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The Status of Rare Plants in the Bighorn Landscape

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in the Bighorn Landscape

Prepared for
The Nature Conservancy
Wyoming Field Office

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INTRODUCTION

The "Bighorn Landscape" includes the entire Wyoming portion of the Bighorn Range and the foothills, prairie, and high desert country of the eastern Bighorn Basin and western Great Plains (Figure 1). This region contains a mosaic of landform and vegetation types, ranging from greasewood and Gardner saltbush playas, to foothill grasslands, conifer and aspen forests, and alpine tundra. As a result of this diversity, the flora of the Bighorn landscape contains over 1000 taxa of vascular plants, including nearly a dozen species that are restricted to the Bighorns or adjacent parts of southern Montana.

Due to its biological diversity and growing popularity as a residential area and recreational destination, the Bighorn Landscape has been identified as a high priority area for conservation attention by The Nature Conservancy (TNC). Since 1989, TNC's Wyoming Field Office has purchased or secured conservation easements on over 70,000 acres, mostly in the foothills on the east slope of the Bighorn Range and in the Ten Sleep area. Bighorn National Forest, the Bureau of Land Management, and Wyoming Game and Fish Department have also set aside portions of the Bighorn Landscape as wilderness, areas of critical environmental concern (ACECs), research natural areas (RNAs), special interest areas (SIAs), and wildlife habitat management areas (WHMAs). Together, these areas form an important protective network for the Bighorn region.

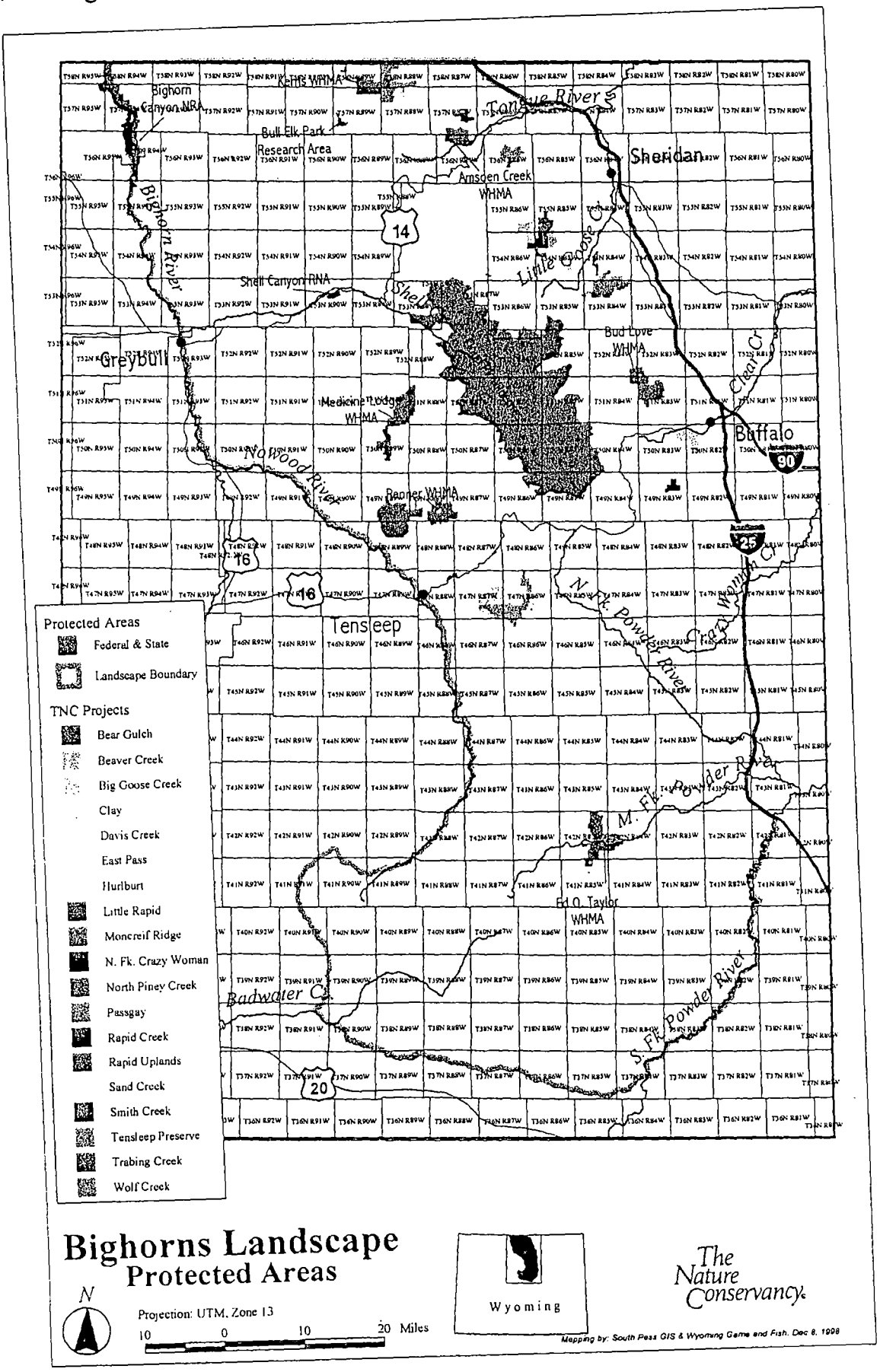
Although the current level of protection in the Bighorn Landscape is impressive, it may be insufficient to protect the entire spectrum of biological diversity in the region. It is the purpose of this report to assess the current level of protection for selected high priority and endemic vascular plant species in the Bighorn Landscape and to identify additional areas that may warrant conservation attention. A comparable analysis of the entire vascular plant flora of the landscape is currently in preparation.

