrush]	Native
<i>Deschampsia cespitosa</i>	Tufted hairgrass	Native
<i>Dodecatheon pulchellum</i>	Dark-throat shooting-star	Native
<i>Elymus trachycaulus</i>	Slender wild-rye	Native
<i>Fragaria virginiana</i>	Virginia strawberry	Native
<i>Juncus balticus</i>	Baltic rush	Native
<i>Linum lewisii</i>	Wild blue flax	Native
<i>Lonicera involucrata</i>	Four-line honeysuckle	Native
<i>Lupinus pusillus</i> var. <i>intermontanus</i>	Rusty lupine	Native
<i>Oxytropis deflexa</i> var. <i>sericea</i>	Pendant-pod locoweed	Native
<i>Poa pratensis</i>	Kentucky bluegrass	Exotic
<i>Potentilla fruticosa</i>	Shrubby cinquefoil	Native
<i>Potentilla gracilis</i>	Graceful cinquefoil	Native
<i>Salix melanopsis</i>	Dusky willow	Native
<i>Taraxacum officinale</i>	Common dandelion	Exotic
<i>Trifolium repens</i>	White clover	Exotic

Topography: Restricted to low-gradient montane riparian systems.

Water and soil relationships: The montane valleybottom flats are subject to flooding early in the growing season. There was prolonged mid-summer flooding in occupied habitat in some 2011 survey settings. Soils are well-drained coarse alluvium of sand and gravel.

Population biology

Population size and condition: *Astragalus robbinsii* var. *minor* is typically found in low numbers (Table 8). There were a couple places surveyed along the Middle Fork of Big Piney (#010) in 2011 where numbers appeared to exceed 20 plants, but census figures are wanting.

Table 8. Population information for Robbins' milkvetch (*Astragalus robbinsii* var. *minor*) in Wyoming

EO#	Population size	Documentation	Last Observed Date
BRIDGER-TETON NATIONAL FOREST			
001	2011-07-24: (Sec. 15). Two spots. In late flower and fruit. Uncommon. Surveyed by B. Heidel. 1992-07-21: (Sec. 15) In fruit. Collected by W. Fertig.	Survey	24 July 2011
002	1987-06-15: In flower and fruit. (# 473). Few plants. Collected by O. Harrison.	Specimen	15 June 1987
003	1926-06-16: In flower and fruit. Patchy distribution. Collected by C. McDonald.	Specimen	16 June 1926
004	1993-08-13: In fruit. Population appears small, but formal census not conducted. Surveyed by W. Fertig and G. Jones.	Survey	13 August 1993
005	1978-08-02: In fruit. Locally common. Collected by N. and P. Holmgren.	Specimen	2 August 1978
006	1992-07-15: In fruit. B.E. and R. Nelson.	Specimen	15 July 1992
007	2011-07-23: Failed to find in surveying spectrum of valleybottom habitats on south side; standing water covered some valleybottom flats. Surveyed by B. Heidel. 1992-08-13: In fruit. Collected by R. Hartman.	Specimen	23 July 2011
008	1992-07-08: In fruit. Collected by B.E. and R. Nelson.	Specimen	8 July 1992
009	2011-07-23: In late flower and fruit. Uncommon. Surveyed by B. Heidel.	Survey	23 July 2011
010	2011-07-26: In late flower and fruit. Locally common but patchy in at least four places along 3 miles of valleybottom. Surveyed by B. Heidel.	Survey	26 July 2011
012	2011-07-24: In flower and fruit. Uncommon. Surveyed by B. Heidel.	Survey	24 July 2011
OUTSIDE OF BRIDGER-TETON NATIONAL FOREST			
	None		

Threats: May be moderately threatened by development of streamside habitats and possibly by gravel quarrying. The Middle Fork Pine Creek occurrence (#010) is downstream over a mile from a drop structure impounding Middle Piney Lake, as well as both above and below summer homes, but the separation distances may buffer it. Two occurrences lie along the route of the Oregon Trail – Lander Cutoff, one of which has the microtopography that suggests it may have been a wagon stream crossing. Roads, trailer camping and fishing accesses are located close to some occurrences.

Grazing signs were not noted at the time of survey. Stream channel and vegetation cover conditions indicated that grazing is generally limited. It is not known whether this species is palatable, but it is apt to be affected by grazing levels that favor increaser species. In general, any practice that contributes to an incised streamcourse or fosters development of continuous sod-forming grass may affect habitat suitability. At present, threats appear low.

SHULTZ'S MILKVETCH
Astragalus shultziorum Barneby

Classification

Scientific name: *Astragalus shultziorum* Barneby

Synonyms: *Astragalus molybdenus* Barneby var. *shultziorum* (Barneby) S.L. Welsh

Common name: Shultz's milkvetch

Family: Fabaceae

Size of genus: There are 62 species of *Astragalus* reported for Wyoming in Dorn (2001), not including distinctions at the variety level. The *Astragalus* genus is comprised of 375 species (Barneby 1964) with at least 20 more recent additions (Isely 1998), not including taxa below the species level.

Phylogenetic relationships: There are relatively few other alpine *Astragalus* taxa. The two closest relatives are *A. molybdenus* (a Colorado endemic) and *A. lackschewitzii* (a Montana endemic). Welsh (1998) treats all three as varieties of *A. molybdenus* and this is the likely treatment in the upcoming *Flora of North America* volume with Welsh and Spellenberg as genus authors. Isely (1998) recognizes *A. shultziorum* as a distinct species from the other two, which he treated as are *A. molybdenus*.

Present legal or other formal status

U.S. Fish & Wildlife Service: None (Former C2 candidate for listing under the Endangered Species Act.)

U.S. Forest Service – Bridger-Teton National Forest: Management Indicator Species (Ryan pers. commun.); previously a sensitive species and recommended for dropping in 1990 (Marriott 1990)

Global Heritage rank: G3Q; the taxonomic question in its rank reflecting debate whether to recognize it at the species or the variety level.

State Legal status: none

State Heritage rank: The more recent list update (Heidel 2007) reported a state rank of S3.

Wyoming contribution rank: Conservation of Shultz's milkvetch as a regional endemic in the core of its range is Very High. As a limited distribution species almost restricted to Wyoming, it is maintained on the Watch List.

Description

Technical description: Schultz's milkvetch is a low perennial herb with slender, elongate subterranean stems arising from a branched rootcrown. Leaves are 1.5-8 cm long and alternate on the 1-2 cm of exposed stem; the petiole length of leaves is reduced toward the top. Leaves have 11-17 green leaflets that are lanceolate to ovate-elliptic, and pubescent on both surfaces or smooth above. The pale, translucent stipules encircle the stem, have 2 teeth, and cover the leaf bases. The cream-colored, lavender-tinged flowers typically are in pairs (1-4) surmounting a 1-4 cm tall flowering stalk. The banner is 11-12 mm long, longer than the wings, sometimes streaked, and the keel has a purple-tip. The calyx is 5.7-6.7 mm long, with slender teeth and short, black hairs. The pod is lance-ovate, 10-12 mm x 3-3.5 mm, with a prolonged narrow beak, sessile, keeled on back, 3-sided in cross-section and becomes papery-thin when ripe (Barneby 1981, Dorn 1989, Fertig 1992, Lavin and Marriott 1997, Isely 1998.)

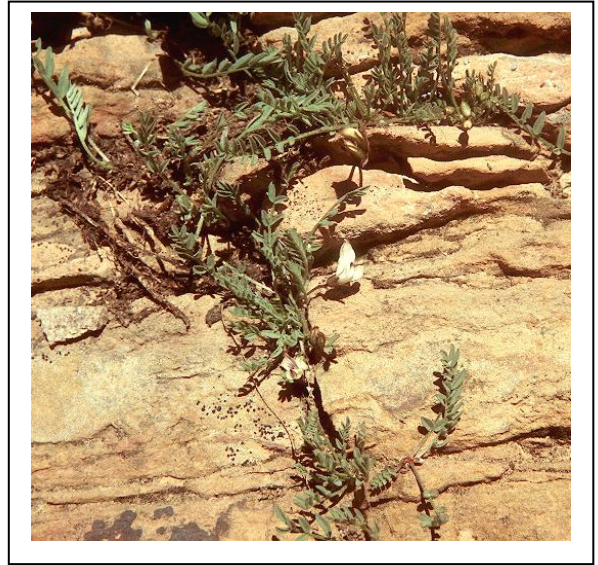
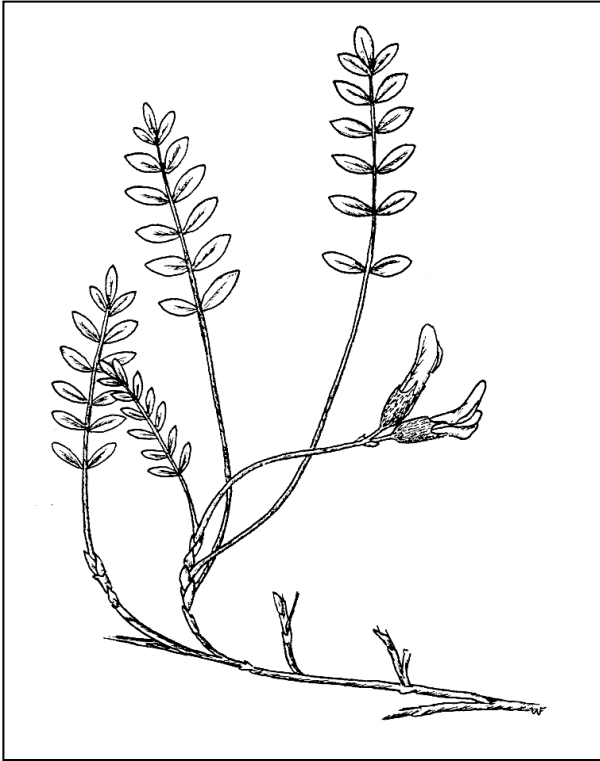


Figure 15 (left): *Astragalus shultziorum* by Walter Fertig

Figure 16 (above): *Astragalus shultziorum* by B. Heidel

Similar species: *Astragalus alpinus* has pendulous pods and more than 5 flowers. *A. bodinii* has more than 5 flowers and a thick taproot. *A. leptaleus* has pendulous pods. Both of the latter two species are found in wet habitats below the subalpine zone.

Phenology: Flowers from July to August. Fruit produced from August-September. The plant is most readily located when in flower.

Local field characters: In alpine and subalpine settings, this is the only milkvetch that ordinarily has flowers and fruits in pairs.

Geographical distribution

Range: Teton, Salt River, Wind River and Wyoming ranges of Teton, Lincoln and Sublette counties, Wyoming; reported in the Teton Range of Idaho.

Extant sites: Known from 26 occurrences in Wyoming, all of which have been surveyed or discovered since 1987 (Figure 17, Table 9). Systematic surveys were previously conducted (Dorn 1989, Marriott 1990). Almost all of these occurrences are on Bridger-Teton National Forest (23 of 26). In 2011, there was just expansion of one known occurrence (#008).

At least 3 occurrences are protected within the Bridger and Gros Ventre Wilderness Areas (Bridger-Teton NF), one is protected in Swift Creek Research Natural Area (Fertig and Jones 1994b) and parts of 4 other occurrences are within Grand Teton National Park. All other reports are from public lands managed for multiple use.

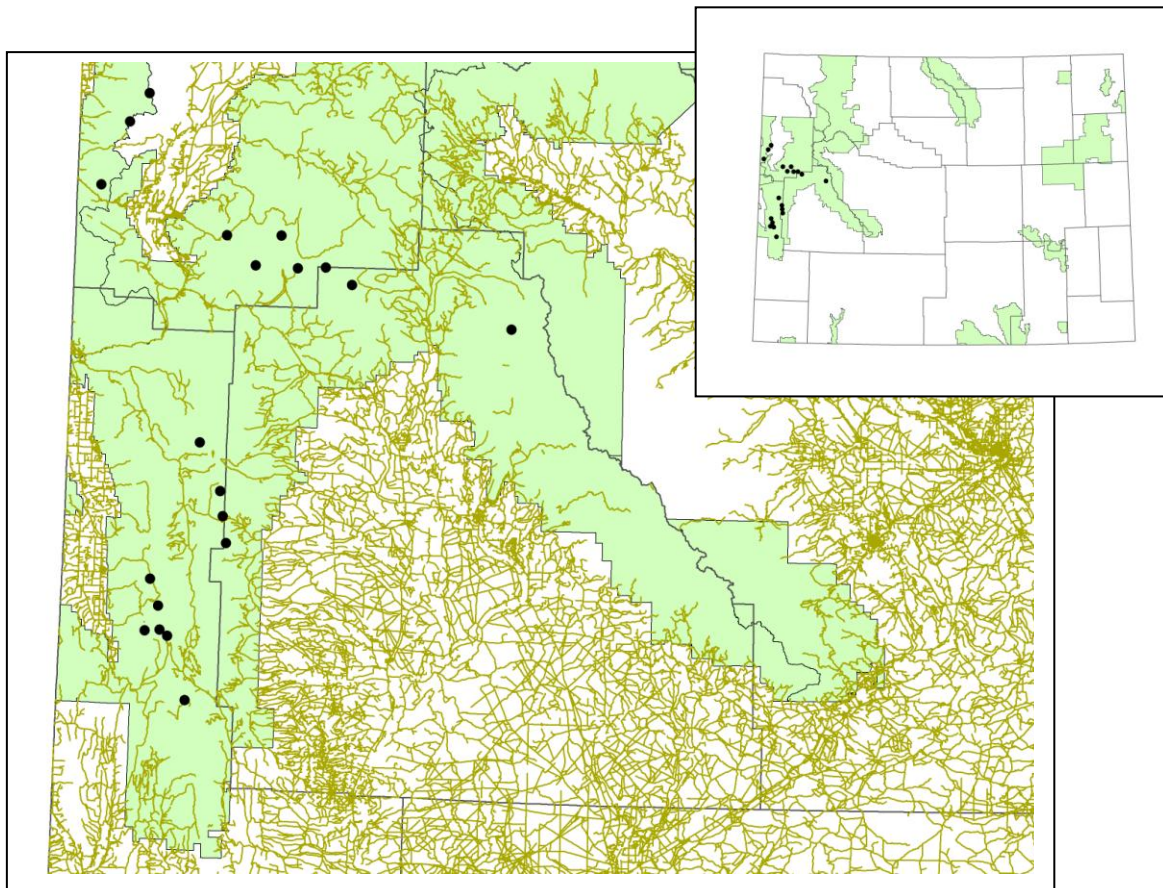


Figure 17. Distribution of Shultz’s milkvetch (*Astragalus shultziorum*) in Region 4 of the U.S. Forest Service (Wyoming), its rangewide distribution

Historical sites: None.

Unverified/Undocumented reports: None known.

Sites where present status not known: None known.

