

Rare Plants

INTRODUCTION

Bighorn National Forest personnel work closely with the Wyoming Natural Diversity Database (WYNDD) of the University of Wyoming in the management of rare plants. The Regional Office annually funds WYNDD to:

- Assist with identification of rare plants
- Compile and maintain a GIS database of rare plant in the State of Wyoming
- Prepare an annual report for the Bighorn NF that updates rare species locations and occurrences. This includes new GIS coverages to the Forest annually.

WYNDD botanists have prepared the following reports, among others, which are an integral part of this existing condition assessment:

- Fine Filter Analysis of the Bighorn, Medicine Bow, and Shoshone National Forests in Wyoming. Welp, et al. 2000.
- Bighorn National Forest: Known Occurrences of Threatened, Endangered, Forest Sensitive and WYNDD-designated Plant and Animal Species of Concern and Community Occurrences. Scholl and Smith, 2001. (This document is updated annually.)
- The Status of Rare Plants in the Bighorn Landscape. Fertig, 1999.
- Ecological Assessment and Monitoring Program for Northern Blackberry (*Rubus acaulis*) in Bighorn National Forest, Wyoming. Fertig, 1999a.
- Field Survey and Modeling of Hall's Fescue (*Festuca hallii*) on Bighorn National Forest. Fertig, 2002
- Status of Cary Beardtongue (*Penstemon caryi*) in Wyoming. Fertig, 2002.

These reports are available at the Forest Supervisor's Office in Sheridan.

For the Forest Plan, there are three considerations concerning rare plants:

1. The Endangered Species Act requires consideration of Threatened, Endangered and Proposed Species.
2. Forest Service Manual 2670, R2 Supplement 2600-94-2 requires that sensitive species be considered.
3. 36 CFR 219.19 requires that fish and wildlife habitat be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. This was extended to plants by a Department of Agriculture directive.

The purpose of this report is to summarize the existing information about plants, while specific determinations on the 3 considerations listed above will be made in the Biological Evaluation and effects analysis that will be prepared for the Forest plan revision analysis.

A review of the United States Fish and Wildlife Service (USFWS) Endangered and Threatened Wildlife and Plant Species List, and the Bighorn National Forest and Wyoming Natural Diversity Database (WYNDD) was conducted. Table 1 lists the Region 2 sensitive species (Forest Service Manual 2670, R2 Supplement 2600-94-2) and USFWS listed threatened, endangered or proposed species known or suspected to occur on the Bighorn National Forest.

Table 1. Threatened and Sensitive Species on the Bighorn National Forest

Species	Common Name	Status	Known to exist on Forest	Potential Habitat Exists
<i>Agoseris lackschewitzii</i> Henderson and Moseley	Pink agoseris	S	Yes	Yes
<i>Arnica lonchophylla</i> Greene	Northern arnica	S	Yes	Yes
<i>Aster mollis</i>	Soft aster	S	Yes	Yes
<i>Botrychium ascendens</i>	Upward-lobe moonwort	S	Yes	Yes
<i>Festuca hallii</i>	Hall's fescue	S	No ¹	Yes
<i>Penstemon caryi</i>	Cary's beardtongue	S	Yes	Yes
<i>Rubus acaulis</i>	Northern blackberry	S	Yes	Yes
<i>Spiranthes dulivialis</i>	Ute ladies tresses	T	No	No ²
<i>Sullivantia hapemanii</i> var. <i>hapemanii</i>	Hapeman's sullivantia	S	Yes	Yes

S = Forest Service Sensitive; T = USFWS Threatened

Fertig (1994) also lists sensitive species *Epipactis gigantea* and *Muhlenbergia glomerata* as potentially occurring on the Bighorn. However, subsequent review of their habitats and historical documentation has removed them from the list of species known or suspected to occur on the Bighorn.

Scholl and Smith (2001), and the associated Geographical Information System (GIS) database, were used to review the known occurrences of sensitive plant species. Table

¹ "Known" from vague, 1898, report. Searched for by Fertig in 2001 and not found (Fertig, 2002c).