METHODS

A target list of rare and endemic plant species of the Bighorn Landscape was developed from the Wyoming Natural Diversity Database (WYNDD) list of species of special concern (Fertig 1997 a) and distributional database of the Wyoming flora (Fertig, unpublished data). Data on the distribution, abundance, trends, and management needs of target species were obtained from the published literature, specimens at the Rocky Mountain Herbarium (RM), WYNDD files, and recent field work. Unpublished reports from floristic surveys of the Bighorn Range and Bighorn Basin (Lichvar *et al.* 1984, 1985; Nelson and Hartman 1984), natural area inventories (Jones and Fertig 1998; Marriott and Jones 1989; Welp *et al.* 1998 a, 1998 b, 1998 c, 1998 d, 1998 e, 1998 f, 1998 g, 1998 h, 1998 i, 1998 j), and status surveys of specific rare species (Dorn 1989; Fertig 1993 c; Marriott 1992) were also used extensively. Locations of species of concern and existing special management areas (wilderness areas, special botanical areas, research natural areas, etc.) were mapped on 1:24,000 scale USGS topographic maps to determine current land management status for each species.

The protection status of each plant species was assessed using a 4-part scale originally developed by the US Geological Survey's National Gap Program for ranking the protection level of different management areas (Merrill *et al.* 1996). The score for each species was based on the highest

Figure 1. The Bighorn Landscape Study Area.



possible protection score for any individual population. Species were ranked 1 if at least one population occurred on Gap Status 1 lands that are permanently protected and managed to maintain biological processes. Such sites include designated wilderness areas, national parks and monuments, most national wildlife refuges, and Nature Conservancy preserves. A rank of 2 was given to species that occur in designated management areas that still allow some land uses that may reduce the quality of natural communities (Gap Status 2 lands). These lands include designated RNAs, ACECs, and WHMAs and TNC conservation easements. Category 3 species are those in which the best protected populations occur on public lands managed for multiple use. Status 3 lands include undesignated BLM, US Forest Service, and state park lands and wilderness study areas. Lastly, species were ranked 4 if they occur only on private, state, or reservation lands with no legally binding protection mandate. Each species was scored on its current status in the Bighorn Landscape, its projected status if populations in potential research natural areas and wilderness study areas become officially designated, and its current status statewide (including areas outside of the study area).

RESULTS

Plant Species of Special Concern in the Bighorn Landscape

Fifty-eight plant taxa are currently considered "high priority" or "Watch List" species of special concern within the Bighorn Landscape (Table 1). This list includes five species (*Botrychium crenulatum, Musineon vaginatum, Pedicularis contorta* var. *ctenophora, Potamogeton amplifolius,* and *Potentilla concinna* var. *bicrenata**) that have been recently added to WYNDD's tracking list, but does not include four taxa dropped from the WYNDD list since 1997 (*Conimitella williamsii, Malacothrix torreyi, Sisyrinchium angustifolium,* and *Teucrium canadense* var. *occidentale*). In Wyoming, eleven of these species are entirely restricted to the Bighorn Landscape (Table 1). Information on the current abundance, distribution, population trends, and management status of these species within the Bighorn Landscape and statewide is summarized in Appendix A.

Current and Potential Protective Status of Plant Species of Special Concern

The Bighorn Landscape currently contains one designated wilderness area (Cloud Peak Wilderness in Bighorn National Forest), and one TNC preserve (Tensleep Preserve). Due to their high level of protection, these areas are considered Status 1 lands by Gap (Merrill *et al.* 1996). At present, 16 plant species of special concern (27.6% of the total number of high priority plant species in the Landscape) are known to occur in these highly protected areas (Tables 1, 2).

Eleven additional plant species of special concern are found in areas ranked Status 2 in the Gap system (Tables 1, 2). In the Bighorn Landscape, these areas include Bighorn Canyon National Recreation Area, Spanish Point Karst, Little Mountain, and Five Springs Falls ACECs, Bull Elk

**Mertensia arizonica* was originally under consideration for tracking by WYNDD, but is currently listed as "Status Uncertain" due to questions about the identification of Bighorn and Uinta mountain specimens attributed to this taxon. Ron Hartman of the Rocky Mountain Herbarium has presented a convincing case that these specimens probably belong to the closely related *M. ciliata.*

Table 1.