Table 9. Occurrences of Shultz’s milkvetch (*Astragalus shultziorum*) in Wyoming

EO#	Directions	County	Legal Description	Elevation m (ft)	USGS 7.5’ Quad	Public Land
BRIDGER-TETON NATIONAL FOREST						
001	Salt River Range; head of Corral Cr east of divide in vicinity of trail from Cottonwood Lake, south to divides with Spring and Dick creeks, ca 4.5-6 miles west of Corral Creek Guard Stn, ca 9-10 miles east-southeast of Afton.	Lincoln	T31N R117W Sec. 16, 21, 22, 27, 28	2841- 3200 (9320- 10500)	Red Top Mountain	Greys River RD

004	Teton Range; along the boundary between Grand Teton National Park and Targhee and Bridger-Teton NFs, from Devils Stair Trail and Alaska Basin, to Death Canyon Shelf, northwest slopes of Spearhead Peak, headwaters of Granite and Moose Cr, and cirques on the east/southeast side of Rendezvous Mtn from top of tram, north of ski boundary, south to Rendezvous Peak.	Teton	T42N R117W Sec. 5, 6, 7, 15, 16	2682-3170 (8800-10400)	Grand Teton, Mount Bannon, Rendezvous Peak, Teton Village	Jackson RD, Teton Basin RD
006	Salt River Range; Upper Swift Creek from divide with Upper Corral Creek north to due east of Dry Creek Lake, on west side of drainage.	Lincoln	T31N R117W Sec. 5; T32N R117W Sec. 32	2896 (9500)	Red Top Mountain	Greys River RD
008	Salt River Range; Sheep Pass and vicinity, ca 8 air miles east-southeast of Smoot.	Lincoln	T30N R117W Sec. 3, 4, 9, 10, 15	2926-3178 (9600-10680)	Mount Wagner	Greys River RD, Kemmerer RD
011	Northwest Wind River Range; southeast end of White Rock ridge, divide south of Slide Lake, east-southeast of upper Green River Lake.	Sublette	T38N R108W Sec. 13, 14, 23, 24	3399 (11150)	Green River Lakes	Pinedale RD
013	Wyoming Range; middle and north peaks of Triple Peak, ca 26 air miles southwest of Daniel Junction.	Sublette	T33N 115W Sec. 33	3292-3392 (10800-11127)	Triple Peak	Big Piney RD
014	Wyoming Range; south end of Mount McDougal on Peak	Lincoln	T33N R115W Sec. 5	3231-3286 (10600-10780)	Triple Peak	Greys River RD
015	Wyoming Range; just northeast of Gunsight Pass, ca 4 air miles north-northwest of McDougal Pass	Lincoln	T34N R115W Sec. 20	2926-3048 (9600-10000)	Lookout Mountain	Big Piney RD
016	Salt River Range; ridge on north side of Mount Wagner and along trail between Wagner and Cottonwood lakes, ca 1 mile north of summit, ca 2 air miles south of Cottonwood Lake, ca 11 air mile southeast of Afton.	Lincoln	T30N 117W Sec. 7, 8	2804-2859 (9200-9380)	Mount Wagner	Greys River RD
017	Salt River Range; above Mink Creek along LaBarge Creek Divide, ca 10.5 air miles east-southeast of Smoot, ca 15 air miles southeast of Afton.	Lincoln	T30N R117W Sec. 10, 11, 14, 15	2890 (9480)	Poison Meadows	Greys River RD
019	Salt River Range; Commissary Ridge, between Peak 10315 and Graham Peak at top of cirque.	Lincoln	T29N R116W Sec. 32	3103 (10180)	Graham Peak	Kemmerer RD
020	Gros Ventre Range; upper Swift Creek and west slope of Corner	Teton	T39N R113W Sec. 3, 4;	2438-3109	Crystal Peak, Granite Falls	Jackson RD

	Peak, ca 2 miles east of Granite Falls.		T40N R113W Sec. 33, 34	(8000-10200)		
021	Gros Ventre Mountains; ridge southeast of Pinnacle Peak and slopes below, just east of Little Granite Creek, ca 4 miles west of Granite Creek Campground.	Teton	T39N R114W Sec. 3, 4, 9, 10; T40N R114W Sec. 33, 34	2804-3231 (9200-10600)	Bull Creek, Turquoise Lake	Jackson RD
022	Gros Ventre Mountains; peak ca 1 air mile north of Cache Peak.	Teton	T40N R115W Sec. 10, 11, 12, 13, 14, 15	2926-3127 (9600-10258)	Turquoise Lake	Jackson RD
023	Gros Ventre Mountains; ridge 1 air mile southeast to 2 air miles south-southeast of Pyramid Peak.	Teton	T40N R113W Sec. 5, 6, 7, 8, 17, 18; T40N R114W Sec. 1, 12, 13	3139-3316 (10300-10879)	Crystal Peak	Jackson RD
024	Gros Ventre Mountains; northeast edge of Tosi Creek Basin, headwaters of Clear and Tosi Creeks southwest of the Red Hills.	Sublette	T39N R111W Sec. 7, 18, 19; T39N R112W Sec. 10, 11, 12, 13, 14, 15, 22	2987-3200 (9800-10500)	Doubletop Peak, Tosi Peak	Jackson RD, Pinedale RD
025	Gros Ventre Range; west and southeast flanks of Darwin Peak, north slopes of Triangle Peak, and northeast -facing slopes of peak 11118 between Steamboat and Palmer peaks, ca 2-3.5 miles south of Gros Ventre River.	Sublette, Teton	T39N R112W Sec. 3, 4, 5, 6, 7, 8; T39N R113W Sec. 1, 12; T40N R112W Sec. 29	2987-3353 (9800-11000)	Darwin Peak, Doubletop Peak	Jackson RD
028	Wyoming Range; east-facing slope of ridge south of Deadman Peak, ca 18 miles east of Etna.	Lincoln	T35N R116W Sec. 22, 23	2957 (9700)	Blind Bull Creek, Pickle Pass	Greys River RD
OUTSIDE OF BRIDGER-TETON NATIONAL FOREST						
004	Teton Range; along the boundary between Grand Teton National Park and Targhee and Bridger-Teton national forests, from Devils Stair Trail and Alaska Basin, to Death Canyon Shelf, northwest slopes of Spearhead Peak, headwaters of Granite and Moose creeks, and cirques on the east/southeast side of Rendezvous Mtn from top of tram, just north of ski boundary, south to Rendezvous Peak.	Teton	T42N R117W Sec. 5, 6, 7, 15, 16	2682-3170 (8800-10400)	Grand Teton, Mount Bannon, Rendezvous Peak, Teton Village	Grand Teton NP, Targhee NF
012	Teton Range; on switchbacks below Hurricane Pass, on western boundary of Grand Teton NP, ca 0.2 mile north of Schoolmarm Glacier, ca 6 miles north-northwest of Phelps Lake.	Teton	T44N R117W Sec. 35	2926-3078 (9600-10100)	Grand Teton	Grand Teton NP
026	West slope Teton Range; summit ridge of Taylor Mtn, ca 2.5 air miles north of Teton Pass, ca 10 air miles WNW of Jackson.	Teton	T41N R118W Sec. 11	3048-3155 (10000-10352)	Rendezvous Peak	Targhee NF



Figures 18-20. *Astragalus shultziorum* habitat in study area (#008; 22 Aug):

Above – south aspect of Greysalt Peak (common), by B. Heidel

Upper right – north-facing slope at dip in ridgeline (abundant), by B. Heidel

Right – east-facing ridgecrest (sparse), by B. Heidel



Figure 21. *Astragalus shultziorum* habitat (toe slope) in Teton Range, by Hollis Marriott

Habitat

Settings and associated vegetation: Found primarily in subalpine forb communities on shallow, rocky, calcareous soils, ranging from 8,800-11,500 ft (Figures 18-21).

Frequently associated species: The species associated with *Astragalus shultziorum* are listed in Table 10.

Table 10. Plants associated with Shultz's milkvetch (*Astragalus shultziorum*)

Scientific name	Common name	Native/ Exotic
<i>Achillea millefolium</i>	Common yarrow	Native
<i>Androsace septentrionalis</i>	Pygmyflower rockjasmine	Native
<i>Antennaria media</i>	Rocky Mountain pussytoes	Native
<i>Antennaria rosea</i>	Rosy pussytoes	Native
<i>Antennaria umbrinella</i>	Brown-bract pussytoes	Native
<i>Arnica longifolia</i>	Spear-leaf leopardbane	Native
<i>Artemisia ludoviciana</i> var. <i>latifolia</i>	White sagebrush	Native
<i>Astragalus kentrophyta</i> var. <i>tegetarius</i>	Spiny milkvetch	Native
<i>Carex elynoides</i>	Black-root sedge	Native
<i>Castilleja applegatei</i>	Wavy-leaved Indian-paintbrush	Native
<i>Castilleja sulphurea</i>	Sulphur Indian-paintbrush	Native
<i>Draba crassifolia</i>	Snowbed whitlow-grass	Native
<i>Cerastium arvense</i>	Field mouse-ear chickweed	Native
<i>Eremogone congesta</i>	Ballhead sandwort	Native
<i>Erigeron ursinus</i>	Bear River fleabane	Native
<i>Haplopappus suffruticosus</i>	Single-head heath-goldenrod	Native
<i>Hedysarum occidentale</i>	Western sweet-vetch	Native
<i>Lewisia pygmaea</i>	Alpine bitter-root	Native
<i>Noccaea montana</i>	Alpine pennycress	Native
<i>Phacelia hastata</i>	Silver-leaf scorpionweed	Native
<i>Phlox pulvinata</i>	Cushion phlox	Native
<i>Poa secunda</i> var. <i>incurva</i>	Sandberg's bluegrass	Native
<i>Polygonum bistortoides</i>	American bistort	Native
<i>Polygonum sawatchense</i>	Douglas' knotweed [Sawatch knotweed]	Native
<i>Potentilla diversifolia</i> var. <i>diversifolia</i>	Mountain-meadow cinquefoil	Native
<i>Potentilla gracilis</i>	Graceful cinquefoil	Native
<i>Ranunculus eschscholtzii</i>	Spruce-fir buttercup	Native
<i>Selaginella densa</i>	Dense spike-moss	Native
<i>Senecio crassulus</i>	Thick-leaf ragwort	Native
<i>Sibbaldia procumbens</i>	Creeping glow-wort	Native
<i>Silene acaulis</i>	Moss campion	Native
<i>Synthesis pimatifida</i>	Feather-leaf kitten's-tail	Native

Topography: Found in a wide range of topographic positions and aspects, depending on setting.

Water and soil relationships: The substrate of *Astragalus shultziorum* is almost always calcareous (Marriott 1990). In the study area, it is associated mainly with the following geological mapping units:

- Madison and Darby Formations
- Phosphoria, Wells and Amsden Formations
- Ankareh Formation, Thaynes Limestone, Woodside Shale and Dinwoody Formations

In 2011 surveys at Greysalt Peak, it was often found near remnant snow banks (Figures 18-20). One portion of the Greysalt Peak occurrence was present in abundance on a non-calcareous substrate ...

Population biology and demography

Population size and condition: Individual populations may be extremely abundant locally or cover large areas of suitable ridge-top alpine habitat (Table 11). The rhizomatous growth form makes it impossible to discern individuals and there are spots where it has higher canopy cover than any other species present.

Table 11. Population information for Shultz’s milkvetch (*Astragalus shultziorum*) in Wyoming

EO#	Population size	Documentation	Last Observed Date
BRIDGER-TETON NATIONAL FOREST			
001	6 subpopulations in ca 1.5 x 1.5 miles. 1989-08-30: (Sec 28) In fruit, mostly vegetative. Surveyed by H. Marriott. 1987-08-29: (Sec 16, 21; 3 subpopulations) Mostly vegetative (few with buds, flowers, or fruit). Locally abundant, at times the dominant species. Ca 10,000+ plants (genets difficult to count due to vegetative reproduction). Surveyed by H. Marriott. 1987-08-28: (Sec 22, 27; 2 subpopulations) A few in flower and fruit. Ca 5000-10,000 plants, although genets difficult to distinguish due to vegetative growth. A co-dominant in places. Surveyed by H. Marriott. 1980-09-30: (Probably Sec 21) In fruit. Collected by J. Shultz. 1980-09-17: (Sec 16) In fruit. Common. Surveyed by R. Lichvar and R. Dorn. 1980-08-21/22: (Sec 16) In flower. Common. Collected by R. Lichvar and R. Dorn. 1980-08-11: (probably Sec 21) Collected by L., J. and K. Shultz, and R. Hartman. 1923-07-31: (probably Sec 21) In flower. Collected by E. Payson and G. Armstrong.	Survey	30 Aug 1989
004	Ca 14 subpopulations in ca 5.5 x 10 miles. 2007-08-20: (Sec 21 NW4) In flower and fruit. Collected by R. Hartman. 2007-08-11: (Sec 21 SE4, NE4; 2 subpopulations) In flower and fruit. Collected by R. Hartman and D. Scott. 2000-08-20: (Rendezvous Mountain) In flower. Collected by C. Delmatier. 2000-07-26: (Rendezvous Mountain) In flower. Collected by C. Delmatier.	Survey	20 Aug 2007

	<p>1999-08-03: (Rendezvous Mountain) In flower. Collected by C. Dalmatier.</p> <p>1995-09-01: (Rendezvous Mountain) In flower. Collected by N. and P. Holmgren.</p> <p>1989-09-12: (Death Canyon Shelf) Mostly vegetative, but good flowering and fruiting in vicinity of Mount Meek Pass. Abundant (many 1,000s of plants, though genets difficult to distinguish due to vegetative growth). (Alaska Basin) Dried flowers. 1,000s of plants in limited survey. Surveyed by H. Marriott.</p> <p>1989-09-11: (Spearhead Peak) Dried flowers and a few in fruit. Abundant (ca 10,000+ but genets difficult to distinguish due to vegetative growth). Surveyed by H. Marriott.</p> <p>1989-09-10: (headwaters of Granite & Moose creeks; 7 subpopulations) Dried flowers. Abundant (ca 10,000s of plants, although genets are difficult to distinguish due to vegetative growth), at times a co-dominant. Surveyed by H. Marriott.</p> <p>1989-09-07: (Rendezvous Mountain) Few flowers, no fruit. Abundant (ca 10,000s of plants, although genets are difficult to distinguish due to vegetative reproduction), at times a co-dominant. Surveyed by H. Marriott.</p> <p>1988-06-26: (Rendezvous Mountain) In bud and and flower. L. and K. Shultz.</p> <p>1987-08-21: (Rendezvous Mountain) Few flowers, no fruit. Observed by H. Marriott.</p> <p>1987-08-20: (Spearhead Peak) In flower and fruit, mostly vegetative. (Death Canyon Shelf) In flower and fruit. Collected by H. Marriott.</p> <p>1987-08-19: (headwaters of Granite & Moose creeks; 7 subpopulations) Mostly vegetative, but good flowering and fruiting material in some areas. Surveyed by H. Marriott.</p> <p>1987-07-24: (Rendezvous Mountain) In flower. Collected by L. and J. Shultz, and J. Reynolds.</p> <p>1986-07-26: (Rendezvous Mountain) In flower. Collected by L. and J. Shultz, and C. Palmer.</p> <p>1986-07-24: (Rendezvous Mountain) In flower. Collected by L. Shultz and TSS class.</p> <p>1985-08-11: (Devils Stairs Trail) In fruit. Collected by E. Evert.</p> <p>1983-09-01: (Rendezvous Mountain) In flower. Collected by A. Youngblood and W. Padgett(?).</p>		
006	Common, but not as abundant as at other sites. Estimated at 2000-5000 plants (Genets difficult to distinguish due to vegetative growth). No flowering individuals seen in lat Aug 1987, very few (dried) seen in early Sep 1989	Survey	5 Sept 1989
008	<p>7 subpopulations in ca 2 miles.</p> <p>2011-08-22: (south and west of Sheep Pass) In early flower and vegetative. Occasional to abundant in 4 discrete areas and settings. Surveyed by B. Heidel.</p> <p>2010-08-02: (north of Sheep Pass) In flower and vegetative. Locally abundant over a large area. Surveyed by H. Marriott.</p> <p>1992-07-10: (south of Sheep Pass) In flower and fruit. Forming thick mats. Collected by B.E. and R. Nelson, and O. Harrison.</p> <p>1989-08-30: (north and south of Sheep Pass) In fruit, mostly vegetative. Abundant (ca 10,000+, but genets difficult to distinguish due to vegetative growth), a co-dominant in places. Surveyed by H. Marriott.</p> <p>1989-08-13: (probably north of Sheep Pass) In flower and fruit. Collected by R. Dorn.</p> <p>1989-07-30: (south and west of Sheep Pass) In flower and fruit. Collected by O. Harrison.</p>	Survey	22 Aug 2011

