

ECOLOGICAL EVALUATION OF  
THE POTENTIAL GRIZZLY CREEK RESEARCH NATURAL AREA  
WITHIN THE SHOSHONE NATIONAL FOREST,  
PARK COUNTY, WYOMING

Prepared for the  
Shoshone National Forest,  
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TABLE OF CONTENTS

INTRODUCTION..... 1  
    LAND MANAGEMENT PLANNING..... 1  
OBJECTIVES..... 1  
PRINCIPAL DISTINGUISHING FEATURES..... 2  
LOCATION..... 2  
    BOUNDARY..... 2  
    AREA..... 2  
    ELEVATION..... 2  
    ACCESS..... 3  
    ECOREGION..... 3  
    MAPS..... 3  
VEGETATION..... 3  
    DESCRIPTION..... 3  
    AREA BY TYPE..... 5  
PHYSICAL AND CLIMATIC CONDITIONS..... 7  
    PHYSICAL SETTING..... 7  
    GEOLOGY..... 8  
DESCRIPTION OF VALUES..... 8  
    VEGETATION TYPES..... 8  
    FLORA..... 8  
        Threatened, Endangered, and Sensitive Plant Species.. 8  
        Plant Species List..... 10  
    FAUNA..... 19  
        Threatened, Endangered, and Sensitive Vertebrates... 20  
        Animal Species List..... 20  
    LANDS..... 20  
SUITABILITY FOR RESEARCH NATURAL AREA SELECTION..... 20  
    QUALITY..... 20  
    CONDITION..... 21  
    VIABILITY..... 22  
    DEFENSIBILITY..... 23  
DEGREE TO WHICH THE POTENTIAL RNA MEETS CRITERIA..... 23  
IMPACTS AND POSSIBLE CONFLICTS..... 23  
    MINERAL RESOURCES..... 23  
    GRAZING..... 23  
    TIMBER..... 23  
    WATERSHED VALUES..... 23  
    RECREATION VALUES..... 23  
    WILDLIFE AND PLANT VALUES..... 24  
    TRANSPORTATION VALUES..... 24  
MANAGEMENT CONCERNS..... 24  
REFERENCES..... 24  
APPENDIXES..... 27  
    APPENDIX 1. MAPS OF THE POTENTIAL GRIZZLY CREEK RESEARCH  
        NATURAL AREA..... 28  
    APPENDIX 2. PHOTOGRAPHS FROM THE POTENTIAL GRIZZLY CREEK  
        RNA..... 31

APPENDIX 3. CANOPY COVER OF PLANTS IN PLOTS AND AT LOCATIONS OF VEGETATION DESCRIPTIONS IN THE POTENTIAL GRIZZLY CREEK RESEARCH NATURAL AREA.....	32
APPENDIX 4. EXPLANATIONS OF RANKS USED BY THE WYOMING NATURAL DIVERSITY DATABASE.....	44
APPENDIX 5. PLANT COMMUNITY TYPES IN THE POTENTIAL GRIZZLY CREEK RESEARCH NATURAL AREA.....	46
APPENDIX 6. ELEMENT OCCURRENCE RECORDS FOR PLANT SPECIES OF SPECIAL CONCERN IN THE POTENTIAL GRIZZLY CREEK RNA..	50

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INTRODUCTION

The potential Grizzly Creek Research Natural Area (RNA) is located in the valley of the North Fork of the Shoshone River in northwestern Wyoming. The area includes sparse grasslands and shrub-steppe, montane conifer forests, and barren cliffs and talus slopes. The potential RNA is in the Shoshone National Forest and is used primarily for recreation, watershed protection, and wildlife habitat.

In 1997, The Nature Conservancy entered a contract with the USDA Forest Service, Shoshone National Forest, to prepare ecological evaluations of areas in the Forest for use by the Forest Service in examining the suitability of the areas as research natural areas. The evaluation of the Grizzly Creek area was done by the Wyoming Natural Diversity Database. This report presents the results of that evaluation.

LAND MANAGEMENT PLANNING

In 1997, Grizzly Creek was selected by USDA Forest Service staff as a potential RNA for possible analysis during revision of the Land and Resource Management Plan. This ecological evaluation is intended to aid the Forest Service staff in that analysis.

OBJECTIVES

One of the primary objectives of research natural areas is to "...preserve a wide spectrum of pristine representative areas that typify important forest, shrubland, grassland, alpine, aquatic, geologic and similar natural situations..." (Forest Service Manual 4063.02).

The objectives of a Grizzly Creek RNA would be to 1) maintain a reference area for (a) monitoring effects of resource management techniques and practices applied to similar ecosystems, (b) comparing results from manipulative research, and (c) determining the range of natural variability; 2) protect elements of biological diversity; 3) provide a site for non-manipulative scientific research; and 4) provide on-site and extension educational opportunities.

## PRINCIPAL DISTINGUISHING FEATURES

The principal distinguishing features of the potential Grizzly Creek RNA are a variety of Douglas-fir woodlands, several types of sagebrush shrub-steppe, and populations of four rare vascular plant species.

## LOCATION

The potential Grizzly Creek RNA is located within the Shoshone National Forest in northwestern Wyoming. The approximate center of the potential RNA is at latitude 44°34'15" and longitude 109°37'55"W.

The potential RNA includes all or parts of the following sections (all on the 6th Principal Meridian): Township 52N, Range 105W, Sections 6, 7, 18, 19, 20; T52N, R106W, Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, 24; T53N, R105W, Sections 30, 31; T53N, R106W, Sections 23, 24, 25, 26, 35, 36.

## BOUNDARY

See Figure 1

The proposed boundary of the potential RNA follows drainage divides and other topographical features. From the southeastern corner of the potential RNA, on the northern bank of the Shoshone River south of Signal Rock, the boundary runs generally north and west ca. 9 miles (14.4 km) along the divide between the drainage basins of Grizzly Creek to the west (inside the potential RNA) and Big Creek to the east (outside the potential RNA); thence south ca. 2.5 miles (4 km) along the divide between the drainage basins of Grizzly Creek to the east and Horse Creek to the west (outside the potential RNA); thence southwest ca. 2 miles (3.2 km) across the valley of Horse Creek to the divide between the drainage basins of Horse Creek to the east and Sweetwater Creek to the west; thence south ca. 2.75 miles (4.4 km) along that divide to the Shoshone River; thence east (downstream) ca. 4.5 miles (7.2 km) along the river to the starting point.

## AREA

The total area of the potential Grizzly Creek RNA is ca. 11,634 acres (4710 ha).

## ELEVATION

The elevation of the potential Grizzly Creek RNA ranges from ca. 5,760 feet (1756 m) on the North Fork of the Shoshone River

at the southeastern corner to ca. 10,850 feet (3307 m) at the northern end.