Current and Potential Protection Status of Plant Species of Special Concern in the Bighorn Landscape, Wyoming

Key: **Protection Status** is based on a modified 4-part scale developed for ranking the protection status of different land areas for Gap Analysis (Merrill *et al.* 1996). Species ranked **1** occur on at least one site that is permanently protected from conversion of natural land cover and managed to maintain natural processes [designated Wilderness Areas, National Parks and Monuments, National Wildlife Refuges, and Nature Conservancy preserves]. Species ranked **2** occur on at least one site that is protected from conversion of natural land cover, but which may be subject to some management practices that reduce the quality of natural communities [BLM ACECs, Forest Service Research Natural Areas and Special Botanical Areas, National Park Service-managed National Recreation Areas, and TNC conservation easements]. Species ranked **3** occur on at least one site that is managed as public land for multiple use. [undesignated BLM, US Forest Service, and state park lands]. Species ranked **4** occur only on lands that lack legally binding mandates for management of natural land cover or species [private, state, and reservation lands]. **Current BIG** status represents the highest possible score for a species in the Bighorn Landscape under present management. **Potential BIG** status represents the maximum score possible for a species if populations in potential or proposed Research Natural Areas or other special management areas in the Bighorn Landscape are designated. **Current WY** status represents the highest possible score for a species if populations throughout the state are considered. A "?" indicates the rank is uncertain.

Heritage Ranks are explained in Appendix B. **Range Notes**: (P) = Peripheral (at the edge of the species' continuous range in Wyoming), (R) = Regional Endemic (restricted to Wyoming and 1-2 adjacent states), (E) = State Endemic (restricted to Wyoming), (D) = Disjunct (Wyoming populations are widely isolated from the species' main contiguous range), (S) = Sparse (widely scattered and uncommon throughout Wyoming). **Species found only within the Bighorn Landscape in Wyoming are indicated by "*".**

Species/ Common Name	**Heritage Rank**	**Range Notes**	**Protection Status**		
			Current BIG	**Potential BIG**	**Current WY**
Adoxa moschatellina Moschatel	G5/S1	S	1	1	1
Agoseris lackschewitzii Pink agoseris [WATCH LIST]	G4Q/S3	R	1	1	1
**Anemone narcissiflora ssp. zephyra* Zephyr windflower	G5T4/S1	R	1	1	1
Antennaria aromatica Aromatic pussytoes [WATCH LIST]	G3G4/S2	R	3	3	1
Antennaria monocephala Single-head pussytoes	G4G5/S1	D	1	1	1
Antennaria neglecta Field pussytoes	G5/S1	P	4	4	3
**Arnica lonchophylla* Northern arnica	G4/S1	D	3	2	3
Asplenium trichomanes-ramosum Green spleenwort	G4/S2	D	3	2	1
Aster mollis Soft aster	G3/S3	E	1	1	1
Astragalus barrii Barr's milkvetch [WATCH LIST]	G3/S3	R	3	3	3?
**Astragalus jejunus var. articulatus* Hyattville milkvetch	G3T1/S1	E	3	3	3
Astragalus simplicifolius Bun milkvetch [WATCH LIST]	G3/S3	E	3	3	1

Species/Common Name	Heritage Rank	Range Notes	Current BIG	Potential BIG	Current WY
**Botrychium crenulatum* Crenulate moonwort	G3/S1	P	3	3	3
Botrychium minganense Mingan Island moonwort	G4/S1	S	3	2	3
Botrychium virginianum Rattlesnake fern	G5/S1	P	3	2	1
Carex limosa Mud sedge	G5/S2	P	3	3	1
Carex misandra Short-leaf sedge	G5/S1	P	3	2	1
Carex sartwellii Sartwell's sedge	G4/S1	S	4?	4?	1
Celtis occidentalis Common hackberry	G5/S1	P	2	2	2
Cirsium foliosum Leafy thistle	G5/S1	P	3	3	1
Cryptogramma stelleri Fragile rockbrake	G5/S1	D	3	2	1
**Cymopterus williamsii* Williams' wafer-parsnip	G3/S3	E	2	1	2
Cypripedium calceolus var. pubescens Large yellow lady's-slipper	G5/S1S2	D	3	2	3
**Cypripedium montanum* Mountain lady's-slipper	G4G5/S1	P	3	3	3
Draba fladnizensis var. pattersonii White arctic whitlow-grass	G4T3?/S2	R	1	1	1
Epipactis gigantea Giant helleborine	G4/S1	P	4?	4?	1
Equisetum sylvaticum Woodland horsetail	G5/S1	D	2	2	2
**Erigeron allocotus* Bighorn fleabane	G3/S2S3	R	1	1	1
Erigeron humilis Low fleabane	G4/S2	S	1	1	1
Eriogonum brevicaule var. canum Rabbit buckwheat	G3/S2	R	2	2	2
**Eriogonum mancum* Mancos buckwheat	G4/S1	R	1	1	1
Eriophorum chamissonis Russet cotton-grass	G5/S1S2	P	2	2	1
Eritrichium howardii Howard forget-me-not	G4/S1	R	3	2	3
Festuca hallii Hall's fescue	G3G4/S1	P	3	3	1
Juncus triglumis var. triglumis Three-flower rush	G5T5/S1	P	1	1	1
Leptodactylon watsonii Watson's prickly-phlox	G3?/S1	P	3	2	3
Listera convallarioides Broad-leaved twayblade	G5/S1	P	3	3	1
**Musineon vaginatum* Sheathed musineon	G3?/S2	R	2	2	2
Papaver kluanense Alpine poppy	G3?Q/S2	D	1	1	1
**Pedicularis contorta var. ctenophora* Coil-beaked lousewort	G5T3/S2	R	1	1	1