	1988-07-16: (north of Sheep Pass) In flower and fruit. Collected by O. Harrison.		
011	1991-08-13: In flower. Locally abundant in ca 5 X 10 meters (in a much larger area of potential habitat), probably one genet. Surveyed by H. Marriott and D. Horning.	Survey	13 Aug 1991
013	1992-08-14: In fruit. Collected by R. Hartman.	Specimen	14 Aug 1992
014	250-300 patches, likely much more.		19 Aug 1992
015	Patches often continuous for many feet.		19 Aug 1992
016	2 subpopulations in ca 0.2 mile. 2010-08-05: (Sec 7, 8) 20% in flower, 80% vegetative. Abundant in ca 1 acre. Surveyed by H. Marriott. 1992-07-23: (Sec 7) In flower. Collected by W. Fertig.	Survey	5 Aug 2010
017	1992-07-25: In flower. Well established population in limited area. Collected by O. Harrison.	Specimen	25 Jul 1992
019	1993-08-17: In flower. Several square meters. Collected by R. Hartman.	Specimen	17 Aug 1993
020	Ca 2 subpopulations in ca 1 mile. 1997-08-07: (Sec 3 NE4) In flower. Collected by W. Fertig. 1994-06-28: (Sec 3-4) In flower. Collected by R. Hartman.	Specimen	7 Aug 1997
021	2 subpopulations in ca 1 mile. 1994-07-07: (both subpopulations) In flower. Collected by R. Hartman.	Specimen	7 Jul 1994
022	1994-07-12: In flower and fruit. Collected by R. Hartman.	Specimen	12 Jul 1994
023	1994-07-27: In flower. Collected by R. Hartman and T. Cramer.	Specimen	27 Jul 1994
024	1994-08-02: In fruit. Collected by R. Hartman and T. Cramer.	Specimen	2 Aug 1994
025	Ca 5 subpopulations in 1.5 x 3.5 miles. 1998-08-04: (Sec 3 NW4) 30% in flower, 70% vegetative. Ca 500 plants. Surveyed by L. Welp. (Sec 3 SW4) In flower and fruit. Collected by W. Fertig. 1994-08-17: (Sec 33) In fruit. Collected by R. Hartman and T. Cramer. 1994-08-05: (Sec 6) In flower and fruit. (Sec 32) In fruit. Collected by R. Hartman.	Specimen	4 Aug 1998
028	1979-08-05: In flower. Collected by L. and J. Shultz.	Specimen	5 Aug 1979
OUTSIDE OF BRIDGER-TETON NATIONAL FOREST			
004	Ca 14 subpopulations in ca 5.5 x 10 miles. 2007-08-20: (Sec 21 NW4) In flower and fruit. Collected by R. Hartman. 2007-08-11: (Sec 21 SE4, NE4; 2 subpopulations) In flower and fruit. Collected by R. Hartman and D. Scott. 2000-08-20: (Rendezvous Mountain) In flower. Collected by C. Delmatier. 2000-07-26: (Rendezvous Mountain) In flower. Collected by C. Delmatier. 1999-08-03: (Rendezvous Mountain) In flower. Collected by C. Delmatier. 1995-09-01: (Rendezvous Mountain) In flower. Collected by N. and P. Holmgren. 1989-09-12: (Death Canyon Shelf) Mostly vegetative, but good flowering and fruiting in vicinity of Mount Meek Pass. Abundant (many 1,000s of plants, though genets difficult to distinguish due to vegetative growth). (Alaska Basin) Dried flowers. 1,000s of plants in limited survey. Surveyed by H. Marriott. 1989-09-11: (Spearhead Peak) Dried flowers and a few in fruit. Abundant (ca 10,000+ but genets difficult to distinguish due to vegetative growth).	Survey	20 Aug 2007

	<p>Surveyed by H. Marriott. 1989-09-10: (headwaters of Granite & Moose creeks; 7 subpopulations) Dried flowers. Abundant (ca 10,000s of plants, although genets are difficult to distinguish due to vegetative growth), at times a co-dominant. Surveyed by H. Marriott. 1989-09-07: (Rendezvous Mountain) Few flowers, no fruit. Abundant (ca 10,000s of plants, although genets are difficult to distinguish due to vegetative reproduction), at times a co-dominant. Surveyed by H. Marriott. 1988-06-26: (Rendezvous Mountain) In bud and flower. L. and K. Shultz. 1987-08-21: (Rendezvous Mountain) Few flowers, no fruit. Observed by H. Marriott. 1987-08-20: (Spearhead Peak) In flower and fruit, mostly vegetative. (Death Canyon Shelf) In flower and fruit. Collected by H. Marriott. 1987-08-19: (headwaters of Granite & Moose creeks; 7 subpopulations) Mostly vegetative, but good flowering and fruiting material in some areas. Surveyed by H. Marriott. 1987-07-24: (Rendezvous Mountain) In flower. Collected by L. and J. Shultz, and J. Reynolds. 1986-07-26: (Rendezvous Mountain) In flower. Collected by L. and J. Shultz, and C. Palmer. 1986-07-24: (Rendezvous Mountain) In flower. Collected by L. Shultz and TSS class. 1985-08-11: (Devils Stairs Trail) In fruit. Collected by E. Evert. 1983-09-01: (Rendezvous Mountain) In flower. Collected by A. Youngblood and W. Padgett(?).</p>		
012	1992-08-06: Only 1% in flower, mostly vegetative. Locally common but sporadic. 1000-3000 plants observed. Surveyed by H. Marriott.	Survey	6 Aug 1992
026	2007-07-09: In early flower; most plants in bud or vegetative. Common on gentle northwest-facing slopes at north end of ridge. Ca 500-1000 plants. Surveyed by B. Heidel.	Survey	9 Jul 2007

Trends: Trend data are lacking, but most populations appear to be stable.

Threats: Sheep grazing has been identified as a potential threat at some sites, but most occurrences are at sufficiently high elevation, low productivity habitat or physically protected sites that receive little use or impacts.

ROCKCRESS DRABA

Draba globosa Payson

Classification

Scientific name: *Draba globosa* Payson

Synonyms: *Draba apiculata*, *D. densifolia* var. *apiculata*, *D. densifolia* var. *globosa*

Common name: Rockcress draba

Family: Brassicaceae

Size of genus: There are 25 species of *Draba* reported for Wyoming in Dorn (2001), not including distinctions at the variety level. The *Draba* genus is the largest one in the Brassicaceae, comprised of about 121 species in North America; 380 worldwide (Al-Shehbaz et al. 2010).

Phylogenetic relationships: *Draba globosa* is an apomictic species closely related to *D. burkei* (Al-Shehbaz et al. 2010), and treated by some as related to *D. densifolia*, but maintained as morphologically and phyletically distinct in the most current literature (Al-Shehbaz et al. 2010).

Present legal or other formal status

U.S. Fish & Wildlife Service: None

U.S. Forest Service – Region 4: sensitive. It was recommended for de-listing by Stone (1995).

Global Heritage rank: G3

State Legal status: none

State Heritage rank: The more recent list update (Heidel 2007) reported a state rank of S3.

Wyoming contribution rank: Conservation of Rockcress draba as a regional endemic at the core of its range is generally a High conservation priority, though it has many occurrences over a wide area. Nevertheless, as a limited distribution species with a significant portion of its distribution in Wyoming, it is maintained on the Watch List.

Description

Technical description: Rockcress draba is a mat forming perennial herb with stems 0.5-3 cm tall. Leaves are lance-shaped, 3-6 mm long, less than 3 mm wide, and crowded in a basal rosette. The leaves are glabrous except for the margins which have unbranched (simple) hairs. The inflorescence consists of 2-5 yellow (rarely white) flowers with 4 petals. The fruits are egg shaped and glabrous with styles less than 0.5 mm long (Dorn 2001; Fertig et al. 1994; Hitchcock and Cronquist 1964, Al-Shehbaz et al. 2010).

Similar species: *Draba densifolia* var. *densifolia* usually has hairy fruits with styles over 0.5 mm long. *D. crassa* has leaves over 10 mm long and 5 mm broad. Other alpine *Draba* spp. in Wyoming have more densely pubescent leaves with forked or pectinate (comb-like) hairs.

A list of alpine species of *Draba* in the Salt River Range include *Draba albertina*, *D. aurea*, *D. cana*, *D. crassifolia*, *D. fladnizensis*, *D. incerta*, *D. lonchocarpa*, *D. *D. oligosperma*, *D. paysonii* var. *paysonii*, *D. praelta*, and *D. ventosa* (Rocky Mountain Herbarium 2011). Those that are asterisked are on the same ridgeline as the *Draba globosa* where found on Greysalt Peak.

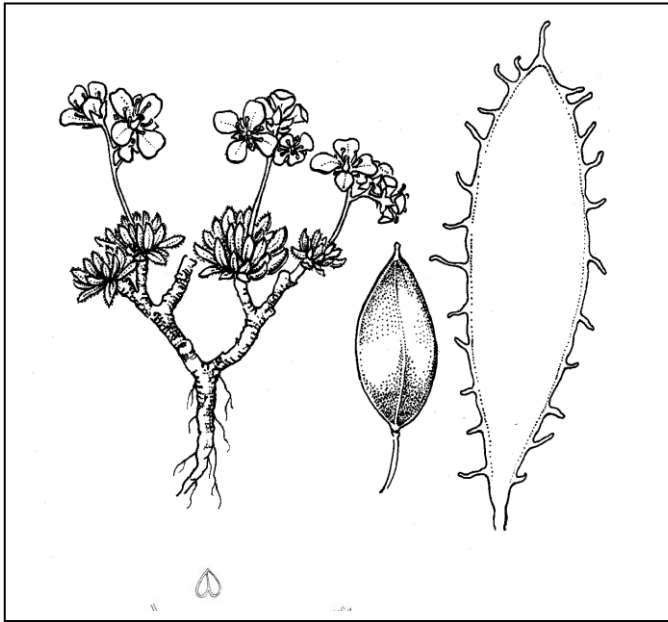


Figure 22 (above). *Draba globosa*, by Margorie Leggitt, from Spackman et al. (1997)

Figure 23 (upper right). Specimen of *Draba globosa* collected on Greysalt Peak, 2011, by B. Heidel

Phenology: Flowers June-August. Fruits present in August. Fruits are needed for positive identification.

Local field characters: The lack of leaves on the stem, and the glabrous fruits, inflorescence and dorsal leaf surface distinguish it from many other species. Style length and other technical characteristics are needed for positive determination.

Geographical distribution

Range: Regional endemic of southwestern Montana, central Colorado, eastern Idaho, northern Utah and western and southern Wyoming. In Wyoming, known from the Absaroka, Teton, Wind River, Beartooth, Medicine Bow, Gros Ventre, and Salt River ranges in Albany, Fremont, Lincoln, Park, Sublette, and Teton counties.

Extant sites: Known from 25 extant occurrences in Wyoming, most of which have been documented since 1990 (most recently surveyed in 2011) (Figure 24, Table 12). Ten are on the Bridger-Teton NF, but only one is in the study area and was the subject of 2011 surveys (#012). There is also a record from BLM lands just outside the study area (Deadline Ridge #023).

At least 13 occurrences are found in designated Wilderness Areas (Bridger, North Absaroka, Gros Ventre, and Popo Agie), Grand Teton National Park, and the Osborn Mountain Research Natural Area (Bridger-Teton NF; Fertig and Jones 1994c). An additional

population is in the potential Beartooth Butte RNA (Shoshone NF). All other populations are on public lands managed for multiple use.

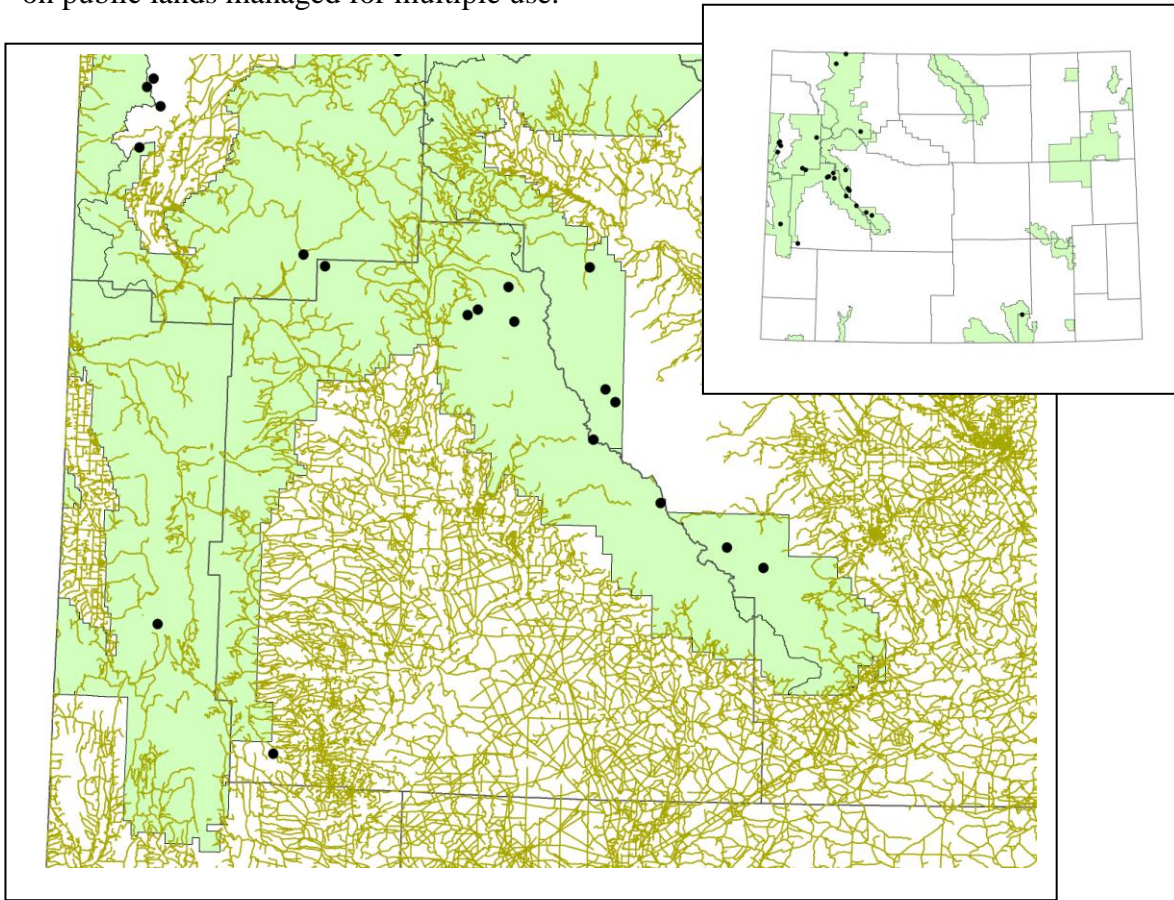


Figure 24. Distribution of Rockcress draba (*Draba globosa*) in Region 4 of the U.S. Forest Service (Wyoming)

Table 12. Occurrences of Rockcress draba (*Draba globosa*) in Wyoming

EO#	Directions	County	Legal Description	Elevation m (ft)	USGS 7.5' Quad	Public Land
BRIDGER-TETON NATIONAL FOREST						
003	Northwest Wind River Range; summit of Gypsum Mountain, ca 3 air miles southwest of Lower Green River Lake, ca 28 air miles north of Pinedale.	Sublette	T38N R109W Sec. 10, 11, 14, 15	3505 (11500)	Big Sheep Mountain	Pinedale RD
004	Northwest Wind River Range; west slope of Lost Eagle Peak and saddle connecting to the southeast end of White Rock Mountain, ca 0.75 miles south of Slide Lake, ca 2.4 miles east of Upper Green River Lake, ca 26 air miles north of Pinedale.	Sublette	T38N R108W Sec. 13, 14, 23, 24	3231-3414 (10600-11200)	Green River Lakes	Pinedale RD