² Fertig considers it to be possible, but unlikely that potential habitat exists within the National Forest boundary. Field surveys are scheduled for 2002.

2 summarizes the occurrence list from Scholl and Smith (2001) and the results from the 2001 plant surveys.

SENSITIVE AND THREATENED SPECIES AND THEIR HABITAT

Agoseris lackschewitzii was first described by Henderson et al, (1990). This species had been previously identified on the Bighorn National Forest by Neighbours and Culver (1990) as *A. glauca* with “pink ray flowers”. A regional endemic, *A. lackschewitzii* inhabits mid-montane to subalpine meadows on a variety of substrates, and occurs only on perennially wet soils (Henderson et al, 1990; Fertig, 1994) at elevations from 8000 to 10600 feet (Scholl and Smith, 2001). Field observation indicates that established plants are tolerant of some disturbance, and seedling establishment may be dependent on some ground cover disturbance (Welp et al, 2000). Because of recent survey efforts and population discoveries, indicating that this species is more abundant than originally suspected, WYNDD botanists downgraded their priority for *A. lackschewitzii* in 1999 (Neighbours, 1998; Fertig, 1999). This species occurs on either sedimentary or granitic substrates. Additional information is in table 5.

Table 2. Bighorn National Forest Threatened (T), Endangered (E), Proposed (P) and Sensitive (S) Species Occurrences as of January 1, 2002

Species	Common Name	Bighorn NF Occurrences
<i>Agoseris lackschewitzii</i>	Pink agoseris	30
<i>Arnica lonchophylla</i>	Northern arnica	21
<i>Aster mollis</i>	Soft aster	31
<i>Botrychium ascendens</i>	Upward-lobe moonwort	1
<i>Festuca hallii</i>	Hall's fescue	0 ¹
<i>Penstemon caryi</i>	Cary's beardtongue	12
<i>Rubus acaulis</i>	Northern blackberry	1
<i>Spiranthes diluvialis</i>	Ute ladies tresses	0
<i>Sullivantia hapemanii</i> var. <i>hapemanii</i>	Hapeman's sullivantia	15

Arnica lonchophylla has at least two distinct habitats in the Bighorn National Forest. The first occurs in open, granitic talus boulder fields, an example of which is shown in Fertig, 1994. The second habitat occurs in openings or low-density spruce-fir, Douglas-fir/limber pine forests on sedimentary soils. Elevations range from 5300 to 10300 feet (Scholl and Smith, 2001). Recent surveys and discoveries of new *A. lonchophylla*

¹ “Known” from vague, 1898, report. Searched for by Fertig in 2001 and not found (Fertig, 2002c).

populations by Heritage program botanists in the Black Hills have prompted them to recommend that this species be dropped from the Region 2 sensitive list (Fertig, 1999). This species, along with *Penstemon caryi*, was a priority for surveys during the 2000 and 2001 field seasons on the Bighorn National Forest. Approximately 13 new occurrences were “discovered” in 2001 field surveys, all in the granitic, talus boulder field habitat. This more than doubled the number of known populations on the Bighorn NF. It is likely that more populations exist. Additional information is in Table 5.

Aster mollis is a Wyoming endemic known primarily from the Big Horn Mountains. Also known from Hoback Canyon in Sublette County. Jones (1984) provides the rationale for considering *A. mollis* at the rank of species. *A. mollis* is often abundant in semi-disturbed montane grass and sagebrush meadows, and seems to have particularly strong manifestation on limestone, sedimentary soils (Fertig, personal observation). However, this species can occur on either sedimentary or granitic substrates. Elevations range from 6400 to 8500 feet (Scholl and Smith, 2001). Recent surveys suggest this species is more widespread and abundant than originally suspected (Fertig, 1999). This species may be sufficiently secure in the Bighorn area to be removed from the Forest Service sensitive and WYNDD high priority lists (Fertig, 1999). Additional information is in Table 5.