#### ACCESS

The potential Grizzly Creek RNA may be reached via three different routes, all on public roads or public lands. To reach the eastern side of the potential RNA, travel on U.S. Highway 14/16/20 from Cody, Wyoming west ca. 30 miles (48 km) to the Shoshone National Forest boundary and a gravel road turning off of the highway to the north, thence north on that road across the Shoshone River and west immediately after crossing the river to the trailhead of Forest Trail 795, thence west ca. 0.5 mile (0.8 km) on the trail to the southeastern corner of the potential RNA. Trail 795 runs north along the eastern side of the area.

To reach the south-central part of the potential RNA, continue west on Highway 14/16/20 an additional ca. 3 miles (4.8 km) to the Horse Creek Picnic Ground, and wade the Shoshone River to the northern bank and Forest Trail 786. That trail ascends Horse Creek through the western side of the area.

To reach the western side of the potential RNA, continue west on Highway 14/16/20 an additional ca. 2 miles (3.2 km) to the Wapiti Campground, thence north on Low Standard Forest Road 423 across the Shoshone River, then east (by foot or horseback) across the drainage divide into the Horse Creek drainage basin and the western side of the potential RNA.

#### ECOREGION

The potential Grizzly Creek RNA lies within the Southern Rocky Mountain Steppe-Open Woodland-Coniferous Forest-Alpine Meadow Province, Yellowstone Highlands Section (M331A) of the ecoregion classification of Bailey et al. (1994) (Freeouf 1996).

#### MAPS

USDA Forest Service 1/2 inch = 1 mile scale map of the Shoshone National Forest.

USDI Geological Survey 7.5-minute topographic Quadrangle Maps: Dead Indian Peak, Wyo. and Flag Peak, Wyo.

#### VEGETATION

#### DESCRIPTION

The potential Grizzly Creek RNA contains the following plant associations: Douglas-fir/common snowberry, Douglas-fir/bluebunch wheatgrass, Douglas-fir/Idaho fescue, Balsam poplar - Douglas-fir, Thinleaf alder/red-osier dogwood, Basin big sagebrush/bluebunch wheatgrass, Mountain big sagebrush/bluebunch

wheatgrass, Mountain big sagebrush/Idaho fescue, Black sagebrush/bluebunch wheatgrass, and Bluebunch wheatgrass. Synonyms are shown in Appendix 5. Data from sample plots and descriptions of vegetation at various locations are given in Appendix 3.

#### Upland vegetation

Douglas-fir woodlands and forests belonging to three community types dominate the upland vegetation in the potential RNA, except for the southwestern portion and (probably) the far northern end. In the southern half of the area, Douglas-fir/bluebunch wheatgrass stands with open tree canopies and sparse understories grow on all but the northerly slopes, and are mixed with (and merge with) non-forest vegetation on southerly slopes and ridge tops. These non-forest types include bluebunch wheatgrass grasslands (often very sparse) on south-facing slopes, basin big sagebrush/bluebunch wheatgrass shrub stands on alluvial fans and terraces, black sagebrush/bluebunch wheatgrass shrub stands on slopes, and mountain big sagebrush/bluebunch wheatgrass shrub stands in small draws on slopes of various aspects. The shrub layers in the black sagebrush and the mountain big sagebrush stands usually are sparse (canopy cover ca. 10%), and these stands merge into the bluebunch wheatgrass stands. On northerly slopes and in the bottoms of mesic draws, the woodlands belong to the Douglas-fir/Idaho fescue community or to the Douglas-fir/ common snowberry community.

In the middle of the area, the Douglas-fir/Idaho fescue and Douglas-fir/common snowberry communities become more widespread, and the Douglas-fir/bluebunch wheatgrass stands are more restricted to south-facing slopes. Non-forest vegetation in the central part of the potential RNA is primarily the mountain big sagebrush/ Idaho fescue community with patches of Idaho fescue grassland.

The 1997 field survey did not reach to the far northern end of the potential RNA, but observations were made of the slopes there through binoculars, and the tree overstory appears to be mainly subalpine fir and Engelmann spruce. The vegetation is patchy, and sparsely-vegetated rock outcrops and slopes are common.

The southwestern corner of the potential RNA, and a narrow strip of fluvial terrace along the north side of the river, are vegetated with a mosaic of bluebunch wheatgrass stands (often sparse) on steeper slopes, black sagebrush/bluebunch wheatgrass shrub stands on gentler slopes, and basin big sagebrush/bluebunch wheatgrass shrub stands on alluvial fans and fluvial terraces.

Wyoming big sagebrush occurs in some of the shrub stands, and the shrub layers in those stands often are sparse. A few small stands of Douglas-fir/bluebunch wheatgrass woodland occur in the grassland and shrub-steppe matrix. This part of the potential RNA contains a substantial area of sparsely-vegetated and unvegetated rock outcrops and slopes.

#### Riparian vegetation

Riparian types constitute only a small proportion of the vegetation in the potential RNA. Thinleaf alder/red-osier dogwood vegetation grows at the intermediate and (probably) the higher elevations in the potential RNA, as a narrow band (up to ca. 150 feet, or 46 m, wide) in a matrix of Douglas-fir forest. This vegetation type consists of a tall shrub layer with thinleaf alder as a major species, a lower shrub layer with red-osier dogwood and other species, and a patchy herbaceous layer.

Balsam poplar trees may be present but contribute little cover. At the low elevation, southern end of the area, the riparian vegetation is primarily balsam poplar - Douglas-fir woodland, with the two tree species contributing about equal amounts of cover over a patchy shrub layer and a herbaceous layer of Kentucky bluegrass. Near the mouth of Horse Creek, the riparian tree overstory is formed by limber pine.

Small patches (up to several hundred square meters) of narrowleaf cottonwood - Douglas-fir woodland grow along steep ephemeral streams in the hills south of Signal Peak, in the southeastern corner of the potential RNA, in a matrix of sparsely-vegetated slopes and sparse bluebunch wheatgrass grasslands. Springs in that area support small patches of sedge-rush wetlands. A small stand (covering several hundred square meters) of water sedge-beaked sedge vegetation grows along the unnamed drainage in the southwestern part of the area.

#### AREA BY TYPE

Complexes of Kuchler vegetation types (Kuchler 1966) were mapped on 1:24,000-scale topographic maps using aerial photographs and field reconnaissance, and the area of each complex was estimated from the maps by use of a digital planimeter. (The vegetation map shows complexes because delineating stands of individual vegetation types was impossible.) The proportion of a complex accounted for by each vegetation type was estimated from the aerial photographs and field survey. Areas of the individual vegetation types (Table 1) were then estimated by multiplying the area of the complex by the proportion of the complex accounted for by the vegetation type.

Areas of complexes of plant community types (Table 2) were estimated in the same manner. Areas of the individual plant communities were not estimated, however, because estimates of the

proportion of each community in each complex were unavailable, given the difficulty of distinguishing closely-related plant communities from aerial photos and the limited extent of the field survey.