005	West Slope Wind River Range; summit of Big Sheep Mountain, ca 1.5 air miles west of Lower Green River Lake, ca 28.5 air miles north of Pinedale.	Sublette	T38N R109W Sec. 12	3414-3475 (11200-11400)	Big Sheep Mountain	Pinedale RD
008	Northwest Wind River Range; summit of Osborn Mountain on north side and head of Mill Creek, ca 3 air miles northeast of Lower Green River Lake.	Sublette	T39N R108W Sec. 22, 23	3475-3536 (11400-11600)	Green River Lakes	Pinedale RD
010	Wind River Range; 1 mile southeast of Lee Lake, between Pronghorn Peak and Nylon Peak [ca 1 mile east of Dragonhead Peak near the Continental Divide].	Sublette	T34N R105W Sec. 25, 26, 36	3353 (11000)	Roberts Mountain	Pinedale RD
012	Salt River Range; West Sheep Pass area immediately north of Greysalt Peak summit, and at lowest ridgeline outcrop west of pass; ca 12 air miles southeast of Afton.	Lincoln	T30N R117W Sec. 3, 4, 9, 10, 15, 16	3109-3267 (10200-10720)	Mount Wagner, Poison Meadows	Greys River RD, Kemmerer RD
014	Teton Range; Jackson Hole Mountain Resort, top of tram and immediately north, Tensleep Bowl, and Rendezvous Mountain on ridge between Granite Canyon and Jackson Hole ca 1 mile southwest of Aprez Vous Peak and ca 1.5 air miles northwest of Teton Village, ca 11-12 air miles north-northwest of Jackson.	Teton	T42N R117W Sec. 14, 15, 22, 23	2743-3185 (9000-10450)	Rendezvous Peak, Teton Village	Jackson RD
015	Gros Ventre Mountains; head of Swift Creek Trail to ca 0.25 mile northeast of top of Corner Mountain.	Teton	T39N R113W Sec. 2, 3; T40N R113W Sec. 25, 26, 27, 28, 33, 34, 35, 36	3292 (10800)	Crystal Peak, Darwin Peak, Doubletop Peak, Granite Falls	Jackson RD
016	Gros Ventre Range; slopes and saddles interconnecting Palmer, Darwin, Triangle, and Doubletop Peaks, ca 6-8.5 miles east of Granite Hot Springs, 12.5-15 miles west of the Green River, and 14.5-16.5 miles north of US Highway 189 at "The Rim", 4 subpopulations within a 2 x 2.5 mile area (1) slopes of Palmer Peak, ca 0.75 miles east of the Teton/Sublette county line, (2) south end of the Darwin Peak massif, at top of steep talus slopes ca 0.1	Sublette, Teton	T39N R112W Sec. 3, 4, 5, 6, 7, 8, 9; T40N R112W Sec. 33	3170-3353 (10400-11000)	Darwin Peak, Doubletop Peak	Big Piney RD

	mile east of Point 11004 and ca 0.6 miles north of Brewster Lake, (3) north slope of Triangle Peak, ca 0.4 miles east of Brewster Lake and ca 2 miles southwest of Lunch Lake, (4) steeply east-dipping saddle and ridgecrest between the southwest end of Triangle Peak and north side of Doubletop Peak.					
024	Absaroka Mountains; ridge to the east of Angle Mountain, 1.5 miles north of US Highway 26/287, ca 6 miles northwest of Togwotee Pass.	Teton	T44N R111W Sec. 1, 2, 3; T45N R110W Sec. 31; T45N R111W Sec. 25, 26, 34, 35, 36	3200 (10500)	Angle Mountain, Togwotee Pass	Buffalo RD
OUTSIDE OF BRIDGER-TETON NATIONAL FOREST						
001	Northern Absaroka Range; Hurricane Mesa, ca 8 air miles west of Crandall Ranger Station.	Park	T56N R107W Sec. 5, 6, 7, 8, 17, 18; T56N R108W Sec. 1, 12, 13	3170-3371 (10400-11060)	Hurricane Mesa	Shoshone NF
002	Teton Range; east side of Timberline Lake.	Teton	T43N R116W Sec. 17, 18, 19, 20	3170 (10400)	Grand Teton	Grand Teton NP
006	Absaroka Range; Chief Mountain to Galena Ridge, ca 2.5-3 air miles north of Kirwin.	Park	T45N R104W Sec. 1, 2; T46N R103W Sec. 30, 31; T46N R104W Sec. 23, 24, 25, 26, 27, 34	3505-3658 (11500-12000)	Francs Peak	Shoshone NF
007	Beartooth Range; Beartooth and Clay buttes, 3 locations (1) west rim of Clay Butte, ca 0.8 miles north of lookout tower and ca 1.5 miles north of US Highway 212, (2) northwest slope of ridge at north end of Beartooth and Clay Butte, ca 1.8 miles north of US Highway 212, (3) Beartooth Highlakes Trail at ridge at north end of Beartooth and Clay Butte, ca 2 miles northwest of Beauty Lake, ca 2.5 miles north of Beartooth Lake.	Park	T57N R106W Sec. 1, 2; T58N R105W Sec. 19, 30; T58N R106W Sec. 24, 25, 35, 36	2926-3075 (9600-10090)	Beartooth Butte, Muddy Creek	Shoshone NF
009	Teton Range; Upper South Cascade Canyon.	Teton	T43N R116W Sec. 6; T43N R117W Sec. 1, 2; T44N R116W Sec.	2804 (9200)	Grand Teton, Mount Moran	Grand Teton NP

			19, 30, 31; T44N R117W Sec. 23, 24, 25, 26			
011	Medicine Bow Mountains; ca 1 mile north-northeast of Brooklyn Lake.	Albany, Carbon	T16N R79W Sec. 2, 3, 10, 11; T17N R79W Sec. 35	3292 (10800)	Centennial, Morgan, Sand Lake	Medicine Bow NF
013	East slope Wind River Range; "cirque above High Meadow Lake, west of Lander" [ca 3 miles east of the Cirque of the Towers] and north and west slopes of peak 12539.	Fremont	T33N R103W Sec. 26, 27, 28, 29, 32, 33, 34, 35	3429- 3703 (11250- 12150)	Lizard Head Peak	Shoshone NF
014	Teton Range; Jackson Hole Mountain Resort, top of tram and immediately north, Tensleep Bowl, and Rendezvous Mountain on ridge between Granite Canyon and Jackson Hole ca 1 mile southwest of Aprez Vous Peak and ca 1.5 air miles northwest of Teton Village, ca 11-12 air miles north-northwest of Jackson.	Teton	T42N R117W Sec. 14, 15, 22, 23	2743- 3185 (9000- 10450)	Rendezvous Peak, Teton Village	Grand Teton NP
017	Teton Range; near Hurricane Pass, along divide between Grand Teton National Park and Targhee National Forest on the Teton Crest Trail [near Schoolroom Glacier, ca 2.2 miles west-southwest of the Grand Teton].	Teton	T43N R117W Sec. 2; T44N R117W Sec. 35	3194 (10480)	Grand Teton	Grand Teton NP, Targhee NF
018	East slope Wind River Range; Arrow Mountain and vicinity, ca 5 miles south of Torrey Lake.	Fremont	T39N R106W Sec. 2, 3, 10	2664- 3523 (8740- 11560)	Ink Wells, Torrey Lake	Shoshone NF
019	East slope Wind River Range; Mount Chevo, ca 15 air miles west-southwest of Lander.	Fremont	T32N R102W Sec. 7, 8, 17	3005- 3392 (9860- 11130)	Dickinson Park	Shoshone NF
020	East slope Wind River Range; between Angel Pass and Dennis Lake, ca 11 air miles southeast of Gannett Peak.	Fremont	T35N R106W Sec. 7, 8	3283- 3502 (10770- 11490)	Fremont Peak South	Shoshone NF
021	East slope Wind River Range; ridge between Snowbridge Lake and Big Milky Lake, ca 7 air miles east-southeast of Gannett Peak.	Fremont	T36N R106W Sec. 10, 11, 14, 15	3307- 3792 (10850- 12440)	Alpine Lake	Shoshone NF
022	East slope Wind River Range; northwest slope of peak 12431, ca 0.5 mile east of lake 10743, ca 2 miles southwest of	Fremont	T36N R106W Sec. 4	3158- 3344 (10360- 10970)	Fremont Peak North, Fremont Peak South	Shoshone NF

	Little Milky Lake, ca 1.5 miles south of North Fork Bull Lake Creek.					
023	Overthrust Belt; drainage off Deadline Ridge [above Rock Creek].	Sublette	T27N R114W Sec. 5, 8, 17; T27N R115W Sec. 12, 13	2469-2865 (8100-9400)	Lake Mountain	BLM Pinedale

Historical sites: Also known from 3-4 vague historical records cited by Hitchcock (1941).

Unverified/Undocumented reports: None known, apart from historic records (above).

Sites where present status not known: One of the records is based on a specimen collected from Timberline Lake in Grand Teton National Park (#002) and it has immature fruit. The growth form and beak length are consistent with *Draba globosa*, but the whitish petals have lead one botanist to annotate it as *D. fladnizensis*. It may warrant field surveys.

Areas surveyed but species not located: There were surveys made to find the species or its habitat on Deadline Ridge, including in the area of the original collection. Neither the species nor its habitat was found. Surveys earlier in the season are recommended.

In addition, about 3 miles of ridge were surveyed south of Greysalt Peak, as recommended by Marriott (2010). The ridge crest was surveyed, but not the upper east-facing slopes below, nor the continuation of the ridge to the north beyond the summit. A survey loop might be developed to fill gaps and expand surveys onto connecting ridges. The ridges run mainly north-south, and if the species is locally restricted to north-facing microhabitat, then there is little suitable habitat.

Habitat

Settings and associated vegetation: Moist, gravelly alpine meadows, slopes, summits, swales, talus, and tundra, often on limestone derived soils at elevations of 9600-12000 feet.

Frequently associated species: The species associated with *Draba globosa* are listed in Table 13.

Table 13. Plants associated with Rockcress draba (*Draba globosa*) in Wyoming

Scientific name	Common name	Native/Exotic
<i>Antennaria aromatica</i>	Scented pussytoes	Native
<i>Antennaria media</i>	Rocky Mountain pussytoes	Native
<i>Artemisia scopulorum</i>	Alpine sagebrush	Native
<i>Astragalus shultziorum</i>	Shultz's milkvetch	Native
<i>Boechea lemmonii</i>	Soldier rockcress	Native
<i>Boechea lyallii</i>	Lyall's rockcress	Native
<i>Carex breweri</i>	Brewer's sedge	Native
<i>Carex elymoides</i>	Black-root sedge	Native
<i>Carex nardina</i>	Nard sedge [Spikenard sedge]	Native
<i>Carex rupestris</i>	Curly sedge	Native
<i>Cerastium beeringianum</i> var. <i>capillare</i>	Bering Sea mouse-ear chickweed	Native

<i>Douglasia montana</i>	Rocky Mountain dwarf-primrose	Native
<i>Draba cana</i>	Cushion whitlow-grass	Native
<i>Draba incerta</i>	Yellowstone whitlow-grass	Native
<i>Draba lonchocarpa</i>	Lance-pod whitlow-grass	Native
<i>Draba oligosperma</i>	Common draba	Native
<i>Dryas octopetala</i>	Eight-petal mountain avens	Native
<i>Erigeron radicans</i>	Tap-root fleabane	Native
<i>Erigeron simplex</i>	One-stem fleabane	Native
<i>Eritrichium nanum</i>	Alpine forget-me-not	Native
<i>Festuca brachyphylla</i>	Alpine sheep-fescue	Native
<i>Geum rossii</i>	Alpine avens	Native
<i>Hymenoxys grandiflora</i>	Old man of the mountain	Native
<i>Lesquerella paysonii</i>	Payson's bladderpod	Native
<i>Lloydia serotina</i>	Common Alp-lily	Native
<i>Minuartia austromontana (Arenaria rossii)</i>	Columbian stitchwort	Native
<i>Minuartia obtusiloba</i>	Alpine stitchwort	Native
<i>Myosotis alpestris</i>	Asian forget-me-not [Mountain forget-me-not]	Native
<i>Oxyria digyna</i>	Mountain-sorrel	Native
<i>Oxytropis borealis</i> var. <i>viscida</i>	Boreal locoweed	Native
<i>Oxytropis deflexa</i>	Pendant-pod locoweed	Native
<i>Parrya nudicaulis</i>	Naked-stem false wallflower	Native
<i>Pedicularis pulchella</i>	Mountain lousewort	Native
<i>Phlox pulvinata</i>	Cushion phlox	Native
<i>Poa alpine</i>	Alpine bluegrass	Native
<i>Poa secunda</i> var. <i>incurve</i>	Curly bluegrass	Native
<i>Polemonium viscosum</i>	Sticky Jacob's-ladder [Sky-pilot]	Native
<i>Polygonum bistortoides</i>	American bistort	Native
<i>Potentilla diversifolia</i>	Mountain-meadow cinquefoil	Native
<i>Potentilla gracilis</i>	Graceful cinquefoil	Native
<i>Potentilla uniflora</i>	One-flower cinquefoil	Native
<i>Saxifraga oppositifolia</i>	Purple mountain saxifrage	Native
<i>Saxifraga rivularis</i>	Alpine brook saxifrage	Native
<i>Saxifraga rhomboidea</i>	Diamond-leaf saxifrage	Native
<i>Sedum lanceolatum</i>	Lance-leaf stonecrop	Native
<i>Selaginella densa</i>	Dense spike-moss	Native
<i>Senecio fremontii</i>	Dwarf mountain ragwort	Native
<i>Sibbaldia procumbens</i>	Creeping glow-wort	Native
<i>Silene acaulis</i>	Moss campion	Native
<i>Smelowskia calycina</i>	Fern-leaf false candytuft	Native
<i>Solidago multiradiata</i>	Rocky Mountain goldenrod	Native
<i>Townsendia alpigena</i>	Wyoming Townsend-daisy	Native
<i>Valeriana edulis</i>	Tobacco-root	Native

The Salt River Range occurrence was found on in two locations on north-facing limestone slopes, where there were outcrops along the summit or crest of the finger ridge and rocky rubble below. The elevation ranged from 10,200 ft -10,720 ft. It is possible that it is restricted to these kinds of sheltered microhabitats at its lower elevation limits. Directly below the populations were steep, unstable, continuous talus slopes with almost no soil, but which might catch and occasionally support the germination of seeds.

The Salt River Range occurrence was also found where three geological mapping units come together. It appears to lie on the first two of the following:

- Phosphoria, Wells and Amsden Formations (summit)
- Madison and Darby Formations (finger ridge)
- Ankareh Formation, Thaynes Limestone, Woodside Shale and Dinwoody Formations



Figures 25 and 26. Lower and upper habitats of *Draba globosa* in the Salt River Range, respectively, by B. Heidel

Topography: Almost all occurrences are on mountaintops or on upper slopes. The Salt River Range occurrence is found within 10 m of the Greysalt Peak summit (Figure 26), and on the finger ridge over 150 m lower that connects to Sheep Pass (Figure 25).

Water and soil relationships: The fractured limestone parent material and inceptisols derived from them hold moisture, particularly on the more sheltered slopes. The *Draba globosa* taproot draws from subsurface moisture. It is not known whether its alpine habitat is susceptible to drought, or to increased and decreased growing seasons from year to year.

Population biology and demography

Population size and condition: Few populations of *Draba globosa* have been surveyed. Fertig and Welp observed two large populations in the Bridger-Teton National Forest that numbered 500-3000 plants (Table 14). Individual colonies may contain 10-30 plants in small clusters. The Greysalt Peak population had an estimated 40+ plants, but it is possible there are scattered individuals on loose talus that was not surveyed. In a review of status information from throughout its range, Ladyman (2004) noted that “*D. globosa* appears to be a naturally uncommon species that is well-adapted to its fragile alpine habitat.”