Botrychium ascendens was first located on the Bighorn National Forest by Walt Fertig in 2001 on the Powder River District. *B. ascendens* was found on grassy and moss-rich hummocks along the banks of a small stream in a marsh at the edge of a lodgepole pine and Engelmann spruce woods (Fertig, 2001). The soils were moist, but not flooded, being drier than the surrounding areas between the hummocks (Fertig, 2001). High lithic ground cover on other sites in Wyoming, indicate the sites are frequently flooded (Welp et al, 2000). At its type locality in the Wallowa Mountains in Oregon, where it is most abundant, *B. ascendens* grows in moist meadows in the Engelmann spruce zone (Zika, 1992). In Wyoming, *B. ascendens* is found at elevations from 8000 to 9000 feet (Scholl and Smith, 2001). *Botrychium* spp. reproduce by spores and believed to be dependent on a mycorrhizal relationship that may allow the ferns to withstand repeated herbivory or prolonged dormancy. Additional information on *B. ascendens* can be found in Table 5.

Festuca hallii is a peripheral species in Wyoming, with the primary habitat being in the plains/grasslands of central Canada. Elevations range from 6800 to 11000 feet (Scholl and Smith, 2001). Pavlick and Looman (1984) cite the taxonomic and nomenclature difficulties with this, and closely related, species. Fertig (1999), in discussing the status of this species in the Big Horn mountains, states:

“Known only from a vague 1898 collection by Williams and Griffiths near Crazy Woman Creek on the east side of the Bighorn Range. Potential habitat exists in rocky meadows and plains on calcareous soils. This species may have been extirpated from the range.”

Fertig developed a GIS predictive habitat model for *F. hallii*, and searched for it in 2001. Although he found potential habitat, based upon his knowledge from the Medicine Bow and Shoshone National Forests, he did not find *F. hallii* (Fertig, 2002c). Additional information on *F. hallii* is in Table 5.

Penstemon caryi is endemic to the Big Horn and Pryor Mountains. Its habitat is calcareous rock outcrops and rocky soil within sagebrush, juniper, Douglas-fir and limber pine communities at elevations from 5200 to 8500 feet (Fertig, 1994, Scholl and Smith, 2001). 1999 observations of 5 of the 10 known populations (at that time) on the Bighorn National Forest indicate that this species prefers actively disturbed soils, such as slumping soils or areas of active erosion (Bighorn collections). Known locations on the Bighorn National Forest of this species are confined to soil map units 20, 21, 27, 30, 32, and 39 (Nesser, 1986). Fertig (2002b) offers a complete status of this species in Wyoming. Additional information is in Table 5.

Rubus acaulis is considered peripheral in Wyoming, with 2 known locations, in Yellowstone National Park and Sourdough Creek of Bighorn National Forest. This species is demonstrably secure in primarily boreal habitats in Canada and Alaska. The Sourdough creek population has two very distinct habitats. It occurs in open, grass/willow communities, and in shady Engelmann spruce/twinflower habitat. An ecological assessment and monitoring protocol was developed by Walter Fertig (1999a) for the Sourdough Creek population. Much of the riparian habitat on the Bighorn has been surveyed during the riparian classification work (Girard, 1997), so it is considered doubtful that this species exists elsewhere on the Bighorn. Additional information is in Table 5.

Spiranthes diluvialis is known to occur in Wyoming from the western Great Plains in Converse, Goshen, Laramie, and Niobrara counties. In Wyoming, *S. diluvialis* is found mostly on low, flat floodplain terraces or abandoned oxbows within 0.5 to 15 meters of a small stream at elevations ranging from 4650 to 5420 feet (Fertig, 2000). The soils are subirrigated and seasonally flooded, remaining moist into the summer (Fertig, 2000).

Rangewide, Mosely (1998) states:

“It [*S. diluvialis*] occurs on plains, in broad intermontane valleys, and in narrow mountain valleys, generally at lower elevations relative to the surrounding landscape. While the absolute elevation of populations varies widely, from 1,800 feet in the Okanogan Valley to 6,800 feet in the Uinta Mountains, the relative position of these sites is low.