Table 1. Areas of Kuchler Types (Kuchler 1966) in the potential Grizzly Creek RNA. See Figure 1.

Cover Type	Acres	Hectares
Douglas fir forest (11) (Pseudotsuga)	7497	3035
Western spruce-fir forest (14) (Picea-Abies)	272	110
Fescue-wheatgrass (43) (Festuca-Agropyron)	625	253
Wheatgrass-needlegrass shrubsteppe (50) (Agropyron-Stipa-Artemisia)	1870	757
Sparse slopes (no Kuchler type)	1370	555

Table 2. Areas of SAF cover type (Eyre 1980) in the potential Grizzly Creek RNA. See Figure 1.

Cover Type	Acres	Hectares
Interior Douglas-fir (21)	7497	3036
Engelmann spruce-subalpine fir (206)	272	110
No SAF type	3865	1565

Table 3. Areas of complexes of plant community types in the potential Grizzly Creek RNA. Major communities in each complex are indicated by "(M)" following the names, and minor communities by "(m)". Appendix 5 contains synonyms.

Complex	Acres	Hectares
Bluebunch wheatgrass (M), Basin big sagebrush/bluebunch wheatgrass (M), Black sagebrush/bluebunch wheatgrass (M), and sparsely-vegetated slopes (M), with Douglas-fir/bluebunch wheatgrass (m) and Balsam poplar - Douglas-fir (m)	2112	855
Douglas-fir/bluebunch wheatgrass (M), Douglas-fir/Idaho fescue (M), and Douglas-fir/common snowberry (M), with Mountain big sagebrush/Idaho fescue (m), Mountain big sagebrush/bluebunch wheatgrass (m), Basin big sagebrush/bluebunch wheatgrass (m), Bluebunch wheatgrass (m), Thinleaf alder/red-osier dogwood (m), and sparsely-vegetated slopes (m)	5179	2097
Douglas-fir/Idaho fescue (M) and Douglas-fir/common snowberry (M) with Douglas-fir/bluebunch wheatgrass (m), Mountain big sagebrush/Idaho fescue (m), Bluebunch wheatgrass (m), and Thinleaf alder/red-osier dogwood (m), and sparsely-vegetated slopes (m)	3664	1483
Spruce-fir forest (M) and sparsely-vegetated slopes (M)	680	275

## PHYSICAL AND CLIMATIC CONDITIONS

### PHYSICAL SETTING

The potential Grizzly Creek RNA is located in the valley of the North Fork of the Shoshone River, and includes narrow stream valleys with steep sides and sharp drainage divides. Local relief, from valley bottoms to ridge tops, is 500 - 1000 feet

(150 - 300 m). The southern edge of the area lies on broad alluvial and colluvial fans and fluvial terraces.

#### GEOLOGY

The bedrock in the proposed RNA is Tertiary volcanic rock, primarily andesitic rock of the Wapiti Formation (Love and Christiansen 1985). The northern end of the potential RNA includes a small area of trachyandesite of the Trout Peak Formation.

#### DESCRIPTION OF VALUES

##### VEGETATION TYPES

See Table 1 for a list of the Kuchler (1966) vegetation types present in the area and the estimated acreage of each, and Table 2 for a list of the plant associations present.

##### FLORA

##### Threatened, Endangered, and Sensitive Plant Species

No federally listed Threatened or Endangered plant species are found in the potential Grizzly Creek RNA. Two USDA Forest Service Region 2 Sensitive plant species (Estill 1993), *Ipomopsis spicata* var. *robruthii* and *Townsendia condensata* var. *anomala*, are known to occur in the area. Two other plants listed as "species of special concern" by WYNDD (Fertig and Beauvais 1999) are also known from the potential RNA. The status of each of these species is briefly summarized below. Complete Element Occurrence Records and location maps for each population are included in Appendix 6.

***Ipomopsis spicata* ssp. *robruthii*** (Kirkpatrick's ipomopsis)

Synonym: *Ipomopsis spicata* var. *robruthiorum*

Heritage Rank: G4?T2/S2.

Federal Status: USFS Region 2 Sensitive.

Geographic Range: Endemic to the Absaroka Range in Park County, Wyoming.

Habitat: Montane, sandy to rocky, volcanic scree slopes, alpine meadows, turf mats, and open Douglas-fir forests on soils derived from volcanic andesite rock (Fertig et al. 1994; Mills and Fertig 1996).

Comments: Two small populations were discovered within the potential RNA during 1997 surveys. The larger colony, located along the divide between Sweetwater and Horse creeks about 2 miles north of the Wapiti Campground, consists of 50-100 widely scattered individuals. A much smaller (probably ephemeral) colony of 4 plants was observed along a shady, dry tributary wash of Horse Creek, 1 mile north of the campground. This latter

population may be derived from seeds that washed downstream from the plant's more typical subalpine habitat (Fertig 1998). This taxon is currently known from 16 extant occurrences, 14 of which are wholly or partly located within designated national forest wilderness areas.

***Lomatium attenuatum*** (Absaroka biscuitroot)

Heritage Rank: G3/S2.

Federal Status: None.

Geographic Range: Regional endemic of the Absaroka and Tendoy mountains of northwestern Wyoming and southwestern Montana (Mills and Fertig 1996).

Habitat: Semi-barren volcanic or calcareous mountain slopes and cliffs in sparsely vegetated sagebrush or cushion plant/bunchgrass communities in openings in Douglas-fir/limber pine woodlands.

Comments: Absaroka biscuitroot is known from 3 occurrences in the potential RNA. Erwin Evert discovered a small population in sagebrush grasslands south of "The Wall" (at the north end of the potential RNA) in 1987 (EO # 017). Eight small to medium-sized colonies were discovered by Fertig and Jones along the divide between Sweetwater and Horse creeks and on the east side of Horse Creek in 1997 (EO # 004). These populations were sparse to locally common on volcanic ridge-crests with low vegetative cover. A cluster of 4 small colonies consisting of 2500-5000 individuals was also located at the southeastern end of the potential RNA in 1997 (EO # 015) (Fertig 1998). Range-wide, this species is now known from 22 occurrences and 20,000-100,000 individuals (Vanderhorst and Heidel 1998). Wyoming populations are largely secure at the present time due to their rugged habitat and low threats (Fertig 1997, 1998).

***Penstemon absarokensis*** (Absaroka beardtongue)

Heritage Rank: G2/S2.

Federal Status: None.

Geographic Range: Endemic to the Absaroka and northeast Wind River Range in Fremont and Park counties, Wyoming.

Habitat: Loose, volcanic scree and talus slopes in sparsely-vegetated openings in Douglas-fir/limber pine woodlands on steep slopes and creek bottoms (Mills and Fertig 1996).