Table 14. Population information for Rockcress draba (*Draba globosa*) in Wyoming

EO#	Population size	Documentation	Last Observed Date
BRIDGER-TETON NATIONAL FOREST			
003	1990-08-09: In fruit. Collected by W. Fertig.	Specimen	9 August 1990
004	1991-08-17: In fruit. Collected by W. Fertig.	Specimen	17 August 1991
005	1992-08-04: One plant in fruit. Collected by W. Fertig.	Specimen	4 August 1992
008	1998-08-02: 75% in flower, 20% in bud, and 5% in fruit. Ca 500-1000. Largest colony 217 plants in 25 square meter area. 2-3 plants per clump. Surveyed by W. Fertig and L. Welp. 1984-08-17: Collected by E. Evert.	Survey	2 August 1998
010	1982-08-17: Collected by B. Neely and A. Carpenter.	Specimen	17 August 1982
012	Small groups of plants at 2 or more spots along steep slope. 2011-08-22 (Sections 9, 10): In fruit and vegetative. Uncommon, possibly over 40 plants total. Surveyed by B. Heidel. 1988-07-16 (Sec. 9): In fruit. Observed by O. Harrison. 1978-07-30 (Sec. 10): In flower and early fruit. Uncommon. Only 12 plants seen. Collected by O. Harrison.	Survey	16 July 1988
014	Ca 5 subpopulations in ca 0.75 x 1 mile. Along ridge and upper slopes. 2000-08-03: (Sec 15 SE4, tram top) Collected by C. Delmatier. 2000-08-01: (Sec 15 SE4, Tensleep Bowl) Collected by C. Delmatier. 1999-07-13: (Sec 15 center of S4) Collected by C. Delmatier. 1996-07-31: (Sec 14) 90% in flower, 10% in fruit. 20-40 plants. Surveyed by S. Markow. 1996-07-10: (Sec 15, 22) In flower and fruit. Collected by E. and Y. Evert.	Survey	3 August 2000
015	1994-06-28: In fruit. Collected by R. Hartman.	Specimen	28 June 1994
016	4 subpopulations in 2.5 x 2 miles. 1998-08-04: 3 subpopulations (Sec 33) In flower and fruit. Intermixed with <i>Draba oligosperma</i> . Surveyed by L. Welp. (Sec 3) In fruit. Sparse. 10 plants observed on rocky edge of tundra meadow. (Sec 9) In flower	Survey	4 August 1998

	and fruit. Ca 1000-3000 individuals. Plants typically in scattered clusters of 25-50 plants. Surveyed by W. Fertig 1994-08-05: (Sec 7) In fruit. Collected by R. Hartman.		
024	1994-07-07: In flower. Collected by E. Evert.	Specimen	7 July 1994
OUTSIDE OF BRIDGER-TETON NATIONAL FOREST			
001	1988-07-05: In fruit. Collected by R. Hartman and T.J. Poll.	Specimen	5 July 1988
002	1967-08-08: In flower and very immature fruit. Rare. Petals appear white, and immature fruits are very short-beaked. Collected by R. Shaw.	Specimen	8 August 1967
006	1984-08-22: In fruit. Collected by R. Hartman.	Specimen	22 August 1984
007	3 subpopulations in ca 1 x 2 miles. 1996-07-15: (Sec 2) In flower and fruit. Locally uncommon. Surveyed by S. Mellmann-Brown. 1996-07-11: (Sec 36) Only 1 fruiting plant observed in brief survey. Very uncommon. Surveyed by W. Fertig, J. Walford, and S. Mellmann-Brown. 1996-07-10: (Sec 2) In flower and fruit. 5 plants observed in small patch (population estimated at 20-40 plants). Surveyed by W. Fertig, J. Walford, and S. Mellmann-Brown. 1996-07-09: (Sec 2) In flower and fruit. Collected by S. Mellmann-Brown, J. Walford. 1980-08-10: (Sec 25) In fruit. Collected by R. Dorn. 1951-08-17: (Sec 2) In flower and fruit. Collected by C.L. Porter. 1951-08-01: (Sec 2) In fruit. Collected by R. Rollins and C.L. Porter. 1939-07-17: (Sec 2) Collected by R. Rollins and C. Munoz.	Survey	15 July 1996
009	1952-07-08: In flower and fruit. Collected by J. French.	Specimen	8 July 1952
011	1985-07-27: In fruit. Collected by R. Dorn. 1898-08-29: In fruit. Collected by E. Nelson.	Specimen	27 July 1985
013	Ca 2 subpopulations in ca 1.5 miles. 2006-07-19: (Sec 29, 28) Collected by R. Massatti. 1975-08-10: (Sec 27, 34) Collected by B. Albee.	Specimen	19 July 2006
014	Ca 5 subpopulations in ca 0.75 x 1 mile. Along ridge and upper slopes. 2000-08-03: (Sec 15 SE4, tram top) Collected by C. Delmatier. 2000-08-01: (Sec 15 SE4, Tensleep Bowl) Collected by C. Delmatier. 1999-07-13: (Sec 15 center of S4) Collected by C. Delmatier. 1996-07-31: (Sec 14) 90% in flower, 10% in fruit. 20-40 plants. Surveyed by S. Markow. 1996-07-10: (Sec 15, 22) In flower and fruit. Collected by E. and Y. Evert.	Survey	3 August 2000
017	1995-09-16: In fruit. Collected by B. Heidel.	Specimen	16 Sep 1995
018	2006-06-11: Collected by R. Massatti.	Specimen	11 June 2006
019	2006-06-24: Collected by R. Massatti.	Specimen	24 June 2006
020	2006-07-25: Extends for over a mile. Collected by R. Massatti and A. Wells.	Specimen	25 July 2006
021	2006-07-27: Collected by R. Massatti and A. Wells.	Specimen	27 July 2006
022	2006-07-27: Collected by R. Massatti and A. Wells.	Specimen	27 July 2006
023	1995-07-02: Collected by J. and J. Jewell.	Specimen	2 July 1995

Trend: There is little basis for evaluating trends because none of the repeat visits have been made by the same investigator or to the identical place. Populations are generally assumed to be stable due to low threats.

Threats: The same generalizations about threats to Shultz's milkvetch are even more pertinent for Rockcress draba. In Wyoming it is generally protected from human threats by its inaccessible habitat (Fertig 2000). Past impacts from sheep grazing at high elevations are poorly known, but most occurrences are at sufficiently high elevation, low productivity habitat or physically protected sites that receive little use or impacts. This would certainly be the case in the study area west of Sheep Pass, where *Draba globosa* is confined to rocky rubble.

Elsewhere in its distribution, *Draba globosa* might be threatened by recreational use, invasive species, mountain goat introduction, and wet nitrogen deposition (acid rain) as it potentially impacts forb communities in alpine tundra (Ladyman 2004).

PAYSON'S BLADDERPOD
Lesquerella paysonii Rollins

Classification

Scientific name: *Lesquerella paysonii* Rollins

Synonyms: *Physaria carinata* (Rollins) O’Kane and Al-Shehbaz ssp. *paysonii* (Rollins) O’Kane. Note: This nomenclatural change will be incorporated in the 2012 species of concern list update.

Common name: Payson’s bladderpod

Family: Brassicaceae

Size of genus: There are 12 species of *Lesquerella* reported for Wyoming in Dorn (2001), not including distinctions at the variety level. The *Lesquerella* genus is a New World genus consisting of over 80 species (Rollins 1993). However, recent molecular and morphological work supports the union of this genus with the *Physaria* genus, which had been published earlier than the *Lesquerella* genus (see Al-Shehbaz and O’Kane 2002).

Phylogenetic relationships: There has also been taxonomic research that has resulted in new combinations and status changes for *Lesquerella paysonii* and two other regional endemics of the Greater Yellowstone area. *Lesquerella paysonii* is reduced to a subspecies of *L. carinata*, the same as is *Lesquerella pulchella* of southwestern Montana (O’Kane 2007). They are transferred to the *Physaria* genus, with O’Kane (2007) stating: “All three taxa can easily be accommodated in an expanded concept of *P. carinata* at the subspecific level.” He developed a key for them and reports that they are all three often sympatric (this sympatry has not been reported from Wyoming to date). In Wyoming, *Physaria carinata* ssp. *carinata* (*Lesquerella carinata*) and *P. c.* ssp. *paysonii* are both present in Teton County, outside the study area.

Present legal or other formal status

U.S. Fish & Wildlife Service: None (Former C2 candidate under the Endangered Species Act)

U.S. Forest Service – Region 4 – sensitive. It has been previously recommended for delisting by Fertig (1997).

Global Heritage rank: G3

State Legal status: none

State Heritage rank: The more recent list update (Heidel 2007) reported a state rank of S3.

Wyoming contribution rank: Conservation of Payson’s bladderpod as a regional endemic at the core of its range is a High conservation priority. As a limited distribution species with a significant portion of its distribution in Wyoming, it is maintained on the Watch List.

Description

Technical description: Payson's bladderpod is a densely pubescent perennial herb with decumbent stems 5-15 cm long from an unbranched caudex. Basal leaves are silvery-hairy with elliptic to triangular blades and short petioles. Stem leaves are shorter, with nearly sessile elliptic blades. Flowers have 4 yellow petals 8-10 mm long. The pubescent, elliptic fruits are borne on S-curved stalks and are slightly flattened at a right angle to the partition separating the two halves of the fruit (the margins and face of the fruit are rounded, rather than sharp-pointed from a raised keel). The styles in fruit are 2-4 mm long (Rollins 1950, 1993; Rollins and Shaw 1973; Fertig et al. 1994, O’Kane 2010).

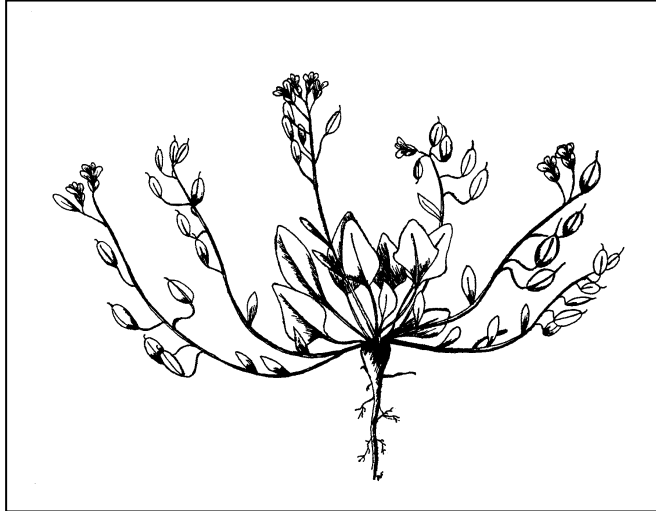


Figure 27 (above). *Lesquerella paysonii*, by W. Fertig, from Fertig et al. 1994

Figure 28 (upper right). *Lesquerella paysonii* in flower, by B. Heidel

Figure 29 (right). *Lesquerella paysonii*, in fruit, by B. Heidel



Similar Species: *Lesquerella carinata* has strongly flattened fruits with keeled margins and faces. *L. fremontii* has recurved fruit stalks and smaller flowers and styles. Other *Lesquerella* spp. in Wyoming differ in having inflated fruit pods (Fertig et al. 1994).

Flowering/Fruiting Period: Flowering occurs from mid-April to late June. Fruits are produced from late June to late August.

There was a very late growing season in 2011 and high winter snowfall, such that snow banks were late to melt. Some of the Deadline Ridge population was apparently buried for an extended time by snow, because segments of a couple subpopulations were found in full flower during late August survey (Figure 28) while the rest were in fruit (Figure 29).

Local field characters: The elliptic to triangular leaf blade is a cluster of basal leaves are fairly distinctive (see both shapes in Figures 28 and 29). Fruits are needed for positive determination.

Geographical distribution

Range: Regional endemic of west-central Wyoming, eastern Idaho, and southwestern Montana. In Wyoming, this species is found in the Gros Ventre, Salt River, Snake River, Teton, Wind River, and Wyoming ranges, the northern Green River Basin, and Jackson Hole in Lincoln, Sublette, and Teton counties. Scott (1997) also reports populations from the east slope of the Wind River Range in Fremont County, but these may represent *L. fremontii*.

Extant sites: Known from 41 extant occurrences, 31 of which are on the Bridger-Teton National Forest; 31 occurrences have been discovered or relocated since 1990 (Figure 30, Table 15). The Deadline Ridge occurrence (#028) surveyed in 2011 is the southernmost known record (Figure 30).

They are known from lands managed by Grand Teton National Park, Bridger-Teton and Targhee National Forests, and the BLM Pinedale Field Office.

Historical sites: There are six occurrences based on historical collection records.

Unverified/Undocumented reports: None known.

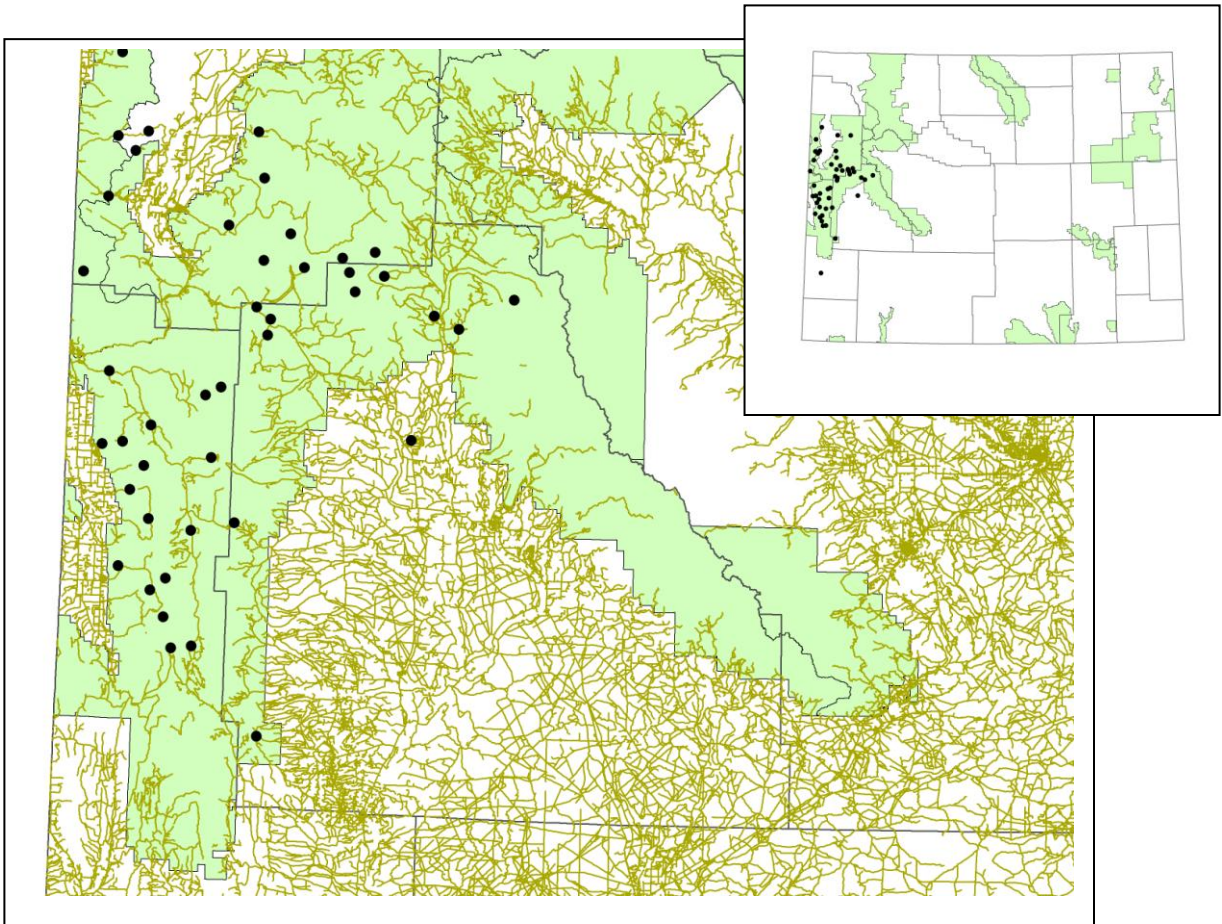


Figure 30. Distribution of Payson's bladderpod (*Lesquerella paysonii*) in Region 4 of the U.S. Forest Service (Wyoming)

