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Protection Status and Checklist of the Vascular Plant Flora of the Bighorn Landscape

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Prepared for
The Nature Conservancy
Wyoming Field Office

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INTRODUCTION

The "Bighorn Landscape" contains the entire Wyoming portion of the Bighorn Range and the surrounding foothills, prairies, and desert badlands on the eastern rim of the Bighorn Basin and western edge of the northern Great Plains (Figure 1). This region provides habitat for over 1400 taxa of vascular plants. The high species richness is a consequence of the heterogeneity of vegetation and landforms in the area.

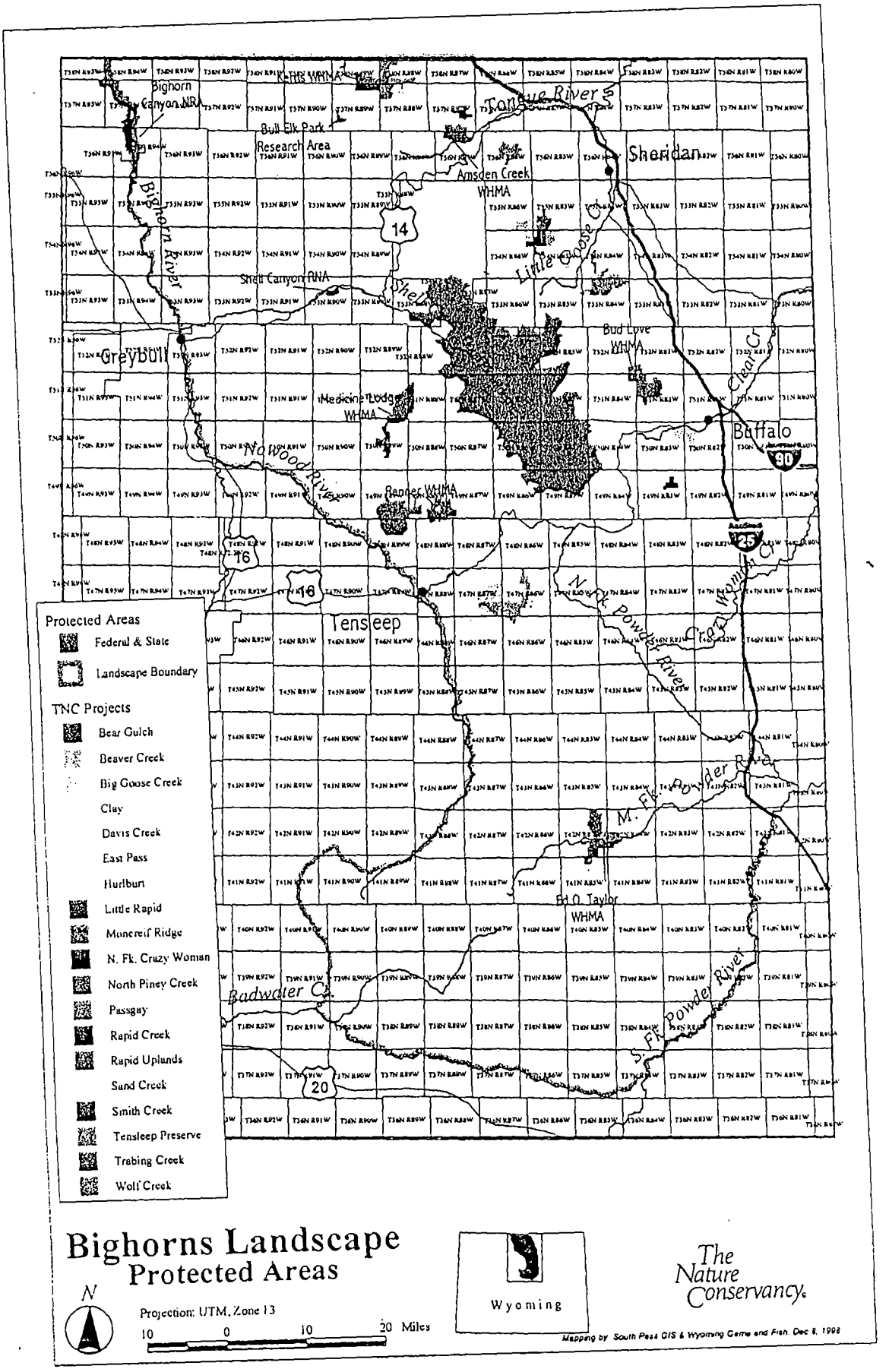
Due to its biological diversity and growing popularity as a residential area and recreational destination, the Bighorn Landscape has been identified as a high priority area for conservation attention by The Nature Conservancy (TNC). Since 1989, TNC's Wyoming Field Office has purchased or secured conservation 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). Collectively, these areas form an important protective network for the Bighorn region.