Comments: Absaroka beardtongue is known from two occurrences in the potential RNA. Three small to medium-sized colonies (with a total of 520-850 plants) were discovered by Fertig between Signal Peak and Anvil Rock in the southeastern corner of the potential RNA in 1997 (EO # 020). Six additional colonies were observed at the western end of the area on ridges along the eastern and western sides of Horse Creek (EO # 004, in part). These colonies contained 315-670 individuals in small patches of largely undisturbed habitat. This species is currently known from 20

occurrences, with a total population of 8000-15,000 individuals (Fertig 1998). Although a number of occurrences are protected in wilderness areas, low-elevation colonies are at some risk from road construction, recreational activity, mining, and competition from weeds (Fertig 1997, 1998).

***Townsendia condensata* var. *anomala*** (North Fork Easter-daisy)

Heritage Rank: G4T2/S2.

Federal Status: USFS Region 2 Sensitive.

Geographic Range: Endemic to the Absaroka Range in Park County, Wyoming (Fertig et al. 1994).

Habitat: Sparsely-vegetated, barren ridges and slopes in openings in Douglas-fir/limber pine woodlands on volcanic andesite scree and talus (Fertig 1997).

Comments: This taxon is currently known from two occurrences in the potential Grizzly Creek RNA. One occurrence, consisting of 4 small subpopulations and an estimated 150-250 plants, is located along the divide between Signal Peak and Anvil Rock at the southeastern end of the area. A larger occurrence with 10 colonies is found along the ridgcrests separating the Sweetwater Creek, Horse Creek, and Grizzly Creek divides. These populations consist of at least 500-800 individuals in largely pristine habitat (Fertig 1998). The North Fork Easter-daisy is known from 21 occurrences, 12 of which are found in designated wilderness areas on the Shoshone National Forest. This species is largely unthreatened due to the ruggedness of its habitat and low rates of grazing (Fertig 1997, 1998).

#### Plant Species List

The following species checklist is based on field surveys conducted by the authors in late June and mid-August 1997. For more information on the vascular flora of the Absaroka Range, consult Evert (1991), Kirkpatrick (1987), and Snow (1992-94). Nomenclature follows Dorn (1992) for scientific names and Hitchcock and Cronquist (1973) and Welsh et al. (1993) for common names. Family acronyms are based on Weber (1982). Non-native species are indicated by "!" before the species name.

Scientific Name	Common Name	Fam
TREES		
<i>Abies lasiocarpa</i>	Subalpine fir	PIN
<i>Betula occidentalis</i>	Water birch	BET
<i>Pinus flexilis</i>	Limber pine	PIN
<i>Populus angustifolia</i>	Balsam cottonwood	SAL
<i>Populus tremuloides</i>	Quaking aspen	SAL
<i>Pseudotsuga menziesii</i> var. <i>glauca</i>	Douglas-fir	PIN
<i>Salix lasiandra</i> var. <i>caudata</i>	Whiplash willow	SAL
SHRUBS		
<i>Acer glabrum</i>	Rocky mountain maple	ACE
<i>Alnus incana</i> var. <i>occidentalis</i>	Mountain alder	BET
<i>Artemisia nova</i>	Black sagebrush	AST
<i>Artemisia tridentata</i> var. <i>tridentata</i>	Basin big sagebrush	AST
<i>Artemisia tridentata</i> var. <i>vaseyana</i>	Mountain big sagebrush	AST
<i>Artemisia tridentata</i> var. <i>wyomingensis</i>	Wyoming big sagebrush	AST
<i>Atriplex confertifolia</i>	Spiny saltbush	CHN
<i>Ceanothus velutinus</i>	Deer-brush	RHM
<i>Chrysothamnus nauseosus</i> var. <i>nauseosus</i>	Rubber rabbitbrush	AST
<i>Chrysothamnus</i> <i>viscidiflorus</i> var. <i>viscidiflorus</i>	Green rabbitbrush	AST
<i>Cornus sericea</i> [ <i>Cornus stolonifera</i> ]	Red-osier dogwood	COR
<i>Elaeagnus commutata</i>	Silverberry	ELE
<i>Juniperus communis</i> var. <i>depressa</i>	Common juniper	CUP
<i>Juniperus scopulorum</i>	Rocky Mountain juniper	CUP

<i>Krascheninnikovia lanata</i> [ <i>Ceratoides lanata</i> ]	Winterfat	CHN
<i>Prunus virginiana</i> var. <i>melanocarpa</i>	Common chokecherry	ROS
<i>Rhus trilobata</i>	Skunkbush	ANA
<i>Ribes cereum</i> var. <i>pedicellare</i>	Wax currant	GRS
<i>Ribes oxycanthoides</i>	Northern gooseberry	GRS
<i>Rosa sayi</i>	Prickly rose	ROS
<i>Rosa woodsii</i>	Woods' rose	ROS
<i>Salix bebbiana</i>	Bebb willow	SAL
<i>Salix lutea</i> [ <i>S. eriocephala</i> var. <i>watsonii</i> ]	Yellow willow	SAL
<i>Salix melanopsis</i>	Dusky willow	SAL
<i>Sarcobatus vermiculatus</i>	Greasewood	CHN
<i>Shepherdia canadensis</i>	Canada buffaloberry	ELE
<i>Symphoricarpos oreophilus</i> var. <i>utahensis</i>	Mountain snowberry	CPR

#### FORBS

<i>Achillea millefolium</i>	Common yarrow	AST
<i>Actaea rubra</i>	Baneberry	RAN
<i>Agoseris glauca</i> var. <i>laciniata</i>	Short-beaked agoseris	AST
<i>Allium brevistylum</i>	Short-style onion	LIL
<i>Allium cernuum</i>	Nodding onion	LIL
<i>Allium geyeri</i>	Geyer's onion	LIL
<i>Allium textile</i>	Textile onion	LIL
<i>Anemone patens</i> var. <i>multifida</i>	Pasqueflower	RAN
<i>Angelica</i> sp.	Angelica	API
<i>Antennaria media</i>	Alpine pussytoes	AST
<i>Antennaria microphylla</i>	Small-leaved pussytoes	AST
<i>Antennaria racemosa</i>	Raceme pussytoes	AST
<i>Antennaria rosea</i>	Rosy pussytoes	AST
<i>Antennaria umbrinella</i>	Umber pussytoes	AST
<i>Apocynum androsaemifolium</i>	Spreading dogbane	APO