Table 15. Occurrences of Payson's bladderpod (*Lesquerella paysonii*) in Wyoming

EO#	Directions	County	Legal Description	Elevation m (ft)	USGS 7.5' Quad	Public Land
BRIDGER-TETON NATIONAL FOREST						
001	Wyoming Range; Hoback Canyon.	Sublette	T38N R113W Sec. 7, 18, 19; T38N R114W Sec. 1, 2, 3, 9, 10, 11, 12	1951-2164 (6400-7100)	Bondurant, Bull Creek, Clause Peak, Granite Falls	Big Piney RD, Jackson RD
002	West slope Wind River Range; Kendall Warm Springs and warm springs north of Stinky Spring on east side of Green River, adjacent to Green River Lakes Road, ca 29 air miles north of Pinedale. Also along Lime Creek on west side of the Green River directly across from Kendall Warm Springs.	Sublette	T38N R110W Sec. 2, 3, 4, 5, 8, 9, 10, 11, 12, 14	2377-2682 (7800-8800)	Klondike Hill	Pinedale RD
003	Gros Ventre Range; Tepee Creek Ridge west to Red Hills, 6-9 air miles southwest of Mosquito Lake (in vicinity of Payson's general collection locality "15 miles northeast of Bondurant").	Sublette, Teton	T39N R111W Sec. 3, 4, 5, 6, 7, 8, 9, 10, 11, 14	2926-3170 (9600-10400)	Ouzel Falls, Tosi Peak	Jackson RD, Pinedale RD
004	Wyoming Range; east and south slopes of Mount McDougal and McDougal Gap, 38 air miles west of Daniel.	Lincoln, Sublette	T33N R115W Sec. 3, 4, 5, 8, 9, 10, 11, 15, 16, 17; T34N R115W	2573-2926 (8440-9600)	Triple Peak	Big Piney RD, Greys River RD
005	Salt River Range; Greys River at Lost Creek, ca 22.5 miles north-northeast of Afton.	Lincoln	T35N R117W Sec. 3, 4, 5, 8, 9, 10, 16, 17	1914 (6280)	Deer Creek	Greys River RD
006	Gros Ventre Range; Lower Slide Lake.	Teton	T42N R114W Sec. 3, 4, 5, 6, 7, 8, 9, 10; T43N R114W Sec. 28, 29	2164 (7100)	Blue Miner Lake, Shadow Mountain	Jackson RD
008	Salt River Range; near Murphy Creek and western slopes of peak 9988, in vicinity of Star Peaks.	Lincoln	T35N R118W Sec. 14, 15, 22, 23, 26, 27	2377-3044 (7800-9988)	Deer Creek, Stewart Peak, Thayne East	Greys River RD
011	Wyoming Range; Grayback Ridge, 2.5-3.5 air miles east-southeast of McCain Guard Station.	Lincoln	T36N R116W Sec. 2, 3, 10, 11, 14, 15	2835-2865 (9300-9400)	Pickle Pass	Greys River RD, Jackson RD
012	Salt River Range; above Crow Creek Lakes, 9 air miles east of Afton.	Lincoln	T32N R117W Sec. 21, 22, 23, 26, 27, 28, 33, 34, 35	2713 (8900)	Box Canyon Creek, Red Top Mountain	Greys River RD
013	Northern Salt River Range; Squaw Flat [along the Greys River, ca 5 air miles east of	Lincoln	T36N R118W Sec. 4, 5; T37N R117W Sec. 19,	1676 (5500)	Ferry Peak	Greys River RD

	Alpine and ca 3.5 miles south of the Grand Canyon of the Snake River].		30, 31; T37N R118W Sec. 35, 36			
014	Salt River Range; Strawberry Creek, 3/8 miles below dam, ca 13 air miles north-northeast of Afton, ca 1.5 air miles east of Bedford.	Lincoln	T34N R118W Sec. 24, 25	2097 (6880)	Man Peak	Greys River RD
015	Salt River/Wyoming Ranges; Greys River, in area of Forest Park, ca 15 air miles northeast of Afton.	Lincoln	T33N R116W Sec. 16, 20, 21, 22, 28	2126 (6975)	Park Creek	Greys River RD
016	Salt River Range; mountains near Cottonwood Lake, east of Smoot.	Lincoln	T30N R117W Sec. 2, 3, 4, 5; T31N R117W Sec. 8, 9, 10, 11, 13, 14	3048 (10000)	Box Canyon Creek, Mount Wagner, Poison Meadows, Red Top Mountain	Greys River RD
017	Southern Teton Range; 2 locations (1) east slope of Rendezvous Mountain ridge on ridge between Granite Canyon and Jackson Hole and (2) along crest of Rendezvous Peak (in the vicinity of the tram) and continuing along the trail into the basin to the south west (Cody Bowl).	Teton	T42N 117W Sec. 14, 15, 21, 22, 28	2896-3139 (9500-10300)	Rendezvous Peak, Teton Village	Jackson RD
018	Northern Wind River Range; Gypsum Creek Road, ca 1-1.5 miles southeast of Red Hill.	Sublette	T38N R109W Sec. 17, 18, 19, 20	2469-2499 (8100-8200)	Big Sheep Mountain, Kendall Mountain	Pinedale RD
021	Wyoming Range; Deadman Mine [Vail Mine, at head of Deadman Creek].	Lincoln	T35N R116W Sec. 25, 26, 35, 36	2402-2805 (7880-9202)	Blind Bull Creek	Greys River RD
022	Wyoming Range; Cliff Creek, ca 0.7 miles south of the junction of Cliff Creek Road and US Highway 189-191, also juncture of Kerr, Little Cliff, and Cliff creeks.	Sublette	T38N R114W Sec. 22, 23, 26, 27, 34, 35	1963-2057 (6440-6750)	Bondurant, Clause Peak	Big Piney RD
023	Salt River Range; Prater Canyon [ca 6.5 air miles northeast of Thayne, ca 7 air miles north of Bedford].	Lincoln	T35N R118W Sec. 17, 18, 19, 20, 21, 28, 29, 30, 31, 32	1999-2499 (6560-8200)	Stewart Peak, Thayne East	Greys River RD
024	Salt River Range; ridge north and west of Corral Creek Lake and pass between two forks of Dry Creek Lake.	Lincoln	T31N R117W Sec. 5, 8, 9; T32N R117W Sec. 29, 30, 31, 32	2911-3170 (9550-10400)	Red Top Mountain	Greys River RD
025	Salt River Range; Man Peak, along ridge from summit for 0.5 miles south and ridge 1-2 air miles southwest.	Lincoln	T34N R117W Sec. 4, 5, 6, 8, 9; T35N R117W Sec. 32	2804-3090 (9200-10139)	Man Peak	Greys River RD

026	Salt River Range; McDougal Pass and ridge for 0.5 miles south.	Lincoln	T33N R117W Sec. 9, 16	2926-2987 (9600-9800)	Rock Lake Peak	Greys River RD
027	Salt River Range; ca 0.5 mile west of North Fork Swift Creek mouth, on north-south trending ridge dividing the Star Valley and Swift Creek Canyon drainage, ca 2 air miles northeast of Afton.	Lincoln	T32N R118W Sec. 16	2621 (8600)	Grover	Greys River RD
028	Wyoming Range; Deadline Ridge and southwest corner of Riley Ridge, ca 21 air miles southwest of Big Piney.	Sublette	T28N R115W Sec. 3, 9, 16, 22; T29N R115W Sec. 36	3078-3109 (9680-10280)	Pine Grove Ridge	Big Piney RD
029	Gros Ventre Mountains; along ridge southeast 0.25 mile from Pinnacle Peak, just east of Little Granite Creek, ca 2.5 mile east of Gros Ventre RNA, ca 6.5 miles north of US Highway 191-189.	Teton	T39N R114W Sec. 3, 4; T40N R114W Sec. 33, 34	3109-3231 (10200-10600)	Bull Creek, Turquoise Lake	Jackson RD
030	Gros Ventre Range; ridges 1.3 air miles north of Cache Peak northwest to base of Jackson Peak.	Teton	T40N R115W Sec. 2, 3, 10, 11, 14, 15	2926-3078 (9600-10100)	Cache Creek, Turquoise Lake	Jackson RD
031	Gros Ventre Range; summit of ridge extending south from Packsaddle Pass and Pyramid Peak.	Teton	T40N R113W Sec. 7, 8, 17, 18	2621-3109 (8600-10200)	Crystal Peak	Jackson RD
032	Gros Ventre Range; Hodges Peak and along base of east side.	Sublette	T39N R112W Sec. 22, 23, 26, 27	3170-3597 (10400-11800)	Doubletop Peak	Jackson RD
033	Snake River Range; ridge and upper slopes extending for ca 0.5 miles south of Teton Pass on Wyoming Highway 22, ca 9.5 air miles west of Jackson.	Teton	T41N R118W Sec. 23, 24, 25, 26	2591-2743 (8500-9000)	Rendezvous Peak, Teton Pass	Jackson RD, Teton Basin RD
036	Gros Ventre Mountains; Swift Creek trail from Wilderness Boundary north-northeast ca 1.5 air miles, ca 1 mile east of "The Open Door", ca 2 air miles east of Granite Creek Campground, also west slope of Corner Peak, ca 1 air mile west of MacLeod Lake.	Teton	T39N R113W Sec. 3, 4, 5, 8, 9, 10; T40N R113W Sec. 33, 34	2438 (8000)	Crystal Peak, Granite Falls	Jackson RD
037	Gros Ventre Mountains; Sheep Mountain, ca 14 miles northeast of Jackson.	Teton	T41N R114W Sec. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	3048 (10000)	Blue Miner Lake, Grizzly Lake	Jackson RD
038	Jackson Hole; Turpin Meadows, east of Moran [north of the Buffalo Fork River in vicinity of Turpin Meadows	Teton	T45N R112W Sec. 13, 14, 15, 22, 23, 24	2103 (6900)	Rosies Ridge	Buffalo RD

	Lodge, ca 3-3.5 air miles north of US Highway 26-287].					
039	Salt River Range; Mink Creek drainage along LaBarge Creek Divide, and headwaters of Spring Creek and Smith Fork, ca 9 miles east-northeast of Smoot.	Lincoln	T30N R117W Sec. 1, 2, 3, 4, 10, 11, 12, 13, 14, 15	2819-2896 (9250-9500)	Mount Wagner, Poison Meadows	Greys River RD
040	Gros Ventre Range; east slope and southeast flank of Darwin Peak, ca 0.3-1.5 miles north of Brewster Lake.	Sublette, Teton	T39N R112W Sec. 3, 4; T40N R112W Sec. 28, 29, 32, 33, 34	3072-3475 (10080-11400)	Darwin Peak	Jackson RD
042	Gros Ventre Range; Dry Fork Trail by junction with Ouzel Falls Trail and on north side of Clear Creek just before footbridge, ca 0.3 and 2.5 miles west of Darwin Ranch.	Teton	T40N R111W Sec. 21, 28, 30	2499-2804 (8200-9200)	Ouzel Falls	Jackson RD
043	Wind River Range; Limestone Mountain [ridge just west of Osbourne Mountain].	Sublette	T38N R108W Sec. 4, 5; T39N R108W Sec. 20, 21, 27, 28, 29, 32, 33, 34	3139 (10300)	Green River Lakes	Pinedale RD
044	Gros Ventre Range; south side of Triangle Peak and North side of Doubletop Peak, ca 0.5-1.5 miles south of Brewster Lake.	Sublette	T39N R112W Sec. 3, 4, 9, 10, 16	3261-3536 (10700-11600)	Doubletop Peak	Jackson RD
046	Wyoming Range; south end of ridge between Hunter and Willow creeks, ca 1.5 miles northwest of Horse Heaven Meadows, ca 2.5 miles east of Grayback Ridge.	Lincoln	T36N R115W Sec. 5, 6, 7, 8; T36N R116W Sec. 1, 12; T37N R115W Sec. 33, 34, 35	2499-2804 (8200-9200)	Bailey Lake, Clause Peak, Hoback Peak, Pickle Pass	Greys River RD, Jackson RD
047	Salt River Range; along Greys River at Mink Creek, ca 12 air miles east of Smoot, ca 16 air miles southeast of Afton.	Lincoln	T30N R116W Sec. 7, 8, 17	2438 (8000)	Poison Meadows	Greys River RD
048	Wyoming Range; Hoback Canyon, road cut on US Highway 189-191, just north of Granite Creek turnoff.	Sublette	T38N R114W Sec. 4	1925 (6315)	Bull Creek	Big Piney RD
OUTSIDE OF BRIDGER-TETON NATIONAL FOREST						
007	Jackson Hole; near mouth of Pacific Creek.	Teton	T45N R114W Sec. 14, 15, 22, 23	2042-2057 (6700-6750)	Moran	Grand Teton NP
010	Green River Basin; 2 locations: (1) east bank of "The Narrows" of the Green River, 1-1.5 miles northeast of Warren Bridge, 16 air miles northwest of Pinedale; (2) Warren Bridge Campground on the east bank of the Green River, just south of US Hwy 191-189.	Sublette	T35N R111W Sec. 2, 3, 4, 5, 8, 9, 10, 11, 15, 16; T36N R111W	2316 (7600)	Warren Bridge	BLM Pinedale

017	Southern Teton Range; 2 locations (1) east slope of Rendezvous Mountain ridge on ridge between Granite Canyon and Jackson Hole and (2) along crest of Rendezvous Peak (in the vicinity of the tram) and continuing along the trail into the basin to the south west (Cody Bowl).	Teton	T42N 117W Sec. 14, 15, 21, 22, 28	2896-3139 (9500-10300)	Rendezvous Peak, Teton Village	Grand Teton NP
019	Teton Range; 0.5-1.5 miles west and south of Marion Lake, adjacent to Game Creek and Teton Crest trails.	Teton	T42N R117W Sec. 7, 18	2713-2957 (8900-9840)	Rendezvous Peak	Grand Teton NP
020	Teton Range; Mount Hunt Divide, adjacent to Open Canyon Trail, ca 0.5 miles east-southeast of summit of Mount Hunt.	Teton	T42N R117W Sec. 2	2957 (9700)	Grand Teton	Grand Teton NP
033	Snake River Range; ridge and upper slopes extending for ca 0.5 miles south of Teton Pass on Wyoming Highway 22, ca 9.5 air miles west of Jackson.	Teton	T41N R118W Sec. 23, 24, 25, 26	2591-2743 (8500-9000)	Rendezvous Peak, Teton Pass	Targhee NF
034	Teton Mountains; west slope, summit of Freds Mountain, ca 0.3 miles southeast of ski lift tower, ca 1.4 miles east of Grand Targhee Resort, ca 2 miles north of the Teton Canyon Road.	Teton	T44N R117W Sec. 7, 18	3018 (9900)	Granite Basin	Targhee NF
035	Snake River Range; ridge leading to and 0.5 miles southwest of Powder Peak, ca 12 air miles north of Alpine, near the head of tributary of Box Canyon, 1.5 air miles east of the Idaho State line, ca 6.5 air miles northeast of Palisades Reservoir.	Teton	T39N R118W Sec. 29	2804 (9200)	Mount Baird	Targhee NF
041	Teton Range; along Webb Canyon Trail, ca 0.5 mile northwest of Moose Basin patrol cabin, ca 0.7 mile east of Moose Basin Divide, ca 27 miles from Jackson.	Teton	T46N R116W Sec. 7, 18, T46N R117W Sec. 12, 13	2792-2896 (9160-9500)	Ranger Peak	Grand Teton NP
045	Overthrust Belt; Hams Fork Plateau, just north of upper Schuster Basin and slopes south of Fish Creek where it bends to the north, ca 2 miles from Emigrant Springs.	Lincoln	T22N R117W Sec. 5, 6; T22N R118W Sec. 1; T23N R117W Sec. 18, 29, 30, 31, 32, 33; T23N R118W Sec. 13	2256-2377 (7400-7800)	Kemmerer Reservoir, The Rock Slide	State of Wyoming

Sites where present status not known: None known.