In the Rocky Mountains and Intermountain regions, most populations are in valley bottoms along medium to large streams and rivers of moderate gradient (not slow and meandering), generally as they near the edge of the mountains or somewhat out onto the plains, but before they start to slow down.”

Based on the habitat descriptions, GIS mapping efforts reveal only a small amount of potential habitat on the Bighorn National Forest. Although it is considered unlikely to exist on the forest, field surveys are scheduled for 2002. It is included on this list due to USFWS input. Further information for *S. diluvialis* is in Table 5.

Sullivantia hapemanii var. *hapemanii* is a regional endemic, with the population centered on the Big Horn mountains. It occurs in very specialized habitats characterized by wet, dripping, calcareous, cliffs, rock outcrops, and boulders in shady, moist areas such as canyon bottoms (Soltis, 1991 and Fertig, 1994). Soltis (1991) reports that species in the *Sullivantia* genus are notable for their disjunctiveness and frequent occurrence in unglaciated areas near Pleistocene glacial margins. Concerning the Bighorn populations of *S. h.* var. *hapemanii*, the Big Horn mountains escaped major glaciation, but valley glaciers occurred at high elevations extending to a lowermost altitude of 1900 m (Flint, 1971 cited in Soltis, 1991). Most *S. h.* var. *hapemanii* populations in the Bighorns occur between 1200 and 1700 meters and are therefore from areas that probably escaped glaciation (Soltis, 1991). The unglaciated hypothesis is supported by the occurrence mapping that shows that known locations of *S. h.* var. *hapemanii* on the Bighorn are not on glaciated Landtype Associations. Surveys in the 1990s have found that this species is fairly common in the Big Horn Mountains where suitable habitat exists. Collections in Tensleep, Crazy Woman, Little Bighorn, Mann Creek, Tongue River, Shell Creek and other canyons indicate that this species is not as uncommon as originally suspected. Additional information is in Table 5.

As part of the Forest Plan revision process additional plants will be considered as species of local concern because they are rare enough to be a viability concern on the Bighorn National Forest. That is, some plants may be common enough elsewhere that they are not sensitive at the Regional scale, but they may be rare on the Bighorn NF. There are several species with one known occurrence on the Bighorn NF. Plants in table 3 are proposed for inclusion as Bighorn NF species of local concern. Species of local concern would be priorities for additional inventories and/or monitoring protocol development. The list in Table 3 was developed from data available from WYNDD. Additional WYNDD species of concern that are not proposed for listing as Bighorn NF species of local concern are listed in Table 4.

The species proposed for species of local concern are higher conservation priorities than the species listed in Table 4. Because of limited time and resources, it is important to begin inventories and monitoring for the species listed in Table 3. As information is collected on the species in Table 3, it is anticipated that the true species at risk will be identified, and it is likely that some of the species will be determined to be secure and their conservation priority will be lowered. As species of concern are "lowered" in conservation priority, species from Table 4 may be elevated in priority to begin better understanding their status on the Bighorn National Forest. This prioritization of species has been the strategy for plant species conservation for several years on the Bighorn NF. For example, species once considered rare (*Agoseris lackschewitzii*, *Aster mollis*, *Arnica lonchophylla*, and *Sullivantia hapemanii* var. *hapemanii*) are recommended by WYNDD botanists to be removed from the sensitive species list because field surveys

discovered many new populations and an increased understanding of their ecology. On the other hand, intensive field surveys showed that it is likely that only one population of *Rubus acaulis* exists on the Forest, which led to the ongoing population trend monitoring.