Species/Common Name	Heritage Rank	Range Notes	Current BIG	Potential BIG	Current WY
Pedicularis parryi ssp. mogollonica Mogollon lousewort	G5T2Q/S1	P	3	3	3
Pedicularis pulchella Mountain lousewort	G3/S2	R	1	1	1
**Penstemon caryi* Cary beardtongue	G3/S2	R	1	1	1
Physaria lanata Woolly twinpod	G5T2/S2	R	2	2	2
Polygonum spergulariiforme Fall knotweed	G5T4?/S1	P	4	4	3
Potamogeton amplifolius Large-leaved pondweed	G5/S1	P	1	1	1
Potentilla concinna var. bicrenata Bitoothed cinquefoil	G5?T?/SH	P	3	3	3
Puccinellia cusickii Cusick's alkali-grass	G3G4Q/S1	S	3	3	3
Pyrrocoma clementis Tranquil goldenweed [*Haplopappus clementis*]	G3G4/S1	S	2?	1?	2
Pyrrocoma integrifolia Entire-leaved goldenweed [*Haplopappus integrifolius*]	G4/S1	R	3	3	1
Rorippa calycina Persistent sepal yellowcress	G3/S2S3	R	2	2	1?
Rubus acaulis Northern blackberry [*Rubus arcticus ssp. acaulis*]	G5/S1	P	3	3	1
Sambucus cerulea Blue elderberry	G5?/S1	P	3	3	3
Sparganium eurycarpum Large bur-reed	G5/S1	P	4	4	3
Stanleya tomentosa var. tomentosa Hairy prince's-plume	G4T3/S2	R	2	2	2
Sullivantia hapemanii var. hapemanii Hapeman's sullivantia	G3T3/S3	R	1	1	1
Triodanis leptocarpa Slim-pod Venus' looking-glass	G5?/S1	P	2	2	2
Utricularia minor Lesser bladderwort	G5/S1S2	S	3	3	1

Table 2.

Protection Summary for High Priority Plant Species of Special Concern in the Bighorn Landscape

Note: The status of all rare species considered in this analysis are listed in the first row in each group. Subsets of regional and Bighorn Landscape endemics follow in the next rows.

A. Current Bighorn Landscape Status

	Status 1	**Status 2**	**Status 3**	**Status 4**
All High Priority and Watch List Species (n = 58)	16 (27.6%)	11 (19%)	26 (44.8%)	5 (8.6%)
Regional Endemics (n = 18)	9 (50%)	5 (27.8%)	4 (22.2%)	0 (0%)
Bighorn Landscape Endemics (n = 4)	1 (25%)	1 (25%)	2 (50%)	0 (0%)

B. Potential Bighorn Landscape Status

	Status 1	**Status 2**	**Status 3**	**Status 4**
All High Priority and Watch List Species (n = 58)	18 (31%)	18 (31%)	17 (29.4%)	5 (8.6%)
Regional Endemics (n = 18)	9 (50%)	6 (33.3%)	3 (16.7%)	0 (0%)
Bighorn Landscape Endemics (n = 4)	2 (50%)	0 (0%)	2 (50%)	0 (0%)

C. Current Statewide Status for Bighorn Landscape Species

	Status 1	**Status 2**	**Status 3**	**Status 4**
All High Priority and Watch List Species (n = 58)	33 (56.9%)	9 (15.5%)	16 (27.6%)	0 (0%)
Regional Endemics (n = 18)	12 (66.7%)	4 (22.2%)	2 (11.1%)	0 (0%)
Bighorn Landscape Endemics (n = 4)	2 (50%)	1 (25%)	1 (25%)	0 (0%)

Park and Shell Canyon RNAs, Kerns, Amsden Creek, Medicine Lodge, Renner, Bud Love, and Ed O. Taylor WHMAs, Preacher Rock Bog SIA, and more than one dozen TNC conservation easements. Combined, Status 1 and 2 lands currently protect 46.6% of the rarest plant species in the Bighorn Landscape. Of the remaining species, 44.8% occur on Status 3 Forest Service and BLM lands managed for multiple use and 8.6% are restricted to unprotected state or private Status 4 lands (Table 2).

The BLM and Forest Service are currently assessing a number of areas in the Bighorn Landscape for potential Wilderness or RNA status. If these new Status 1 or 2 lands become officially designated, the number of protected species in the landscape would increase from 46.6 to 62.% (an increase of 9 species) (Table 2). Designation of these areas would also increase the number of protected populations of taxa already found in existing special management areas.

Statewide, 42 of the 58 species of concern in the Bighorn Landscape (72.9%) are protected in existing Status 1 or 2 areas (Table 1, 2). Of the remaining 16 unprotected species, one is a state endemic (*Astragalus jejunus* var. *articulatus*), two are regional endemics (*Astragalus barrii* and *Eritrichium howardii*), and the rest are disjunct, sparse, or peripheral in the state.

Eleven plant species of special concern are found only in the Bighorn Landscape in Wyoming (indicated by a "*" in Table 1). Seven of these species are currently protected in Status 1 or 2 areas. One additional species would be protected if existing potential conservation sites in the Bighorns were officially established.