Areas surveyed but species not located: None.

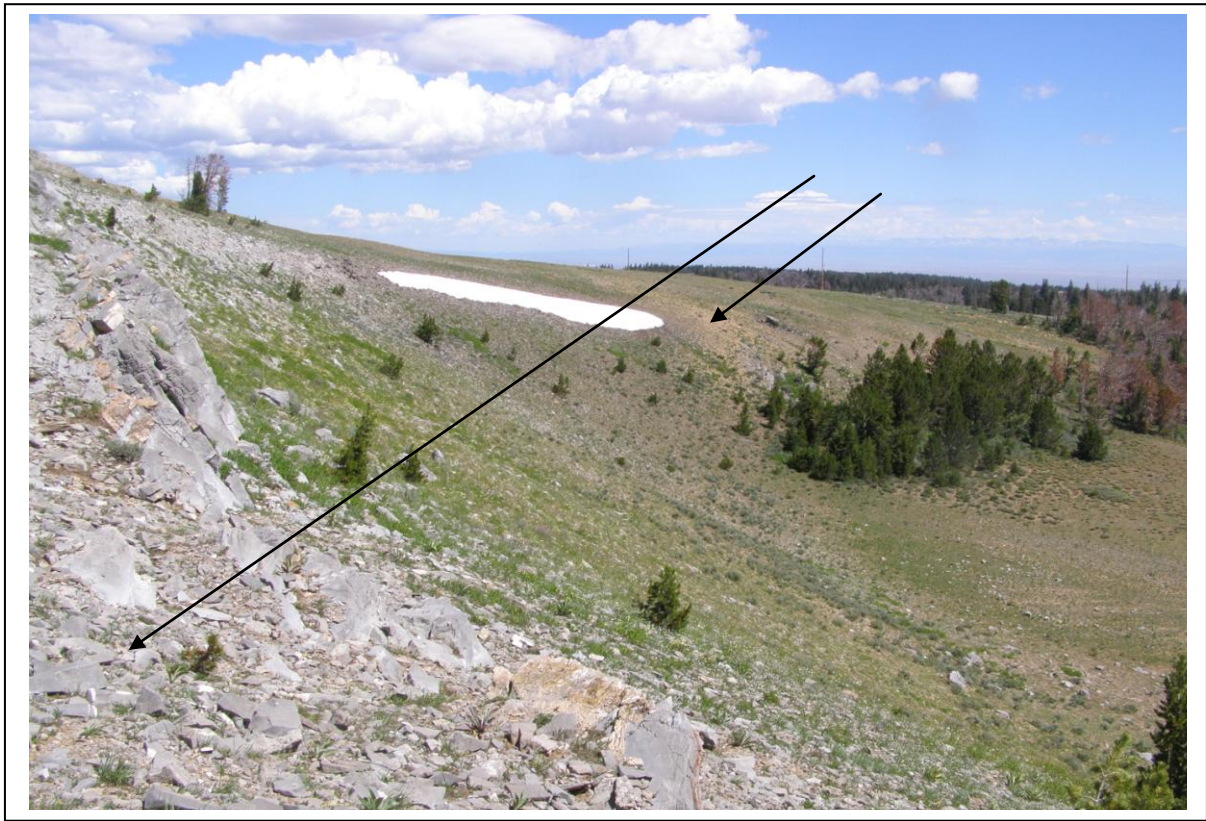


Figure 31. Habitat of *Lesquerella paysonii* on Deadline Ridge (#028), at arrows, Bridger-Teton National Forest, by B. Heidel



Figure 32. Habitat of *Lesquerella paysonii* in the Teton Range, Grand Teton National Park, by H. Marriott

Habitat

Setting and associated vegetation: In Wyoming, *Lesquerella paysonii* is found primarily on windswept, gravelly, calcareous ridgecrests and semi-open slopes (Fertig 1997), typically on crest and upper slope positions, and with other breaks in topography (Figures 31-32). He goes on to describe the surrounding vegetation as typically dominated by *Artemisia tridentata* var. *vaseyana* but populations have also been reported from talus slopes, disturbed roadsides, dried stream channels, and rocky clearings in lodgepole pine and subalpine fir forests (Fertig 1997).

It is mainly found on the following two geology mapping units but not restricted to them:

- Madison and Darby Formations
- Phosphoria, Wells and Amsden Formations

Frequently associated species: The species associated with *Lesquerella paysonii* are listed in Table 16.

Table 16. Plants associated with Payson’s bladderpod (*Lesquerella paysonii*) in Wyoming

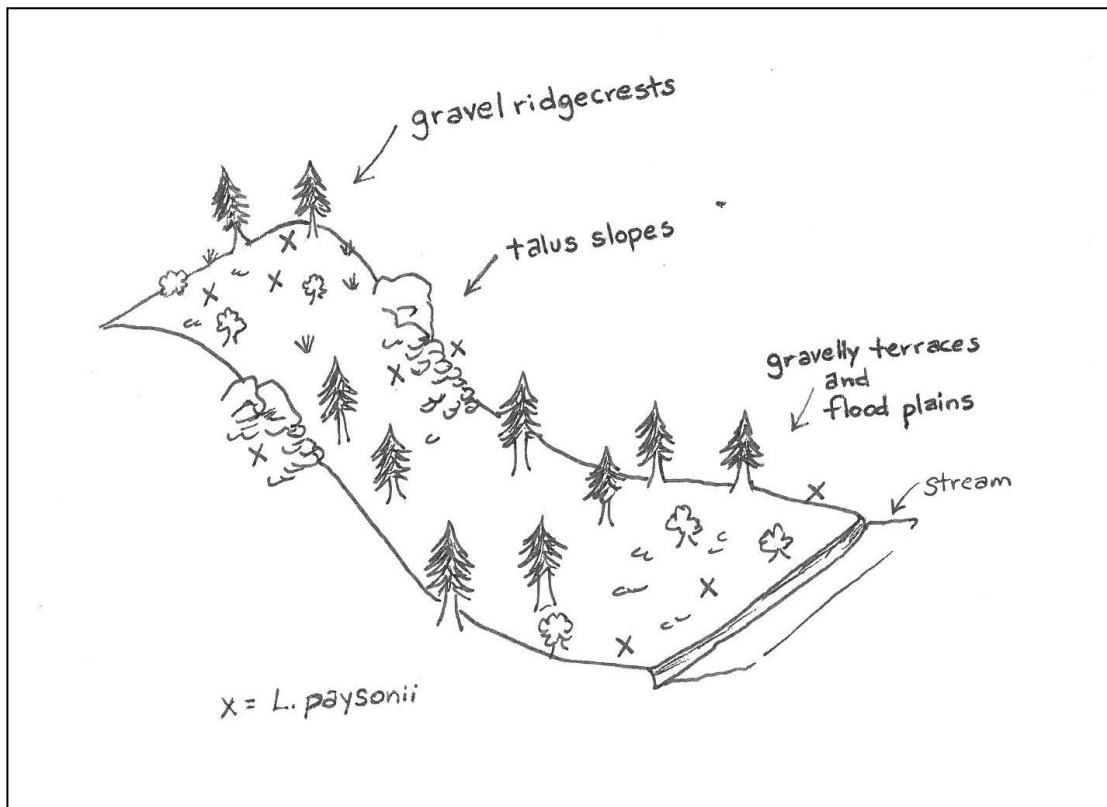
Scientific name	Common name	Native/ Exotic
<i>Achillea millefolium</i>	Common yarrow	Native
<i>Allium brandegei</i>	Brandege onion	Native
<i>Anemone tetonense</i>	Teton thimbleweed	Native
<i>Antennaria dimorpha</i>	Cushion pussytoes	Native
<i>Antennaria microphylla</i>	Small-leaf pussytoes	Native
<i>Antennaria umbrinella</i>	Umber pussytoes	Native
<i>Astragalus kentrophyta</i> var. <i>tegetarius</i>	Thistle milkvetch	Native
<i>Astragalus miser</i>	Weedy milkvetch	Native
<i>Astragalus shultziorum</i>	Shultz’s milkvetch	Native
<i>Boechera holboellii</i>	Holboell’s rockcress	Native
<i>Carex nardina</i>	Spikenard sedge	Native
<i>Cymopterus terebinthinus</i>	Turpentine cymopterus	Native
<i>Eremogone congesta</i>	Ballhead sandwort	Native
<i>Elymus elymoides</i>	Bottlebrush squirreltail	Native
<i>Erigeron compositus</i>	Cut-leaved daisy	Native
<i>Erigeron eatonii</i>	Eaton’s daisy	Native
<i>Erigeron ursinus</i>	Bear River fleabane	Native
<i>Eriogonum umbellatum</i>	Sulfur buckwheat	Native
<i>Frasera speciosa</i>	Green gentian	Native
<i>Hedysarum occidentale</i>	Western sweetvetch	Native
<i>Leucopoa kingii</i>	Spike-fescue	Native
<i>Linum lewisii</i>	Wild blue flax	Native
<i>Lupinus lepidus</i>	Stemless dwarf lupine	Native
<i>Macranthera canescens</i>	Hoary aster	Native
<i>Penstemon montanus</i>	Mountain beardtongue	Native
<i>Phacelia sericea</i>	Silky phacelia	Native

<i>Phlox hoodii</i>	Hood's phlox	Native
<i>Pinus albiculis</i>	Whitebark pine	Native
<i>Poa secunda</i> var. <i>incurva</i>	Sandberg's bluegrass	Native
<i>Potentilla fruticosa</i>	Shrubby cinquefoil	Native
<i>Potentilla glandulosa</i>	Glandular cinquefoil	Native
<i>Potentilla ovina</i>	Sheep cinquefoil	Native
<i>Sedum lanceolatum</i>	Lance-leaved stonecrop	Native
<i>Senecio crassulus</i>	Thick-leaf ragwort	Native
<i>Townsendia alpigena</i>	Wyoming Townsend-daisy	Native
<i>Taraxacum officinale</i>	Common dandelion	Exotic

Topography: The topographic position of *Lesquerella paysonii* varies. It is often on exposed ridgecrests or upper slopes but is also known from gravelly stream terrace bottomland. A schematic diagram of its topographic position is reprinted from Fertig (1997) in Figure 33.

Water and soil relationships: *Lesquerella paysonii* populations are found primarily on calcareous substrates derived from limestone or dolomite. Soils are usually well-drained, poorly developed, thin, and coarse textured (Fertig 1997). Occasionally, populations have been reported from sandstones, shales, alluvium, and travertine.

Figure 33. Topographic position of *Lesquerella paysonii* on the landscape, by W. Fertig, from Fertig (1997)



Population biology and demography

Population size and condition: Censused populations range were reported as ranging in size from 10-1500 individuals in areas between 1-30 acres, with estimated total population numbers conservatively estimated at 20,000 individuals (Fertig 1997; Table 17). Surveys at Deadline Ridge suggest that it has among the larger known populations, with at least 1800 individuals, though totaling less than 5 acres of occupied habitat. This is a conservative estimate because census figures are usually underestimated when conducted after flowering. On the other hand, this estimate might also reflect the exceptional moist growing conditions in 2011 because it appeared that some first-year plants were in flower.

Trends: Trend data are lacking for nearly all occurrences, but at least 3 are known to have persisted since the 1920s. Short-term observations suggest that population size may fluctuate from year to year based on climatic conditions (Fertig 1997).

Table 17. Population information for Payson’s bladderpod (*Lesquerella paysonii*) in Wyoming

EO#	Population size	Documentation	Last Observed Date
BRIDGER-TETON NATIONAL FOREST			
001	1930s?: Collected by L. and T. Williams. 1922-08-19: In flower and fruit. Collected by E. and L. Payson.	Specimen	1930s?
002	Ca 7 subpopulations in ca 3 miles. 1995-06-20: (Sec 2 E2 of W2) In flower and early fruit. Hundreds of plants observed near roadside and in undisturbed sites near Kendall Warm Springs. Overall, population much larger and more widespread than during 1994 survey. Observed by W. Fertig. 1994-07-11: (Sec 2 SW4; 3 subpopulations) In late fruit or vegetative. 300-500 plants observed (actual population probably larger). Surveyed by W. Fertig. 1991-08-22: (Sec 4, 9, 10) In fruit. Collected by R. Hartman and J. Hughes. 1990-06-25: (Sec 2 SW4 of SW4) In flower and fruit. Surveyed by W. Fertig. 1990-06-13: (Sec 11 1/8 mile north of Stinky Spring) In flower and fruit. Collected by W. Fertig. 1990-06-08: (Sec 11 7800-7900') In flower and fruit. Collected by R. Hartman. 1922-08-06: (Sec 2 NE4 of SW4) In fruit. Collected by E. and L. Payson.	Survey	20 June 1995
003	1994-07-09: In flower and fruit. Collected by R. Hartman. 1922-08-15: In fruit. Collected by E. and L. Payson.	Specimen	9 July 1994
004	Ca 3 subpopulations in ca 1 mile. 1992-06-04: (Sec 4, 9) In flower and fruit. Collected by B. Embury. 1978-07-20: (Sec 9 SW4) In fruit. Collected by L. and J. Shultz. 1978-06-26: (Sec 10) In flower. Common. Collected by L. and J. Shultz.	Specimen	4 June 1992
005	1978-05-28: In flower and early fruit. Collected by O. Harrison.	Specimen	28 May 1978
006	1977-05-24: In flower and immature fruit (fruit characters appear to fit <i>L. paysonii</i> better than its close relative <i>L. carinata</i>). Frequent. Collected by R. Lichvar.	Specimen	24 May 1977