WYNDD RANKING SYSTEM

WYNDD uses the Nature Conservancy's standardized ranking system to assess the global and state rarity of all plant and animal species, subspecies and varieties. Each taxon is ranked on a scale of 1-5 (rarest to most common) based on population size, geographic range, habitat specificity, and downward trend at the state and global levels. Codes are as follows:

- G Global rank: based on the rangewide status of a species.
 - T Trinomial rank: based on the rangewide status of a subspecies or variety.
 - S State rank: based on the status of a taxon in Wyoming (state ranks may differ in other states).
- 1 Critically imperiled because of extreme rarity (5 or fewer extant occurrences, or very few remaining individuals), or because of some factor of a species' life history that makes it vulnerable to extinction.
 - 2 Imperiled because of rarity (6 to 20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.
 - 3 Rare or local throughout its range or found locally in a restricted range (21 to 100 occurrences).
 - 4 Apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.
 - 5 Demonstrably secure, although the species may be quite rare in parts of its range, especially at the periphery.

Table 3. Proposed List of Bighorn NF Species of Local Concern

Common Name	Scientific Name	Federal/State Ranking	Natural Heritage Ranking	Habitat	Occurrence on Forest
Crenulate Moonwort	<i>Botrychium crenulatum</i>	None/NSS	G3/S1?	Riparian	Reported – 1? ³
Fragile Rockbrake	<i>Cryptogramma stelleri</i>	None/NSS	G5/S1	Moist wooded slopes and limestone cliffs	Known - 1
Williams Spring-parsley	<i>Cymopterus williamsii</i>	None/NSS	G3/G3	Sedimentary soils, sagebrush ridges	Known (?) ⁴
Large Yellow Lady's Slipper	<i>Cypripedium calceolus</i> var. <i>pubescens</i>	None/NSS	G5/S1S2	Decaying leaf litter in wooded areas.	Known - 2
Woodland horsetail	<i>Equisetum sylvaticum</i>	None/NSS	G5/S1	Preacher Rock Bog - riparian	Known - 1
Hairy Prince's Plume	<i>Stanleya tomentosa</i> var. <i>tomentosa</i>	None/NSS	G4T3/S2	Limber pine woodlands, juniper shrublands on limey-sandstone ridges, dry dolomite cliffs/talus	Known –1 Near Shell Canyon Research Natural Area
Sheathed musineon	<i>Musineon vaginatum</i>	None/NSS	G3?/S2	Limestone outcrops, chugwater redbeds	Known - 6
Woolly twinpod	<i>Physaria lanata</i>	None/NSS	G5T2/S2	Roadcuts, redbed shale, lime-sandstone outcrops	Known - 3
Mountain lousewort	<i>Pedicularis pulchella</i>	None/NSS	G3/S2	Alpine meadows or alpine/subalpine talus or scree slopes	Known - 2

³ Fertig (9/6/01 e-mail) reports: "I have recently changed its rank to S1 because it is uncertain that it is present in the state, and moved it to our "status uncertain" list. Rather than being scored as "known" from the Forest, it should be listed as "reported".

⁴ The WYNDD location for the occurrence on the Bighorn NF is from an approximately 1900 vague location, and is suspect because it is clearly on a granitic substrate, whereas this species has a strong affinity for limestone, sedimentary substrates.

Table 4. WYNDD Species of Local Concern Considered, but Not Listed as Bighorn NF Species of Local Concern