DISCUSSION

Plant Species of Special Concern in the Bighorn Landscape

Approximately 47% of the high priority plant species in the Bighorn Landscape are currently protected in Gap status 1 or 2 lands. This figure is low compared to the 76% protection level for rare plants on Shoshone National Forest (Fertig 1998 b), but is higher than the 38% protected in the basin country of Southwest Wyoming (Fertig *et al.* 1998). Designation of potential RNAs and WSAs in the Bighorn Range and Bighorn Basin could increase the level of protection in the Bighorn Landscape to 62%.

The Bighorn Landscape provides habitat for 22 regional and locally endemic plant species, 16 of which are currently protected in at least one Status 1 or 2 management area. Of the six unprotected species, three (*Antennaria aromatica, Astragalus simplicifolius,* and *Pyrrocoma integrifolia*) are adequately protected elsewhere in Wyoming in established wilderness areas, TNC preserves, and national parks. Two other unprotected endemics (*Astragalus barrii* and *Eritrichium howardii*) are either at the very edge of their main range in the Bighorn Landscape or are found in potential special management areas in other areas of the state, and are thus lower priority targets for conservation attention in the Bighorns. The highest priority, unprotected endemic plant in the Landscape is *Astragalus jejunus* var. *articulatus*, a species that is entirely restricted to the study area and threatened by surface disturbing activities in its small range.

Although present in existing Status 1 and 2 lands, some endemic species may be inadequately represented or lack sufficient management attention to be truly considered "protected". Such species include *Cymopterus williamsii, Pedicularis contorta* var. *ctenophora, Penstemon caryi,* and *Physaria lanata.* Other plants that should be considered medium to high priorities for protection are disjunct or peripheral species listed as "Sensitive" by Bighorn National Forest or which are highly threatened and under-protected state-wide. These plants include *Cypripedium calceolus* var. *pubescens, C. montanum, Epipactis gigantea, Festuca hallii, Rubus acaulis, Botrychium crenulatum,* and *B. minganense*. All species of concern in the Bighorn Landscape are ranked according to their priority for conservation attention in Table 3.

Potential Conservation Sites in the Bighorn Landscape

Our analysis of the current and potential protection status of rare plant species in the Bighorn Landscape has revealed that several suites of species are poorly protected or under-represented. In particular, species restricted to montane and low elevation wetlands, desert basin foothills and badlands, and dry grassland and pine savanna habitats should be considered high priorities. In order to fill in the gaps in the current protective network in the Bighorn Landscape, the following areas are recommended for conservation attention:

1. Military Creek/Hyattville area (Bighorn Basin badlands and desert foothills)

The Military Creek area east of Hyattville was originally identified by WYNDD (1996) as a high priority conservation site because it contains the entire world range of the Hyattville milkvetch (*Astragalus jejunus* var. *articulatus*), a T1 taxon (Fertig 1997 a). This site also contains examples of cushion plant, bluebunch wheatgrass, and juniper communities that provide important habitat for wildlife and other rare plants, such as *Erigeron allocotus*. The Military Creek site contains approximately 9000 acres of mixed BLM and state lands and is currently managed for multiple use, including livestock grazing, off-road vehicle recreation, and mineral development.

Other areas in the drier portions of the Bighorn Basin may be worthy of conservation attention for "coarse filter" elements that are poorly represented or completely lacking from the montane parts of the Bighorn Landscape. These elements may be better represented in the Wyoming Basins ecoregion plan currently being developed by The Nature Conservancy.

2. Southern Bighorn Range Grasslands

Sagebrush-grasslands and Rocky Mountain juniper/ponderosa pine savannas are important vegetation types in the dry, limestone-rich southern portion of the Bighorn Range, but are inadequately represented in the current network of conservation areas. Several rare plant species occur in this region, including *Cymopterus williamsii* and *Pedicularis contorta* var. *ctenophora.* Good examples of southern Bighorn grassland/savanna habitats exist on the slopes of Gardner Mountain west of Mayoworth, the Barnum slope (a series of east-west ridges and canyons), approximately 8 miles northwest of Barnum, and along the Thirty-three Mile Road north of Arminto. All of these sites contain a mix of BLM, state, and private lands.

3. Story Area (Moist, shady coniferous forest canyons on the east slope)

The Story Fish Hatchery and adjacent state lands provide important habitat for three rare orchids (*Cypripedium calceolus* var. *pubescens, C. montanum,* and *Listera convallarioides*), as well as a suite of other uncommon (S1 and S2) grasses and forest herbs (Evert no date a; WYNDD 1996). The site consists of moist, shady forests of Douglas-fir and ponderosa pine, beaver ponds, and steep limestone cliffs. Similar habitat may exist elsewhere on the east slope of the Bighorn Range, primarily at the toe of the mountains. Many of these sites may occur on Bighorn National Forest or adjacent private lands. Existing conservation easements should be carefully studied to determine if this suite of species is present. The Nature Conservancy could play an important role in assisting the state hatchery with management of the Story site.