Fifty-eight plant species (including 22 local or regional endemics) are considered high priority targets for conservation attention in the Bighorn Landscape by the Wyoming Natural Diversity Database (WYNDD) (Fertig 1997, 1999). Twenty-seven of these rare species (47%) are currently known from designated protected areas in the Bighorn region (Fertig 1999). No comparable analysis of more widespread species in the region has previously been attempted. The purpose of this report is to determine the protection status of the entire vascular plant flora in the Bighorn Landscape and to compare the level of protection afforded to rare ("fine filter" elements) and common species ("coarse filter" elements) in the region.

METHODS

A checklist of the vascular flora of the Bighorn Landscape was created from local floristic surveys (Lichvar *et al.* 1984, 1985; Lofgren 1956; Nelson and Hartman 1984, TNC Tensleep Preserve), regional floras (Dorn 1992; Jensen 1987; Scott 1997) and distribution maps and databases maintained by the University of Wyoming's Rocky Mountain Herbarium (RM) and WYNDD. Additional information on the distribution of species by managed areas was determined from recent surveys of potential RNAs, ACECs and WSAs (Evert, no date; Jones and Fertig 1998; Marriott and Jones 1989; Neighbours and Culver 1990; Welp *et al.* 1998 a, 1998 b, 1998 c, 1998 d, 1998 e, 1998 f, 1998 g, 1998 h, 1998 i, 1998 j) and RM and WYNDD files. The protection status of each 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 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, WHMAs

Figure 1. The Bighorn Landscape Study Area.



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 protection status in the Bighorn Landscape and its projected status if populations in potential RNAs and WSAs are officially established.

RESULTS

Summary of the Flora of the Bighorn Landscape

The Bighorn Landscape contains 1410 taxa of vascular plants, representing 51.2% of the entire state flora (Appendix A). Exotic (non-native) species account for 159 of these taxa (11.3% of the total flora of the study area). State and regional endemics (see Table 1 for definitions) account for 5.7% of the total Bighorn Landscape flora (80 species). Peripheral, disjunct, and sparse species represent 71 species and only 5% of the total Bighorn Landscape flora. The remaining 1100 species in the region (78%) are widespread throughout their range and in Wyoming, and are not considered conservation targets at the "fine filter" scale (Table 1).

Table 1.
Geographic Distribution Patterns in the Bighorn Landscape Flora

Distribution Pattern	BIG Total # Taxa	% of BIG Flora	WY Total # Taxa	% of WY Flora	Notes
Exotic	159	11.3%	337	12.2%	Taxa not native to WY or North America
Widespread	1100	78%	1467	53.5%	Abundant in WY, occupying > 5% of the state and widely and continuously distributed outside the state
Sparse	19	1.3%	77	2.8%	Populations widely distributed across WY but small and restricted to specialized or uncommon habitats
Peripheral	43	3.1%	472	17.1%	Populations at the edge of a species' continuous global range, limited to < 5% of the state
Disjunct	9	0.6%	107	3.9%	Populations widely isolated in WY from the main, contiguous portion of a species' range
State and Regional Endemic	80	5.7%	292	10.6%	Total range restricted to a small geographic area, defined here as an area smaller than the state of WY.
Total # of Taxa	1410		2752		

Key: BIG = Bighorn Landscape. Statewide data from Fertig 1998.

State abundance patterns (Table 2) also indicate that most of the Bighorn Landscape flora consists of relatively common species of low conservation priority. 1018 taxa from the Bighorn area (72.2%) are currently ranked S2S3 to S5 in Wyoming, indicating that these species are moderately to very common within the state (Table 2). By contrast, only 41 species (2.9%) are ranked in the two rarest categories, S1 (extremely rare) and SH (state historical, not observed since 1950).