<i>Arabis confinis</i> [ <i>Arabis divaricarpa</i> ]	Spreadingpod rockcress	BRA
<i>Arabis glabra</i>	Towermustard	BRA
<i>Arabis holboellii</i>	Holboell's rockcress	BRA
<i>Arenaria congesta</i> var. <i>congesta</i>	Ballhead sandwort	CRY
<i>Arenaria hookeri</i> var. <i>hookeri</i>	Hooker's sandwort	CRY
<i>Arenaria nuttallii</i> [ <i>Minuartia nuttallii</i> ]	Nuttall's sandwort	CRY
<i>Arnica cordifolia</i>	Heartleaf arnica	AST
<i>Artemisia dracuncululus</i>	Tarragon	AST
<i>Artemisia frigida</i>	Fringed sagewort	AST
<i>Artemisia michauxiana</i>	Michaux sagewort	AST
<i>Asclepias viridiflora</i>	Green milkweed	ASC
<i>Aster ascendens</i>	Long-leaved aster	AST
<i>Aster bracteolatus</i>	Eaton's aster	AST
<i>Aster conspicuus</i>	Showy aster	AST
<i>Aster foliaceus</i>	Leafy aster	AST
<i>Aster glaucodes</i>	Blueleaf aster	AST
<i>Aster occidentalis</i>	Western mountain aster	AST
<i>Aster perelegans</i>	Elegant aster	AST
<i>Astragalus australis</i> var. <i>glabriusculus</i>	Indian milkvetch	FAB
<i>Astragalus miser</i> var. <i>decumbens</i>	Sagebrush weedy milkvetch	FAB
<i>Astragalus miser</i> var. <i>hylophilus</i>	Weedy milkvetch	FAB
<i>Astragalus purshii</i>	Woolly-pod milkvetch	FAB
<i>Astragalus vexilliflexus</i>	Bent-flowered milkvetch	FAB
<i>Balsamorhiza sagittata</i>	Arrowleaf balsamroot	AST
<i>Brickellia grandiflora</i>	Large-flowered brickellbush	AST
! <i>Camelina microcarpa</i>	Littlepod falseflax	BRA
<i>Campanula rotundifolia</i>	Scotch bellflower	CAM
<i>Cardamine</i> sp.	Bitter cress	BRA
! <i>Carduus nutans</i>	Musk thistle	AST
<i>Castilleja angustifolia</i> var. <i>angustifolia</i>	Narrowleaf paintbrush	SCR
<i>Castilleja linariifolia</i>	Wyoming paintbrush	SCR

<i>Chaenactis douglasii</i> var. <i>montana</i>	Hoary dusty-maiden	AST
<i>Chenopodium atrovirens</i>	Mountain goosefoot	CHN
<i>Chenopodium berlandieri</i> var. <i>zschackei</i>	Pitseed goosefoot	CHN
! <i>Cirsium arvense</i>	Canada thistle	AST
<i>Cirsium scariosum</i>	Elk thistle	AST
! <i>Cirsium vulgare</i>	Bull thistle	AST
<i>Clematis ligusticifolia</i>	Western virgin's-bower	RAN
<i>Clematis occidentalis</i> var. <i>grosseserrata</i>	Purple virgin's bower	RAN
<i>Collinsia parviflora</i>	Small-flowered blue-eyed Mary	SCR
<i>Collomia linearis</i>	Narrowleaf collomia	PLM
<i>Collomia tenella</i>	Diffuse collomia	PLM
<i>Comandra umbellata</i> var. <i>pallida</i>	Pale bastard toadflax	SAN
<i>Conyza canadensis</i>	Horseweed	AST
<i>Crepis acuminata</i>	Mountain hawksbeard	AST
<i>Crepis atribarba</i>	Slender hawksbeard	AST
<i>Crepis intermedia</i>	Gray hawksbeard	AST
<i>Cryptantha ambigua</i>	Obscure cryptantha	BOR
<i>Cryptantha celosioides</i>	Cockscomb cryptantha	BOR
<i>Cymopterus acaulis</i>	Plains spring-parsley	API
<i>Cymopterus terebinthinus</i> var. <i>albiflorus</i>	Turpentine rock parsley	API
<i>Delphinium nuttallianum</i>	Nuttall's larkspur	RAN
<i>Descurainia incana</i> var. <i>incana</i>	Mountain tansymustard	BRA
<i>Disporum trachycarpum</i>	Wartberry fairybell	LIL
<i>Dodecatheon pulchellum</i>	Pretty shooting-star	PRM
<i>Epilobium angustifolium</i>	Fireweed	ONA
<i>Epilobium brachycarpum</i>	Autumn willowherb	ONA
<i>Epilobium ciliatum</i> var. <i>ciliatum</i>	Northern willowherb	ONA
<i>Erigeron caespitosus</i>	Tufted fleabane	AST
<i>Erigeron compositus</i> var. <i>discoideus</i>	Cut-leaved daisy	AST

<i>Erigeron divergens</i>	Diffuse fleabane	AST
<i>Erigeron glabellus</i>	Smooth daisy	AST
<i>Eriogonum ovalifolium</i>	Cushion buckwheat	PLG
<i>Eriogonum pauciflorum</i>	Few-flowered buckwheat	PLG
<i>Eriogonum umbellatum</i> var. <i>majus</i>	Sulfur buckwheat	PLG
<i>Erysimum</i> sp.	Wallflower	BRA
<i>Euphorbia brachycera</i> var. <i>robusta</i>	Rocky Mountain spurge	EUP
<i>Fragaria vesca</i>	Woods strawberry	ROS
<i>Fragaria virginiana</i>	Virginia strawberry	ROS
<i>Fritillaria atropurpurea</i>	Checker-lily	LIL
<i>Galium aparine</i>	Cleavers	RUB
<i>Gayophytum diffusum</i> var. <i>strictipes</i>	Spreading groundsmoke	ONA
<i>Geum triflorum</i>	Prairie smoke	ROS
<i>Gilia tweedyi</i>	Tweedy's gilia	PLM
<i>Glycyrrhiza lepidota</i>	Licorice-root	FAB
<i>Gnaphalium palustre</i>	Lowland cudweed	AST
<i>Hackelia floribunda</i>	Many-flowered stickseed	BOR
<i>Haplopappus acaulis</i>	Stemless goldenweed	AST
<i>Heracleum sphondylium</i> var. <i>lanatum</i>	Cow-parsnip	API
<i>Heuchera cylindrica</i> var. <i>suksdorfii</i>	Roundleaf alumroot	SAX
<i>Heuchera parvifolia</i>	Littleleaf alumroot	SAX
<i>Hieracium albiflorum</i>	White hawkweed	AST
<i>Ipomopsis spicata</i> var. <i>robruthiorum</i> [ <i>I. s. var. robruthii</i> ]	Kirkpatrick's ipomopsis	PLM
<i>Lactuca oblongifolia</i> [ <i>Lactuca pulchella</i> ]	Blue lettuce	AST
! <i>Lactuca serriola</i>	Prickly lettuce	AST
<i>Lappula redowskii</i>	Western stickseed	BOR
<i>Lepidium densiflorum</i> var. <i>macrocarpum</i>	Common peppergrass	BRA
<i>Lewisia rediviva</i>	Bitterroot	POR
<i>Linum lewisii</i>	Blue flax	LIN
<i>Lithospermum ruderale</i>	Western gromwell	BOR