4. Montane Wetlands in the Bighorn Mountains

The summit plateau of the Bighorn Range is rich in ponds, lakes, and small streams, most of which have been poorly surveyed for unusual wetland plants. Preacher Rock Bog is one of the few wetland sites to be intensively surveyed and has turned up half a dozen unusual and rare disjunct plant species. Many of these wetlands may be impacted by grazing or high recreation use. Few of these areas have been included in potential RNA surveys due to high demand for human use. The McLain Lakes, Middle Paint Rock Creek, South Piney Creek, and Dome Lake areas may have good potential for unusual wetland plants and plant communities and are a high priority for survey efforts and conservation attention.

In addition to focusing on these areas as conservation targets, additional field surveys are needed in existing protected areas to document the presence, distribution, abundance, and management needs of rare and common plant species. The current protection scores for the Bighorn flora may, in part, be an artifact of incomplete sampling. In particular, better botanical surveys are needed of TNC easements, Wildlife Habitat Management Areas, and the Cloud Peak Wilderness Area.

Table 3.

Priorites for Conservation of Rare Plant Species
in the Bighorn Landscape

1. Highest Priority

Species	Heritage Rank	Rationale
Astragalus jejunus var. *jejunus* Hyattville milkvetch	G3T1/S1	* Endemic to Bighorn Landscape * Formerly a candidate for listing under the Endangered Species Act * Unprotected with potential threats from surface disturbing activities, including road construction and mineral development.
Cymopterus williamsii Williams' wafer-parsnip	G3/S3	* Endemic to Bighorn Landscape * Protected at only one site (a WY Game and Fish WHMA located at the edge of its main range and managed primarily for big game species, not rare plants) - additional representation in protected areas a high priority * Good potential habitat for conservation attention in dry grasslands and pine savannas in southern Bighorns.
Penstemon caryi Cary beardtongue	G3/S2	* Regional endemic centered on the Bighorn Landscape (only found in the study area in WY) * 4 populations present in existing protected areas (2 in the Ten Sleep Preserve). * Threats potentially high from loss of habitat and over-collection.
Pedicularis contorta var. *ctenophora* Coil-beaked lousewort	G5T3/S2	* Regional endemic centered on the Bighorn Landscape (only found in the study area in WY) * Only 2 populations are protected in the Cloud Peak Wilderness * Additional populations should be protected to ensure adequate representation * Threats poorly understood
Physaria lanata Woolly twinpod	G5T2/S2	* Regional endemic, centered in the Bighorn Landscape * 4 small populations are found in TNC easements and WHMAs, but these may not adequately represent the species. * Additional conservation areas are recommended.
Cypripedium montanum Mountain lady's slipper	G4G5/S1	* Unprotected in Bighorn Landscape and elsewhere in WY * Formerly a Candidate for listing under the Endangered Species Act * Highly threatened by habitat loss to rural development, over-collection for garden flowers and medicinal roots, and grazing.
Cypripedium calceolus var. *pubescens* Large yellow lady's slipper	G5/S1S2	* Unprotected in Bighorn Landscape or elsewhere in WY * Threats high from over-collection, habitat destruction, and grazing.
Epipactis gigantea Giant helleborine	G4/S1	* Unprotected in Bighorn Landscape * Listed as Sensitive by Bighorn National Forest * Threats high from development of wetland habitats, over-collection, and grazing.

Botrychium crenulatum Crenulate moonwort	G3/S1	* Peripheral * Known from a single, unprotected population in Wyoming * Threats poorly known, but potentially high from habitat loss due to high recreation use and grazing
Botrychium minganense Mingan Island moonwort	G4/S1	* Sparse in Wyoming * No populations currently protected in state, although at least one occurs in the potential Mann Creek RNA in the Bighorn Landscape * Threats poorly known

2. Medium Priority

Species	Heritage Rank	Potential Conservation Action
Eritrichium howardii Howard forget-me-not	G4/S1	* Regional endemic * Currently not protected at any site in Wyoming, although several populations are in proposed or potential conservation sites at Heart Mountain (a potential TNC Conservation Easement or Preserve), Bald Ridge (a proposed RNA on Shoshone National Forest), and Mann Creek (a potential RNA on Bighorn National Forest). * Threats low due to rugged, rocky habitat.
Stanleya tomentosa var. *tomentosa* Hairy prince's-plume	G4T3/S2	* Regional endemic * Only 2 small populations are currently protected, one of which could not be relocated in 1998 survey. * Threats moderately high from heavy browsing by native game and impacts from surface disturbing activities * More protected sites are desirable
Rorippa calycina Persistent-sepal yellowcress	G3/S2S3	* Regional endemic with only 1 occurrence in study area (Bighorn Canyon NRA) * Poorly protected through most of its range * Threats moderate from competition with exotics, herbicides, and reservoir management. * Most habitat is probably outside the Bighorn Landscape.
Musineon vaginatum Sheathed musineon	G3?/S2	* Regional endemic centered on the Bighorn Landscape * At least 3 protected populations currently, more sites desirable * Threats poorly known, but probably fairly low.
Leptodactylon watsonii Watson's prickly-phlox	G3?/S1	* Peripheral in Wyoming * Grank may be too high. * No populations are currently protected, although one is in a potential RNA * Potential habitat should be investigated on dolomite cliff faces in the Ten Sleep Preserve * Threats low due to rugged habitat
Arnica lonchophylla Northern arnica	G4/S1	* No populations currently protected, although several are in potential RNAs on Bighorn National Forest * Listed as Forest Sensitive (although recently recommended for downlisting in USFS Region 2 due to recent-found abundance in Black Hills National Forest). * May be more widespread than currently recognized due to difficulties in identification. * May be threatened by forestry practices, although limestone talus populations are probably secure.