All six of the state's major biome types are represented in the flora of the Bighorn Landscape (Barbour and Billings, in press). In terms of species richness, the Rocky Mountain Forest biome accounts for the largest component of the flora (562 species, or 39.9% of the total flora) (Table 3). The Great Plains and Intermountain Desert Steppe contribute fewer species (15% and 9.4%, respectively) due to the relatively small area occupied by these biomes along the eastern and western edge of the landscape. Despite their small geographic area, wetlands contribute a high percentage (18.4%) of the total species richness. Combined, the Alpine and Eastern Deciduous Forest biomes account for only 6% of Landscape flora. The composition of the Bighorn flora is comparable to statewide percentages except for the greater contribution of Rocky Mountain Forest species and lower number of Intermountain Desert Steppe plants (Table 3).

Table 2.
Distribution of the Flora of the Bighorn Landscape
by State Abundance Pattern

State Rank	BIG Total # taxa	% of BIG Flora	WY Total # taxa	% of WY Flora	Notes
SH	2	0.1%	46	1.7%	State Historical: taxa last observed prior to 1950
SR	0	0%	20	0.8%	State Reported: reported for WY, but confirmation is needed
S1	39	2.8%	468	17%	Known from less than 5 extant populations in WY or with a small population size
S1S2-S2	192	13.6%	627	22.8%	S1S2: known from 6-7 locations and a small population size; S2: known from 6-20 locations and a small to medium population size
S2S3-S3	489	34.7%	708	25.7%	Known from ca 20-75 locations with medium population size
S3S4-S4	279	19.8%	295	10.7%	Known from 75-100 locations and may be locally abundant in at least 1 major biome
S4S5-S5	250	17.7%	251	9.1%	Known from over 100 locations and often abundant in 2 or more major biomes.
SE	159	11.3%	337	12.2%	State Exotic: not native to WY or North America

Key: BIG = Bighorn Landscape. Statewide data from Fertig 1998.

Table 3.
Distribution of the Flora of the Bighorn Landscape
by Biome Type

Biome Type	BIG Total Taxa	% of BIG Flora	WY Total Flora	% State Flora
Alpine	74	5.2%	164	6%
Eastern Deciduous Forest	11	0.8%	53	1.9%
Great Plains	211	15%	404	14.7%
Intermountain Desert Steppe	133	9.4%	342	12.4%
Rocky Mountain Forests	562	39.9%	928	33.8%
Wetlands	260	18.4%	524	19%
Exotics	159	11.3%	337	12.2%

Key: BIG = Bighorn Landscape. Statewide data from Fertig 1998.

Current and Potential Protection Status of the Flora of the Bighorn Landscape

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, 522 plant taxa (41.7% of the total flora of the Landscape) are known to occur in these highly protected areas (Table 4, Appendix A). 120 additional species (9.6%) are found in areas ranked Status 2 in the Gap system (Table 4). In the Bighorn Landscape, these areas include Bighorn Canyon National Recreation Area, Spanish Point Karst, Little Mountain, and Five Springs Falls ACECs, Bull Elk 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 51.3% of the total flora in the Bighorn Landscape. Of the remaining species, 42.1% occur on Status 3 Forest Service and BLM lands managed for multiple use and 6.6% are restricted to unprotected state or private Status 4 lands (Table 4).

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 51.3 to 65.5% (an increase of 178 species) (Table 4). Designation of these areas would also increase the number of protected populations of taxa already found in existing special management areas.

Local and regional endemic species account for only 5.7% of the Bighorn Landscape flora (80 taxa) (Table 1). Of these, 56.3% (45 species) are currently protected in Gap Status 1 or 2 lands. Designation of existing potential special management areas would increase this total to 71.3% (57 species) (Appendix A). The majority of the unprotected endemics are sufficiently common elsewhere in the state that they are not considered high priority conservation targets at the individual species level by WYNDD (Fertig 1999).

Table 4.
Protection Summary for Native Vascular Plant Species of the Bighorn Landscape

Note: Exotic species of the Bighorn Landscape (159 taxa, 11.3% of the total flora) are not included in this analysis.