<i>Lomatium attenuatum</i>	Absaroka biscuitroot	API
<i>Lupinus argenteus</i>	Silvery lupine	FAB
<i>Machaeranthera canescens</i>	Hoary aster	AST
<i>Maianthemum stellatum</i>	Starry false Solomon's- seal	LIL
<i>Melilotus officinalis</i>	Yellow sweet-clover	FAB
<i>Mentha arvensis</i>	Field mint	LAM
<i>var. canadensis</i>		
<i>Mentzelia dispersa</i>	Small-flowered stickleaf	LOA
<i>Mentzelia laevicaulis</i>	Beautiful blazingstar	LOA
<i>Mertensia viridis</i>	Green bluebells	BOR
<i>Microsteris gracilis</i>	Pink microsteris	PLM
<i>Mimulus patulus</i>	Small-flowered monkeyflower	SCR
<i>Mimulus guttatus</i>	Yellow monkeyflower	SCR
<i>Monolepis nuttalliana</i>	Povertyweed	CHN
<i>Oenothera cespitosa</i>	Tufted evening-primrose	ONA
<i>var. cespitosa</i>		
<i>Oenothera nuttallii</i>	Nuttall's evening-primrose	ONA
<i>Oenothera villosa</i>	Common evening-primrose	ONA
<i>Opuntia polyacantha</i>	Plains prickly-pear	CAC
<i>var. polyacantha</i>		
<i>Orobanche fasciculata</i>	Clustered broomrape	ORO
<i>Osmorhiza depauperata</i>	Blunt-fruit sweet-cicely	API
<i>Oxytropis besseyi</i>	Bessey's locoweed	FAB
<i>var. ventosa</i>		
<i>Oxytropis sericea</i>	Silky crazyweed	FAB
<i>Penstemon absarokensis</i>	Absaroka beardtongue	SCR
<i>Penstemon arenicola</i>	Red Desert beardtongue	SCR
<i>Penstemon deustus</i>	Hot-rock beardtongue	SCR
<i>Penstemon eriantherus</i>	Crested beardtongue	SCR
<i>var. eriantherus</i>		
<i>Penstemon glaber</i> <i>var.</i> <i>glaber</i>	Glabrous beardtongue	SCR
<i>Phacelia hastata</i>	Silverleaf phacelia	HYD
<i>Phacelia sericea</i>	Silky phacelia	HYD
<i>Phlox hoodii</i>	Hood's phlox	PLM
<i>Phlox multiflora</i>	Many-flowered phlox	PLM
<i>Physaria didymocarpa</i>	Common twinpod	BRA
<i>Polemonium pulcherrimum</i>	Pretty Jacob's-ladder	PLM

<i>Polygonum aviculare</i>	Prostrate knotweed	PLG
<i>Polygonum douglasii</i> var. <i>douglasii</i>	Douglas' knotweed	PLG
<i>Potentilla arguta</i>	Tall cinquefoil	ROS
<i>Potentilla gracilis</i>	Slender cinquefoil	ROS
<i>Potentilla hippiana</i> var. <i>effusa</i>	Woolly cinquefoil	ROS
<i>Potentilla ovina</i> var. <i>ovina</i>	Sheep cinquefoil	ROS
<i>Psoralidium lanceolatum</i>	Lemon scurf-pea	FAB
<i>Rumex aquaticus</i> var. <i>fenestratus</i>	Western dock	PLG
<i>Saxifraga bronchialis</i> var. <i>austromontana</i>	Spotted saxifrage	SAX
<i>Sedum lanceolatum</i>	Lance-leaved stonecrop	CRS
<i>Senecio canus</i>	Woolly groundsel	AST
<i>Senecio serra</i>	Butterweed groundsel	AST
<i>Senecio streptanthifolius</i> var. <i>rubricaulis</i>	Cleft-leaved groundsel	AST
<i>Silene drummondii</i>	Drummond's campion	CRY
<i>Sisyrinchium idahoense</i> var. <i>occidentale</i>	Western blue-eyed grass	IRI
! <i>Sisymbrium altissimum</i>	Tumblemustard	BRA
<i>Solidago canadensis</i>	Canada goldenrod	AST
<i>Solidago missouriensis</i> var. <i>missouriensis</i>	Missouri goldenrod	AST
<i>Solidago multiradiata</i> var. <i>scopulorum</i>	Northern goldenrod	AST
! <i>Sonchus</i> sp.	Sow-thistle	AST
<i>Sphaeralcea coccinea</i>	Red globemallow	MLV
<i>Stellaria longipes</i>	Long-stalk starwort	CRY
<i>Stephanomeria runcinata</i>	Desert wirelettuce	AST
<i>Stephanomeria tenuifolia</i>	Slender wirelettuce	AST
! <i>Taraxacum laevigatum</i>	Red-seeded dandelion	AST
! <i>Taraxacum officinale</i>	Common dandelion	AST
<i>Thalictrum fendleri</i>	Fendler's meadowrue	RAN
! <i>Thlaspi arvense</i>	Field pennycress	BRA
<i>Townsendia condensata</i> var. <i>anomala</i>	North Fork Easter-daisy	AST
<i>Toxicodendron rydbergii</i> [ <i>Rhus radicans</i> ]	Poison ivy	ANA

! <i>Tragopogon dubius</i>	Yellow salsify	AST
! <i>Trifolium hybridum</i>	Alsike clover	FAB
! <i>Trifolium repens</i>	White clover	FAB
<i>Valeriana dioica</i>	Northern valerian	VAL
<i>Vicia americana</i>	American vetch	FAB
<i>Viola purpurea</i> var. <i>venosa</i>	Goosefoot violet	VIO
<i>Zauschneria garrettii</i> [ <i>Epilobium canum</i> ]	Hummingbird flower	ONA
<i>Zigadenus venenosus</i> var. <i>gramineus</i>	Meadow death-camas	LIL