Rubus acaulis Northern blackberry	G5/S1	* Peripheral * Listed as Sensitive by the US Forest Service * One extant population in Bighorn Landscape is impacted by nearby dams, campgrounds, and proposed timber sales * Potential habitat on Forest is poorly protected at present and under high threat from dams and logging * One population protected in Yellowstone National Park
Festuca hallii Hall's fescue	G3G4/S1	* Peripheral in Wyoming * Listed as Sensitive by Forest Service * Known from a single historical record in the Bighorn Range * Suitable calcareous grassland habitat present, but this species may have been lost due to human changes on the landscape * Protected elsewhere in Wyoming, but not adequately
Listera convallarioides Broad-leaved twayblade	G5/S1	* Peripheral * Unprotected and highly threatened in the Bighorn Landscape from habitat loss due to development and over-collection by orchid fanciers * Potential conservation site at Story * Protected elsewhere in Wyoming
Agoseris lackschewitzii Pink agoseris	G4Q/S3	* Regional endemic * Several populations already protected in the Bighorns, but additional sites may be desirable * Well protected in other mountain ranges in Wyoming
Aster mollis Soft aster	G3/S3	* State endemic, nearly restricted to the Bighorn Landscape * 4 populations are already protected and 10 more populations are in potential RNAs * Listed as Forest Sensitive * Some additional protected areas would be desirable for adequate representation * Threats appear low.
Pyrrocoma integrifolia Entire-leaved goldenweed	G4/S1	* Regional endemic * Not currently protected in Bighorns, but protected elsewhere in Wyoming * Taxonomic problems make this a lower priority
Puccinellia cusickii Cusick's alkali-grass	G3G4Q/S1	* Sparse in Wyoming and unprotected. * Occurs in playa and alkali wetland habitats that are poorly protected (recognized as a high priority land type by the Wyoming Gap Project). * There is some disagreement among specialists as to the taxonomy of this species, with some arguing that it should be lumped with the more widespread and common *P. nuttalliana.*
Adoxa moschatellina Moschatel	G5/S1	* Sparse in Wyoming * One of 3 known occurrences in the Bighorn Landscape is protected and one is in a potential RNA * Threats low to moderate at present, although logging could be detrimental at some sites * Well protected outside the study area * More protected populations would be desirable
Asplenium trichomanes-ramosum Green spleenwort	G4/S2	* Disjunct in Wyoming * Not currently protected in Bighorn Landscape, but at least one is in a potential RNA * Potential habitat exists in the Ten Sleep Preserve

		* Protected elsewhere in the state
Utricularia minor Lesser bladderwort	G5/S1S2	* Sparse * One population known from the Bighorns is not protected and possibly impacted by nearby campgrounds and roads * Potential habitat is present in Cloud Peak Wilderness and should be inventoried * Protected elsewhere in the state

3. Lower Priority

Species	Heritage Rank	Potential Conservation Action
Astragalus barrii Barr's milkvetch	G3/S3	* Regional endemic * Not protected anywhere in Wyoming at present * 3 populations found at very eastern edge of study area, little suitable habitat present in Bighorn Landscape * Should be considered a high priority for conservation attention in the Powder River Breaks country of the Northern Great Plains Ecoregion, rather than the Bighorn Landscape
Astragalus simplicifolius Bun milkvetch	G3/S3	* State endemic, barely entering Bighorn Landscape * Not currently protected in the study area * Better sites for conservation exist in the Wyoming Basins ecoregion
Antennaria aromatica Aromatic pussytoes	G4G5/S1	* Regional endemic on WYNDD Watch List * Known from a single, unprotected population in the Bighorn Landscape * Well protected in wilderness areas and national parks elsewhere in Wyoming
Eriogonum brevicaule var. *canum* Rabbit buckwheat	G3/S1S2	* Regional endemic * Populations locally very abundant * At least 2 occurrences are well protected in Bighorn Canyon NRA * Threats low * Additional representative sites are desirable for protection, especially on east slope of Bighorns
Eriogonum mancum Mancos buckwheat	G4/S1	* Regional endemic * Protected at one of 2 known sites in Wyoming * Additional conservation sites are desirable for better representation of the species
Pyrrocoma clementis Tranquil goldenweed	G3G4/S1	* Sparse in Wyoming * May be protected already in Spanish Karst ACEC, but population needs to be relocated * Potential habitat on the Ten Sleep Preserve also needs to be investigated * Taxonomic problems need to be resolved
Pedicularis parryi ssp. *mogollonica* Mogollon lousewort	G5T2Q/S1	* Highly ranked (T2), but may not be a legitimate taxon, at least in the Bighorns (it may be a large growth form of *P. parryi* ssp. *parryi*). * No protected populations in Wyoming
Potentilla concinna var. *bicrenata* Bitoothed cinquefoil	G5?T?/SH	* Peripheral species * Not protected in Wyoming * Last observed in the Bighorns in 1934.
Sambucus cerulea Blue elderberry	G5?/S1	* Peripheral * Not protected in Wyoming * Low elevation wetland habitat is potentially threatened by