A. Current Bighorn Landscape Status

	Status 1	**Status 2**	**Status 3**	**Status 4**
Total # Taxa	522 (41.7%)	120 (9.6%)	527 (42.1%)	82 (6.6%)
Alpine Species (ALP) n = 74	62 (83.8%)	0 (0%)	12 (16.2%)	0 (0%)
Eastern Deciduous Forest Species (EDF) n = 11	1 (9.1%)	2 (18.2%)	5 (45.6%)	1 (9.1%)
Great Plains Species (GRS) n = 211	45 (21.3%)	16 (7.6%)	110 (52.1%)	40 (19%)
Intermountain Desert Steppe Species (IDS) n = 133	30 (22.6%)	26 (19.5%)	75 (56.4%)	2 (1.5%)
Rocky Mountain Forest Species (RMF) n = 562	289 (51.4%)	46 (8.2%)	214 (38.1%)	13 (2.3%)
Wetland Species (WET) n = 260	95 (36.5%)	28 (10.8%)	111 (42.7%)	26 (10%)

B. Potential Bighorn Landscape Status

	Status 1	**Status 2**	**Status 3**	**Status 4**
Total # Taxa	558 (44.6%)	262 (20.9%)	349 (27.9%)	82 (6.6%)
Alpine Species (ALP) n = 74	62 (83.8%)	6 (8.1%)	6 (8.1%)	0 (0%)
Eastern Deciduous Forest Species (EDF) n = 11	1 (9.1%)	5 (45.5%)	4 (36.3%)	1 (9.1%)
Great Plains Species (GRS) n = 211	49 (23.2%)	47 (22.3%)	75 (35.5%)	40 (19%)
Intermountain Desert Steppe Species (IDS) n = 133	42 (31.6%)	27 (20.3%)	62 (46.6%)	2 (1.5%)
Rocky Mountain Forest Species (RMF) n = 562	307 (54.6%)	122 (21.7%)	120 (21.4%)	13 (2.3%)
Wetland Species (WET) n = 260	97 (37.3%)	55 (21.2%)	82 (31.5%)	26 (10%)

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].

DISCUSSION

Approximately 51% of the vascular plant species of the Bighorn Landscape are currently protected in Gap status 1 or 2 lands. This figure is comparable to the 47% protection rate for high priority plants of special concern in the Bighorn area (Fertig 1999). Designation of potential RNAs and WSAs in the Landscape would increase the level of protection for all plants to 65%, and for the subset of rare species to 62%. These figures suggest that the protection status of rare species can be used as a surrogate for total species protection in the Bighorns with little loss in predictive ability.

Within the Bighorn Landscape, alpine plant species receive disproportional protection (83.8%) compared to other biome types. This is not surprising considering the high percentage of alpine habitat protected within the Cloud Peak Wilderness Area. Rocky Mountain forest species are also relatively well-protected within the landscape (59.6%), probably due to the large area of forested habitat protected within existing RNAs and TNC's Tensleep Preserve. Designation of potential RNAs and WSAs will increase the level of protection for forest species by nearly 17%.

Species belonging to other biome types enjoy much less protection in the Bighorn Landscape. Only 47% of wetland plants, 42% of Intermountain desert steppe species, 29% of Great Plains taxa, and 27% of eastern deciduous forest species are currently protected in the region. These reduced rates of protection are due to the relatively small amount of protected lands at lower elevations of the range and the lack of comprehensive species list for most of these areas. Designation of potential special management areas would increase the level of protection for species in all of these biome types by 9-29%.

Increasing the overall protection scores for all plant species in the Bighorn Landscape will require focussing conservation attention on habitat types and locations that are not incorporated into the existing protective network. Obvious "holes" in the network include low elevation and montane wetlands, desert basins and badlands, and dry grassland-savanna vegetation types of the southern Bighorn Range (Beauvais 1999; Fertig 1999; Wyoming Natural Diversity Database 1996). Improvements in the protection scores can also be achieved through better documentation of the flora in existing and any newly created special management areas. In particular, better botanical surveys are needed of TNC easements, Wildlife Habitat Management Areas, and the Cloud Peak Wilderness Area.

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