#### GRAMINOIDS

<i>Agrostis scabra</i>	Winter bentgrass	POA
<i>Bromus anomalus</i>	Nodding brome	POA
<i>Bromus carinatus</i>	California brome	POA
! <i>Bromus inermis</i> var. <i>inermis</i>	Smooth brome	POA
! <i>Bromus tectorum</i>	Cheatgrass	POA
<i>Calamagrostis canadensis</i>	Bluejoint reedgrass	POA
<i>Carex aurea</i>	Golden sedge	CYP
<i>Carex filifolia</i>	Thread-leaved sedge	CYP
<i>Carex hoodii</i>	Hood's sedge	CYP
<i>Carex interior</i>	Inland sedge	CYP
<i>Carex lanuginosa</i>	Woolly sedge	CYP
<i>Carex microptera</i> var. <i>microptera</i>	Smallwing sedge	CYP
<i>Carex praegracilis</i>	Clustered field sedge	CYP
<i>Carex rossii</i>	Ross sedge	CYP
<i>Carex rostrata</i> [ <i>Carex utriculata</i> ]	Beaked sedge	CYP
<i>Carex stenophylla</i>	Narrow-leaved sedge	CYP
<i>Carex stipata</i>	Awl-fruit sedge	CYP
<i>Eleocharis</i> sp.	Spikerush	CYP
<i>Elymus cinereus</i>	Great Basin wildrye	POA
<i>Elymus elymoides</i> [ <i>Sitanion hystrix</i> ]	Bottlebrush squirreltail	POA
<i>Elymus glaucus</i>	Blue wildrye	POA
! <i>Elymus hispidus</i>	Intermediate wheatgrass	POA
! <i>Elymus junceus</i>	Russian wildrye	POA
<i>Elymus lanceolatus</i>	Thickspike wildrye	POA

<i>var. lanceolatus</i>		
[ <i>Agropyron dasystachyum</i> ]		
<i>Elymus x saxicolus</i>	Hybrid wildrye	POA
<i>Elymus spicatus</i>	Bluebunch wheatgrass	POA
<i>Elymus trachycaulus</i>	Bearded wheatgrass	POA
<i>Festuca idahoensis</i>	Idaho fescue	POA
<i>Glyceria striata</i>	Fowl mannagrass	POA
<i>Juncus balticus</i>	Baltic rush	JUN
<i>Juncus bufonius</i>	Toad rush	JUN
<i>Juncus longistylis</i>	Long-styled rush	JUN
<i>Juncus tracyi</i>	Tracy's rush	JUN
<i>Koeleria macrantha</i>	Prairie junegrass	POA
<i>Leucopoa kingii</i>	Spike-fescue	POA
<i>Muhlenbergia richardsonis</i>	Mat muhly	POA
<i>Oryzopsis exigua</i>	Little ricegrass	POA
<i>Oryzopsis hymenoides</i>	Indian ricegrass	POA
! <i>Phleum pratense</i>	Common timothy	POA
<i>Poa cusickii</i> var. <i>epilis</i>	Skyline bluegrass	POA
<i>Poa fendleriana</i>	Muttongrass	POA
<i>Poa interior</i>	Inland bluegrass	POA
<i>Poa juncifolia</i> var. <i>ampla</i>	Alkali bluegrass	POA
! <i>Poa pratensis</i>	Kentucky bluegrass	POA
<i>Poa secunda</i>	Canby bleugrass	POA
<i>Stipa comata</i> var. <i>intermedia</i>	Needle-and-thread	POA
<i>Stipa nelsonii</i> var. <i>dorei</i>	Nelson's needlegrass	POA
<i>Stipa nelsonii</i> var. <i>nelsonii</i>	Nelson's needlegrass	POA

#### FERNS AND FERN ALLIES

<i>Cystopteris fragilis</i>	Brittle bladder fern	ASL
<i>Equisetum arvense</i>	Common horsetail	EQU
<i>Equisetum hyemale</i> var. <i>affine</i>	Common scouring-rush	EQU
<i>Equisetum laevigatum</i>	Smooth scouring-rush	EQU

#### FAUNA

## Threatened, Endangered, and Sensitive Vertebrates

Grizzly bears (*Ursos arctos*) may occur in the potential Grizzly Creek RNA sporadically, but the area is not particularly good habitat and bears do not frequent it (Larry Roop, Wyoming Game and Fish Department, personal communication, August 1997).

## Animal Species List

The field work in the potential Grizzly Creek RNA did not include identification of the animal species present.

## LANDS

The potential Grizzly Creek RNA is National Forest System land and is surrounded by National Forest System land of the Wapiti Ranger District of the Shoshone National Forest. Sixty-eight percent of the area is within the North Absaroka Wilderness Area.

## SUITABILITY FOR RESEARCH NATURAL AREA SELECTION

An area is suitable for designation as a research natural area according to how well it meets four criteria: quality, condition, viability, and defensibility (USDA Forest Service Region 2, 1993). Each criterion is briefly defined below, and the information collected during field work that is pertinent to each criterion is described.

## QUALITY

The degree to which the potential RNA represents the range in variability within the ecosystem types that it contains.

The potential Grizzly Creek RNA contains the major low-elevation ecosystem types of the Absaroka Mountains (as indicated by Kuchler [1966] vegetation types) ascribed to the Yellowstone Highlands section (McNab and Avers 1994), those being Douglas-fir woodlands, and wheatgrass-needlegrass shrub-steppe. These two vegetation types occur in a mosaic in the southern half of the area. A third Kuchler type, the fescue-wheatgrass type, is common in the area as well.

The information in Appendix 3 indicates that the Douglas-fir forests exhibit a range in species composition and in the structure of the understory. Generally, these forests appear to represent, in dominant species and in their relationships to non-forest vegetation types, the vegetation of the low-elevation Douglas-fir habitat types in the area (Steele et al. 1983). The aerial photographs of the potential RNA show a wide range in density of trees in the Douglas-fir forests. Composition and vegetation cover of the grass and shrub-steppe vegetation types also vary widely, from sparse stands of bluebunch wheatgrass to sagebrush shrublands with grass understories.

By including a range in elevation from valley bottom to timberline, the potential RNA encompasses a sequence of vegetation types from foothills grasslands and shrublands to high-elevation subalpine forest typical of the region.

#### CONDITION

The degree to which the potential RNA has been altered from pre-settlement conditions.

##### - Exotic Plants

Three exotic plant species are present throughout the potential RNA, but apparently constitute only a minor part of the vegetation. Cheatgrass (*Bromus tectorum*) is common throughout the grass and shrub-steppe vegetation, and occurs in the Douglas-fir woodlands in the southern part of the area. It generally occurs as scattered plants in the sparse vegetation, and it may form patches up to ca. 10 square meters in draws. The species dominates the herbaceous layer along the lower reaches of the unnamed, ephemeral stream across the Shoshone River from the Horse Creek Picnic Area. Kentucky bluegrass (*Poa pratensis*) also is common in the area, growing in riparian zones where it may dominate the herbaceous layer. Canada thistle (*Cirsium arvense*) is present in draws and in the riparian zones, but the 1997 field survey suggests that it is uncommon in the potential RNA. The species forms patches up to ca. 20 square meters, containing ca. 100 stems.

In the drainage basin immediately west of the potential RNA, a burned area of several thousand acres has been seeded with exotic grasses, smooth brome (*Bromus inermis* var. *inermis*) and meadow timothy (*Phleum pratense*). These two species have become well established, and may provide a source of seed for invasion into the potential RNA.