		rural development and loss of water quality
Sparganium eurycarpum Large bur-reed	G5/S1	* Peripheral * Not protected in Wyoming * Low elevation wetland habitat is potentially threatened by rural development and loss of water quality
Carex sartwellii Sartwell's sedge	G4/S1	* Peripheral * Known from a vague, historical record on unprotected lands in the Bighorn Range * May be threatened by agricultural practices or loss of wetland habitat in the eastern foothills * Protected elsewhere in Wyoming
Botrychium virginianum Rattlesnake fern	G5/S1	* Peripheral * Only one known population in the Bighorns, located in the Mann Creek potential RNA * Protected elsewhere in the state
Carex limosa Mud sedge	G5/S2	* Peripheral * Unprotected in the Bighorn Landscape * Protected elsewhere in Wyoming * Threats may be moderate from development and grazing in wetland areas
Carex misandra Short-leaf sedge	G5/S1	* Peripheral * One population in the Bighorn Landscape is in the potential McLain Lake RNA * Threats moderate from high recreation use * Protected elsewhere in Wyoming
Antennaria neglecta Field pussytoes	G5/S1	* Peripheral in Wyoming * No populations are currently protected in the state * Habitat near Story Fish hatchery was in poor condition when surveyed by Evert in 1985. * Additional habitat may occur at other forest and meadow sites along the eastern front of the Bighorn Range. * More information is needed on abundance of to determine this species' conservation status.
Polygonum spergulariiforme Fall knotweed	G5T4?/S1	* Peripheral * Known only from 2 historical records in study area on eastern plains, neither of which is protected * Potential habitat may occur in Bighorn Basin in the study area * Threats may be low
Cirsium foliosum Leafy thistle	G5/S1	* Peripheral * Not protected in the Bighorn Landscape * Protected elsewhere in Wyoming
Cryptogramma stelleri Fragile rock-brake	G5/S1	* Disjunct * Not protected in the Bighorn Landscape, although found in a potential RNA * Protected elsewhere in Wyoming * Habitat very remote in the study area
Celtis occidentalis Common hackberry	G5/S1	* Peripheral * One population protected in a WHMA in the study area; additional protected sites would be desirable for better representation
Equisetum sylvaticum Woodland horsetail	G5/S1	* Disjunct * Single known occurrence in Bighorn Landscape is protected in Preacher Rock Bog SIA

		* Additional populations (if found) should be protected to improve representation of this species
Eriophorum chamissonis Russet cotton-grass	G5/S1S2	* Peripheral * Single known occurrence in Bighorn Landscape is protected in Preacher Rock Bog SIA * Additional populations (if found) should be protected to improve representation of this species * Protected elsewhere in Wyoming
Potamogeton amplifolius Large-leaved pondweed	G5/S1	* Peripheral * Single known occurrence in Bighorn Landscape is protected in Cloud Peak Wilderness * Additional populations (if found) should be protected to improve representation of the species.
Triodanis leptocarpa Slim-pod Venus' looking-glass	G5?/S1	* Peripheral * One population is on a TNC easement on the east slope of the Bighorns * Threats poorly understood * Additional protected populations may be desirable

4. Adequately Protected

Species	**Heritage Rank**	**Rationale**
Anemone narcissiflora ssp. *zephyra* Zephyr windflower	G5T4/S1	* Four of 5 populations in the state are adequately protected * Threats low in rugged alpine habitat
Antennaria monocephala Single-head pussytoes	G4G5/S1	* Disjunct in Wyoming * Known from a single occurrence in the Bighorn Landscape that is protected in the Cloud Peak Wilderness.
Draba fladnizensis White arctic whitlow-grass	G4T3?/S2	* Regional endemic * Single Bighorn occurrence protected in Cloud Peak Wilderness * Well protected elsewhere in Wyoming
Erigeron allocotus Bighorn fleabane	G3/S2S3	* Regional endemic, centered on Bighorn Landscape * Adequately protected at 9 sites, including the Ten Sleep Preserve * 6 additional populations are in potential conservation sites
Erigeron humilis Low fleabane	G4/S2	* Sparse in Wyoming * Well protected in Cloud Peak Wilderness and other wilderness areas in Wyoming * Threats low in rugged alpine habitat.
Juncus triglumis var. *triglumis* Three-flower rush	G5T5/S1	* Peripheral * Well protected in Cloud Peak Wilderness and other wilderness areas in Wyoming * Threats low in rugged alpine habitat.
Papaver kluanense Alpine poppy	G3?Q/S2	* Disjunct * Well protected in Cloud Peak Wilderness and other wilderness areas in Wyoming * Threats low in rugged alpine habitat.
Pedicularis pulchella Mountain lousewort	G3/S2	*Regional endemic * Well protected in Cloud Peak Wilderness and other wilderness areas in Wyoming * Threats low in rugged alpine habitat.

Sullivantia hapemanii var. *hapemanii*	G3T3/S3	* Regional endemic, centered on Bighorn Landscape * Well protected in at least 11 sites * 7 additional populations in potential conservation areas on BLM and USFS lands * Listed as Sensitive by Forest Service * Threats relatively low due to rugged habitat

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