Species Common Name	Species Scientific Name	Ranking	Rationale
Moschatel	<i>Adoxa moschatellina</i>	SSC G5/S1	Low conservation priority ⁵
Zephyr windflower	<i>Anemone narcissiflora</i> ssp. <i>zephyra</i>	SSC G5T4/S1	Threats appear to be low; 4 of 5 known occurrences on Bighorn in Cloud Peak Wilderness (Scholl and Smith, 2000)
Single-head pussytoes	<i>Antennaria moncephala</i>	SSC G4G5/S1	Low conservation priority ³ . Threats low due to rugged, alpine scree habitat; trends not known but probably stable (Scholl and Smith, 2000)
Green spleenwort	<i>Asplenium trichomanes-ramosum</i>	SSC G4/S2	Low conservation priority ⁶ .
Lance-leaved grapefern	<i>Botrychium lanceolatum</i>	SSC G5/S1	Low conservation priority ⁶
Mingan Island moonwort	<i>Botrychium minganense</i>	SSC G4/S1	Low conservation priority ⁶
Rattlesnake fern	<i>Botrychium virginianum</i>	SSC G5/S1	Low conservation priority ⁶
Mud sedge	<i>Carex limosa</i>	SSC G5/S2	Low conservation priority ⁶
Short-leaf sedge	<i>Carex misandra</i>	SSC G5/S1	Low conservation priority ⁶
Hackberry	<i>Celtis occidentalis</i>	SSC G5/S1	Low conservation priority ⁶
Mountain lady's slipper	<i>Cypripedium montanum</i>	SSC G4G5/S1	Low conservation priority ⁶
White arctic whitlow-grass	<i>Draba fladnizensis</i> var. <i>pattersonii</i>	SSC G4T2T3/S2	Threats low due to inaccessible habitat, Cloud Peak Wilderness (Scholl and Smith, 2000)
Bighorn fleabane	<i>Erigeron allocotus</i>	SSC G3/S2S3	Populations that have been surveyed appear to have stable trends; threats low overall; plants are usually found in relatively inaccessible areas with low forage, although road construction or trampling could be threat (Scholl and Smith, 2000)

⁵ From the WYNDD Species of Special Concern ranking: "The conservation priority of any species needs to be assessed on a case-by-case basis, taking into account threats, population trends, biological significance, and rarity. [This] list [is] intended to provide decision makers and the public with sufficient background information to determine which species are the highest priority for conservation attention and often scarce dollars for implementation" (Fertig, W. and G. Beauvais. 1999).

Species Common Name	Species Scientific Name	Ranking	Rationale
Low fleabane	<i>Erigeron humilis</i>	SSC G4/S2	Low conservation priority ⁶
Russet cotton-grass	<i>Eriophorum chamissonis</i>	SSC G5/S1S2	Low conservation priority ⁶ . Bighorn population at Preacher Rock Bog (Scholl and Smith, 2000)
Howard forget-me-not	<i>Eritrichium howardii</i>	SSC G4/S1	Trends are not known, but probably stable at most sites; threats probably low given the rocky, sparsely vegetated habitats occupied by this plant (Scholl and Smith, 2000)
Watson's prickly-phlox	<i>Leptodactylon watsonii</i>	SSC G3?/S1	Populations may be stable, but trends not well established; threats appear to be minimal at known sites due to the ruggedness of the plant's habitat, ledges and crevices in cliffs (Scholl and Smith, 2000)
Broad-leaved twayblade	<i>Listera convallarioides</i>	SSC G5/S1	Low conservation priority ⁶
Alpine poppy	<i>Papaver kluanense</i>	SSC G5T3?/S2	Low conservation priority ⁶ . Probably unthreatened in rugged alpine habitat (Scholl and Smith, 2000)
Coil-beaked lousewort	<i>Pedicularis contorta</i> var. <i>ctenophora</i>	SSC G5T3/S2	9 known locations on Bighorn NF; Fertig (9/6/01 email) recommendation.
Mogollon lousewort	<i>Pedicularis parryi</i> ssp. <i>mongollonica</i>	SSC G5T2T4	Low conservation priority ⁶ . Record in Bighorn NF is questionable and historical (Scholl and Smith, 2000)
Three-flower rush	<i>Juncus triglumis</i> var. <i>triglumis</i>	SSC G5T5/S1	Recommendation by Fertig in 9/6/01 e-mail. Relatively secure habitat, alpine rocks.