008	Ca 3 subpopulations in ca 1 mile. 1992-08-22: (Sec 23 western slopes of peak 9988) In fruit. Collected by R. Hartman. 1986-08-02: (Sec 23 rocky basin) In flower and fruit. Collected by O. Harrison. 1986-07-21: (Sec 22) In flower and fruit. Collected by O. Harrison.	Specimen	22 August 1992
011	2 subpopulations in ca 1.5 miles. 1990-07-16: (Sec 14) Collected by B.E. Nelson. 1979-08-06: (Sec 10) In fruit. Collected by L. and J. Shultz.	Specimen	16 July 1990
012	1979-07-05: In flower and fruit. Collected by J. Shultz. Occurs with Douglas-fir and whitebark pine.	Specimen	5 July 1979
013	1926-05-16: In flower and immature fruit. Distribution patchy. Collected by C. McDonald.	Specimen	16 May 1926
014	1985-05-18: In flower. Collected by O. Harrison.	Specimen	18 May 1985
015	1980-07-16: In flower and fruit. Collected by O. Harrison.	Specimen	16 July 1980
016	1923-08-13: In flower and fruit. Collected by E. Payson and G. Armstrong.	Specimen	13 August 1923
017	Ca 4 subpopulations in ca 2 miles. 2000-08-22: (Sec 22 center of N4) In fruit. Collected by C. Delmatier. 2000-08-02: (Sec 21 SE4, 22 SW4 of NW4; 2 subpopulations) In fruit. Collected by C. Delmatier. 2000-07-26: (Sec 21 NE4) In fruit. Collected by C. Delmatier. 1996-07-31: (Sec 14; ridge above Granite Canyon) Ca 10% in flower, 90% in fruit. 200-500 individuals in 1-2 acres. Surveyed by S. Markow. 1994-07-10: (Sec 15, 21, 22; along trail) In flower and fruit. Moderately common. Surveyed by Wyoming Native Plant Society annual field trip. 1990-08-26: (Sec 22 center of N4, NE4 of NW4; 2 subpopulations) In fruit. Collected by H. Marriott.	Survey	20 August 2000
018	1990-06-08: In flower and fruit. Collected by R. Hartman.	Specimen	8 June 1990
021	1992-06-06: In flower and fruit. Collected by B. Embury.	Specimen	6 June 1992
022	2 subpopulations in ca 1.5 miles. 1995-06-20: (Sec 22, 23) Ca 70% of all plants with fruit, 50% also in flower, and ca 30% vegetative. Ca 500+ plants in limited area (additional habitat in the vicinity in the floodplain of Cliff Creek). Surveyed by W. Fertig. 1992-05-09: (Sec 26, 27) In flower and fruit. Collected by R. Hartman and B. Embury.	Survey	20 June 1995
023	1992-06-19: In flower and fruit. Collected by R. Hartman and B. Embury.	Specimen	19 June 1992
024	2 subpopulations along ca 2 miles of same ridge system. 1992-06-19: (Sec 8) In flower and fruit. Collected by R. Hartman. 1990-07-07: (Sec 31) Collected by O. Harrison.	Specimen	19 June 1992
025	2 subpopulations in ca 0.75 mile. 1992-08-16: (both subpopulations) In fruit. Collected by R. Hartman.	Specimen	16 August 1992
026	1992-07-24: In fruit. Collected by R. Hartman.	Specimen	24 July 1992
027	1993-07-16: In flower and mature fruit. Surveyed by W. Fertig.	Survey	16 July 1993
028	7 main subpopulations along ca 3 miles of ridge, plus 2 northern outliers. 2011-08-22, 23: In fruit, flower and vegetative. Ca 1800-5000 plants. Surveyed by B. Heidel, later revisited with Forest staff. 1993-07-24: In flower and fruit. Collected by R. Hartman.	Specimen	23 August 2011
029	1994-07-07: In flower and immature fruit. Collected by R. Hartman.	Specimen	7 July 1994
030	1994-07-12: In fruit. Collected by R. Hartman.	Specimen	12 July 1994

031	1994-07-27: In fruit. Collected by R. Hartman and T. Cramer.	Specimen	27 July 1994
032	1994-08-02: In fruit. Collected by R. Hartman and T. Cramer.	Specimen	2 August 1994
033	1999-08-21: (Sec 25 W2) In fruit. Collected by N. and P. Holmgren 1999-07-27: (Sec 25 W2) Collected by E. Evert. 1997-08-19: (Sec 25 NW4) Ca 1% in flower, 80% fruiting, 19% vegetative. 1000-5000 plants. Surveyed by S. Markow. 1995-09-01: (Sec 2 5 W2, 24 SW4) 100% in fruit. 500-1000 individuals. Surveyed by S. Markow. 1992-07-08: (near microwave station) In fruit. Collected by E. Evert. 1979-06-25: (Ca Sec 24 SW4) In flower and fruit. Collected by Dieffenbach. 1920-07-25: (Teton Pass mountains) In fruit. Collected by E. and L. Payson.	Survey	21 August 1999
036	2 subpopulations in ca 0.5 mile. 1997-08-07: (Sec 3) In fruit. Collected by W. Fertig. 1994-06-28: (Sec 3, 4, 9) In flower and fruit. Collected by R. Hartman.	Specimen	7 August 1997
037	1957-07-30: In fruit. Collected by J.H. Beaman and K.J. Store.	Literature	30 July 1957
038	1940s: Collected by H.D.D. Ripley and R. Barneby.	Literature	1940s
039	3 subpopulations in ca 2.3 miles. 2010-08-03: (Sec 14 SW4) 95% in fruit, 5% vegetative. Ca 200 plants in ca 1 acre. Surveyed by H. Marriott. 2010-08-02: (Sec 3, 4) 80% in fruit, 20% vegetative. Ca 25 plants on 3 outcrops. <100 square meters of occupied habitat. Surveyed by H. Marriott. 1978-08-11: (Mink Creek drainage) Collected by F. Smith and J. Shultz.	Specimen	3 August 2010
040	2 subpopulations in ca 1.5 miles. 1998-08-04: (both subpopulations) In fruit. (Sec 32) 100 plants in 50 x 50 meters. Collected by L. Welp.	Specimen	4 August 1998
042	2 subpopulations in ca 2.5 miles. 1998-08-03: (both subpopulations) In flower and fruit. (Sec 30) 400-500 plants. Locally numerous. Collected by W. Fertig and L. Welp.	Specimen	3 August 1998
043	1925-08-05: In flower. Collected by E. and L. Payson.	Specimen	5 August 1925
044	2 subpopulations in ca 1 mile. 1998-08-05: (Sec 10) In flower and fruit. Collected by W. Fertig. 1998-08-04: (Sec 9) In flower and fruit. Collected by W. Fertig.	Specimen	5 August 1998
045	2 subpopulations in ca 3 miles. 1994-06-29: (Sec 13) In fruit. Collected by R. Hartman and C. Refsdal. 1994-05-26: (Sec 31, 32, 36) In flower. Collected by R. Hartman, T. Cramer, and C. Refsdal.	Specimen	29 June 1994
046	1990-08-21: Collected by R. Hartman.	Specimen	21 August 1990
047	1990-05-27: In flower and immature fruit. Collected by O. Harrison.	Specimen	27 May 1990
048	2002-05-27: In flower. Infrequent. Collected by N. and P. Holmgren.	Specimen	27 May 2002
OUTSIDE OF BRIDGER-TETON NATIONAL FOREST			
007	1971-06-07: In flower and fruit. Moderately abundant. Collected by R. Dorn. 1948-06-02: In flower and fruit. Collected by J. and M. Reed.	Specimen	7 June 1971
010	2 subpopulations in ca 1.5 miles. 1992-04-18: (campground) In flower. Moderately common. Petals	Specimen	18 April 1992

	yellow. Collected by W. Fertig and J. Struttman. 1990-06-10: (The Narrows) In flower and fruit. Collected by R. Hartman.		
017	Ca 4 subpopulations in ca 2 miles. 2000-08-22: (Sec 22 center of N4) In fruit. Collected by C. Delmatier. 2000-08-02: (Sec 21 SE4, 22 SW4 of NW4; 2 subpopulations) In fruit. Collected by C. Delmatier. 2000-07-26: (Sec 21 NE4) In fruit. Collected by C. Delmatier. 1996-07-31: (Sec 14; ridge above Granite Canyon) Ca 10% in flower, 90% in fruit. 200-500 individuals in 1-2 acres. Surveyed by S. Markow. 1994-07-10: (Sec 15, 21, 22; along trail) In flower and fruit. Moderately common. Surveyed by Wyoming Native Plant Society annual field trip. 1990-08-26: (Sec 22 center of N4, NE4 of NW4; 2 subpopulations) In fruit. Collected by H. Marriott.	Survey	20 August 2000
019	4 subpopulations in ca 1.5 mile. 2007-08-11: (Sec 18) In fruit. Collected by D. Scott. 1992-08-12: (Sec 7; 3 subpopulations) In fruit and producing lots of seed. A total of 500-1000 plants. Occasional to locally common. Surveyed by H. Marriott.	Survey	11 August 2007
020	1992-08-13: 50-200 plants in small area. Locally common but restricted in distribution. Surveyed by H. Marriott.	Survey	13 August 1992
033	1999-08-21: (Sec 25 W2) In fruit. Collected by N. and P. Holmgren 1999-07-27: (Sec 25 W2) Collected by E. Evert. 1997-08-19: (Sec 25 NW4) Ca 1% in flower, 80% fruiting, 19% vegetative. 1000-5000 plants. Surveyed by S. Markow. 1995-09-01: (Sec 25 W2, 24 SW4) 100% in fruit. 500-1000 individuals. Surveyed by S. Markow. 1992-07-08: (near microwave station) In fruit. Collected by E. Evert. 1979-06-25: (Ca Sec 24 SW4) In flower and fruit. Collected by Dieffenbach. 1920-07-25: (Teton Pass mountains) In fruit. Collected by E. and L. Payson.	Survey	21 August 1999
034	1995-08-19: 100% in fruit. Fewer than 10 individuals. Surveyed by S. Markow.	Survey	19 August 1995
035	1995-08-15: 100% in fruit. Ca 100+ individuals. Surveyed by S. Markow.	Survey	15 August 1995
041	2002-08-21: Collected by Valerie Kurth, Cory Bolen, and Erica Lee. 2000-07-24: 100% in fruit. 100-500 plants. Widely and intermittently scattered along side of trail for over 1 mile. Surveyed by S. Markow and S. Fedorchak.	Survey	21 August 2002
045	2 subpopulations in ca 3 miles. 1994-06-29: (Sec 13) In fruit. Collected by R. Hartman and C. Refsdal. 1994-05-26: (Sec 31, 32, 36) In flower. Collected by R. Hartman, T. Cramer, and C. Refsdal.	Specimen	29 June 1994

Protection status: Thirteen occurrences are found within the Gros Ventre Wilderness Area, Grand Teton National Park, Kendall Warm Springs Special Interest Area, and Afton Front Research Natural Area. Three other occurrences are found just outside of other RNAs and SIAs on Bridger-Teton National Forest.

Threats: Impacts from recreation (hiking and off-road vehicles), ski development, grazing, mining, oil and gas development and forest management practices are potential threats, especially in lower elevation populations. Overall, however, threats are low to most occurrences.

Unusual settings for *Lesquerella paysonii* were documented north of Deadline Ridge at the corner of Riley Ridge (Figures 34 and 35). Small fruiting plants of it were found in very low numbers in settings that appeared to have been created within the past few years, less than a half mile from one another, included a bladed-off ridgetop (Figure 34) and a pipeline corridor segment that ran along a roadway connecting the two (Figure 35). They were associated with Idaho fescue (*Festuca idahonis*) that was not present in any adjoining habitat, which was apparently seeded to restore the disturbed habitat. The area outcrops and parent material appeared to be metamorphic. It is not known whether *L. paysonii* was introduced with fill or adherence to machinery. The subpopulation numbers of *L. paysonii* plants were very low. These two subpopulations are in the database as outliers of the large Deadline Ridge population, but might also be considered unrelated waifs that do not contribute to species' viability, whether or not they persist. Their presence in these disturbed conditions indicate that there is *L. paysonii* habitat that is being quarried, or at least, that there is heavy machinery moving through *L. paysonii* habitat elsewhere.

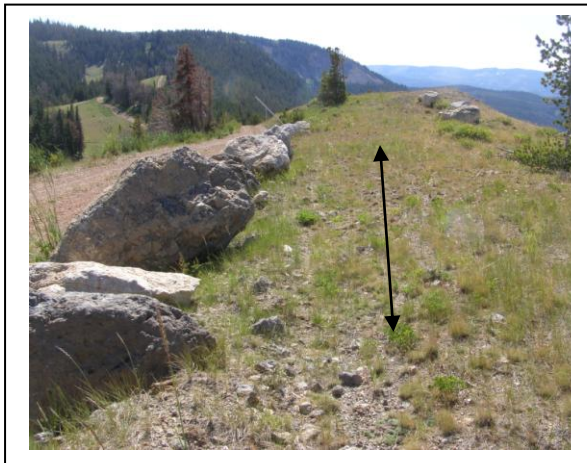


Figure 34 (above). *Lesquerella paysonii* in bladed roadside ridgetop

Figure 35 (right). *Lesquerella paysonii* in pipeline corridor. Note: The location of the above photo is on the skyline of the right photo.



Discussion

Four of the five target species have robust status reports (all except *Astragalus robbinsii* var. *minor*) so the compounded challenge was to represent this already massive amount of information, and identify key information gaps within each that are appropriately translated into survey objectives in the Wyoming and Salt River Ranges. Without duplicating the reports that have already been done, the reader is referred to all prior works for original data and interpretations, but to this report for the most current synthesis.

The 2011 *Astragalus paysonii* survey results offer the first trend data produced for this species in Wyoming. Previous researchers compared species' numbers in a multi-aged series of clearcuts as basis for interpreting trend (Shultz and Shultz 1978). Major decline was documented in 2011 for two of the four populations that had ever been reported as having over 100 plants (Fertig and Marriott 1993). However, major increase was documented in relocating it in the vicinity of the 1922 type locality where it could not be found in 1978 but apparently persisted in low numbers or in the seed bank in the general area until the Horse Creek fire in 2007. The Horse Creek Fire and the earlier but contiguous Mule Fire represent one of five major wildfire areas burned between 1991-2010 on the Forest. Survey might be expanded further in the North Horse Creek landscape that burned. In addition, the other four major wildfire areas might be considered for *A. paysonii* survey. One of the most far-reaching questions might be species' response to bark beetle and blister rust outbreak. Considering that they do not expose the soil to the mineral layer, they may only have indirect affects for *A. paysonii* in that they ultimately include fuel load for fires.

It appeared that *Astragalus paysonii* is found on the broadest range of parent materials of any of the five species, so it is not a habitat specialist so much as a successional species. The adequacy of wildfire policy and associated practices for maintaining species' viability warrant further consideration. The practices instituted in wildfire areas, including logging, revegetation, grazing, and inadvertent invasion by noxious weeds potentially alter habitat suitability and may warrant further investigation.

Three of the five species are calciphiles, at varying degrees of habitat breadth or narrowness. *Draba globosa* appears to have the narrowest habitat specificity among calciphiles, restricted to sheltered alpine microhabitats. The single known occurrence in the study area, at Greysalt Peak, is in sloping rocky rubble little affected by management actions. Additional surveys are warranted before drawing all interpretation of study area management impacts from the single population.

Lesquerella paysonii appears to have some of the widest ecological amplitude among calciphiles, spanning the greatest elevation range and perhaps less restricted to limestone and dolomite than the other three species. Almost half of all known Wyoming occurrences are in the Salt River and Wyoming Ranges. There is little prospect for it being directly affected by prescribed burn treatment because its habitat has low fuel load. But any machinery, chemicals or access development used in the treatment could have potential affects. It might be appropriate to conduct monitoring of any population segments that adjoin burns, at least

by mapping boundaries if not also establishing a transect closest to the burn. For purposes of this study, additional surveys might be appropriate in select areas.

No followup survey tasks were identified for *Astragalus shultziorum*, but it is the regional endemic species most restricted to the Bridger-Teton National Forest among the five species. Any surveys for *Draba globosa* would be covering potential habitat of *Astragalus shultziorum*.

The fifth species, *Astragalus robbinsii* var. *minor*, may also be a poor competitor even though it occupies mesic habitat. It occurs at vegetation transition bands below willows and on stream banks, sometimes under partial shade and sometimes in the open, but where there are often pockets of bare ground. It was found only in low numbers, and might be favored by the process of stream meanders. It was not found in any of the settings where old beaver dams were evident, whether because beaver dams changed successional processes or because this habitat was never suited for beaver activity. It appeared to favor low-gradient streamcourses on fairly broad valleys. Further surveys are warranted as time and priorities allow.

The three different species of milkvetch addressed in 2011 surveys are striking studies in contrast, with fundamentally different distribution (widespread vs regional endemic), habitats (dry vs mesic) and the vegetation stage of development (successional vs edaphic climax). As such, they hint at the multi-faceted nature of species richness in the Wyoming and Salt River Ranges and the biogeographic significance of the flora.

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