Table 5. Summary of Information from *The Status of Rare Plants in the Bighorn Landscape, Fertig (1999), Wyoming Plant and Animal Species of Special Concern, Fertig and Beauvais (1999), Bighorn National Forest: Known occurrences of Threatened, Endangered, Forest Sensitive and WYNDD-designated Plant and Animal Species of Concern and Community Occurrences, Scholl and Smith (2001), and results of recent Bighorn National Forest plant surveys.*

Species	Occurrences in Wyoming	Range	Trends	Threats	Status in Bighorn Landscape	Conservation Priority in Bighorns, Heritage Rank
<i>Agoseris lackschewitzii</i>	50 extant occurrences, 45 discovered or relocated since 1991	EC Idaho, SW Montana, NW Wyo. Regional endemic.	Data lacking for nearly all occurrences; probably stable at present time; long-range trend maybe downward due to loss of historical riparian habitats.	Probably low. Some populations near trails, threat of trampling. Grazing a potential threat in some areas.	24 new populations discovered since 1994. Observed in partially-disturbed meadows with moderate livestock grazing.	Watch List. G4Q/S3
<i>Arnica lonchophylla</i>	24 extant occurrences, 22 of those discovered since 1992.	Disjunct in Wyoming. Newfoundland to British Columbia.	Unknown.	Not known. Grazing and logging potential threats, no analysis to date.	Entire known Wyoming population in Bighorns.	Medium conservation priority. G4/S2
<i>Aster mollis</i>	35 extant occurrences, 33 discovered or relocated since 1990	Wyoming endemic. Restricted to Bighorn Mtns. and Sublette County.	Probably stable, although data lacking for most populations.	Grazing and trampling, although low levels of herbivory or disturbance don't appear to have negative impact.	31 occurrences in Bighorns. Surveys suggest more common than originally suspected.	Medium conservation priority. G3/S3 Possibly secure enough to remove from sensitive list.
<i>Botrychium ascendens</i>	4 extant occurrences; 3 on Shoshone NF and 1 on Bighorn NF.	Disjunct in Wyoming, Yukon to Ontario, south to California.	Unknown	Not known. May be vulnerable to changes in the hydrology of its streamside habitat.	One known occurrence on Bighorns.	Medium conservation priority. G2G3/S1
<i>Festuca hallii</i>	10 confirmed WY locations, 1 "vague, historical" report on Bighorn Mtns.	Peripheral in WY. Common in Canada.	May be decreased under heavy grazing, although observations	Maybe threatened by grazing, exotic competition, habitat disturbance.	Known only from vague, 1898, collection. Habitat exists in Bighorns, although may have been extirpated.	Medium conservation priority. G4/S1

Species	Occurrences in Wyoming	Range	Trends	Threats	Status in Bighorn Landscape	Conservation Priority in Bighorns, Heritage Rank
			suggest it is not preferred by livestock.			Search by Fertig in 2001 did not find this species (Fertig, 2002c).
<i>Penstemon caryi</i>	15 extant occurrences, 9 discovered or located since 1989.	Regional endemic. Found in Bighorn and Pryor Mtns. of WY and MT.	Trend data lacking, but thought to be relatively stable at present.	May be threatened by livestock grazing and trampling, roads, quarries, development.	Restricted to Bighorns/Pryors. Good populations on TNCs Tensleep Preserve.	Medium conservation priority. G3/S2
<i>Rubus acaulis</i>	2 extant occurrences, Sourdough Cr. and Yellowstone NP.	Peripheral, very common in Canada, boreal areas.	Probably stable; Sourdough Creek monitoring begun in 1999.	Dams, logging, recreation. YNP population protected.	One known location on Bighorns.	Low conservation priority. G5/S1
<i>Spiranthes dulivialis</i>	4 extant occurrences, all discovered between 1993 and 1997. All resurveyed by WYNDD between 1998 and 2000.	Currently known from W Nebraska, SE Wyoming, NC Colorado, EC Idaho, and C Washington.	Trends unknown, but probably stable at most sites in Wyoming.	Threatened by habitat destruction, water modification, and over-collection	No known sites on the Bighorns.	Sparse (High conservation priority) G2/S1
<i>Sullivantia hapemanii</i> var. <i>hapemanii</i>	26 extant occurrences, 22 discovered or located since 1988.	Regional endemic, centered on Bighorn mtns.	Data lacking for most populations, but presumed to be stable.	Water development projects. Low risk due to rugged, protected habitats.	15 locations well distributed across Bighorns.	Considered to be "adequately protected". G3T2T3/S3