##### - Fire suppression

Suppression of fires may have caused some alteration in the low-elevation mosaic of Douglas-fir forest and shrub-steppe. The pre-settlement fire regime in most of the Yellowstone Highlands section was one of low-intensity, low-severity, patchy fires and infrequent high-intensity, severe, continuous fires, but fire suppression in the section has decreased the frequency of the mild fires and increased the frequency of the severe fires (McNab and Avery 1994). On the *Pseudotsuga menziesii*/*Agropyron spicatum* habitat types in central Montana, lack of fire results in an increase in tree density and fuel loads, with a resulting increase in flammability (Fischer and Clayton 1983). Lack of fire may also allow conversion of grass or shrub-steppe vegetation to woodland or forest. On the *P. menziesii*/*Festuca idahoensis* and the *P. menziesii*/*Symphoricarpos albus* habitat types, fire may have maintained open, park-like stands, which

have become more dense with fire suppression (Fischer and Clayton 1983).

Fire suppression may thus have increased the area covered by Douglas-fir forest in the potential RNA, and increased the density of already-established stands.

#### - Structures

The only structure observed during the 1997 field survey was a small (< 1 acre, or 0.4 ha) dilapidated enclosure in the valley in the southwestern part of the area (Figure 2). This enclosure apparently was used to study the effects of grazing.

#### VIABILITY

The prospect for long-term maintenance of the ecosystem types in the area and the survival of their constituent species.

As is true throughout the Rocky Mountains (Peet 1988), fire has no doubt been a major factor in shaping the vegetation of the potential RNA. The role of fire may be inferred by reference to studies in similar vegetation types in Montana (Fischer and Clayton 1983). On the warmest Douglas-fir habitat types (fire group 4), including the *P. menziesii*/*Agropyron spicatum* habitat type, the fire frequency was 5 to 20 years. The fire frequency was longer (perhaps 35 to 40 years) on the *P. menziesii*/*Festuca idahoensis* habitat type (fire group 5), and over 40 years on the *P. menziesii*/*Symphoricarpos oreophilus* habitat type (fire group 6). Fire in these types probably maintained relatively open Douglas-fir stands and maintained areas of grassland and shrubland in the vegetation mosaic.

If this interpretation is correct, then maintenance over the long term of the vegetation mosaic of Douglas-fir forests with grasslands and shrub-steppe will depend on a fire management program with rather frequent fires. The potential RNA may be small enough that, for the purpose of fire management, it must be treated as part of a larger management unit.

The large populations of smooth brome (*Bromus inermis* var. *inermis*) and meadow timothy (*Phleum pratense*) in the drainage basin immediately west of the potential RNA may serve as reservoirs for invasion of these exotic species into the area.

## DEFENSIBILITY

The extent to which the area can be protected from extrinsic, anthropogenic factors that might worsen the condition of the area or threaten the viability of the ecosystems present.

No immediate threats to the ecosystems in the potential RNA were obvious during the 1997 field work. The lack of easy access to the area, and the prohibition on motor vehicles, will greatly reduce the number of visitors.

## DEGREE TO WHICH THE POTENTIAL RNA MEETS CRITERIA

The potential Grizzly Creek RNA contains a variety of grass, shrub-steppe, and Douglas-fir vegetation types representative of the dry, low elevations of the Absaroka Mountains. Fire suppression may have changed the vegetation mosaic and the structure of Douglas-fir stands that existed before settlement by Europeans, but the viability of the ecosystem types probably can be assured with a prescribed fire program. The lack of easy access to the area makes it relatively easy to defend.

## IMPACTS AND POSSIBLE CONFLICTS

This section is limited to the conflicts obvious from field survey and from conversations with USDA Forest Service staff.

## MINERAL RESOURCES

No evidence was observed during field survey to suggest that mineral resources would conflict with RNA designation.

## GRAZING

No evidence of livestock grazing was observed during field survey.

## TIMBER

Approximately 68% of the potential Grizzly Creek RNA is within the North Absaroka Wilderness Area, where timber harvest is prohibited. Woodlands in the remainder of the area are so sparse that they appear to offer little merchantable timber.

## WATERSHED VALUES

The potential RNA includes the entire watershed of Grizzly Creek and the southern part of the watershed of Horse Creek. No evidence was observed during field survey to suggest that RNA designation would conflict with watershed values.

## RECREATION VALUES

The field survey of the area suggests that it receives little recreational use. Hunting in the fall probably is the main use of the area. The portion of the potential RNA outside

(south) of the North Absaroka Wilderness Area is open to snowmobile use, but the difficulty of reaching the area probably makes it unattractive to snowmobiles. Hence RNA designation apparently would have little effect on recreational use of the area.

#### WILDLIFE AND PLANT VALUES

No evidence was observed during field survey to suggest that RNA designation would conflict with management of the area for wildlife and plant values. The potential RNA contains four species of rare vascular plants that would appear to benefit from RNA designation.

#### TRANSPORTATION VALUES

The potential RNA apparently contains two mapped Forest Trails. Trail #795 more-or-less parallels the eastern boundary of the area (and might make a good boundary). Trail #786, shown on the Flag Peak 7.5-minute topographic quad but not on the Shoshone National Forest visitor map, heads on the northern side of the Shoshone River and ascends Horse Creek across the western part of the area, and Access to Trail #786 can be gained only by fording the Shoshone River from the Horse Creek Picnic Area on the river's southern bank, and therefore probably receives little use. The topography in the southeastern part of the potential RNA is so rugged that few travellers on that trail are likely to leave it and strike cross-country through the potential RNA. Consequently, RNA designation probably would have little impact on transportation values.

#### MANAGEMENT CONCERNS

No evidence was observed during the 1997 survey to suggest that RNA designation would conflict with existing or potential management of the potential Grizzly Creek RNA.

#### REFERENCES

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakley. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume II: the national vegetation classification system: list of types. The Nature Conservancy, Arlington VA, USA.

Bailey, R. G. et al. 1994. Ecoregions and subregions of the United States. 1:7,500,000-scale map. USDA Forest Service.

Dorn, R. D. 1992. Vascular Plants of Wyoming, second edition. Mountain West Publishing, Cheyenne, WY. 340 pp.

Estill, E. 1993. Interim directive 2600-93-1. USDA Forest Service Region 2, Denver, CO. (Interim directive establishing Sensitive species in Region 2).

Evert, E. F. 1991. Annotated checklist of the vascular plants of the North Fork Shoshone River drainage, northwest Wyoming. Unpublished report. 64 pp.

Federal Geographic Data Committee. 1997. National vegetation classification standard. FGDC-STD-005. Vegetation subcommittee, June 1997.

Fertig, W. 1997. Plant species of special concern on Shoshone National Forest: 1996 survey results. Unpublished report prepared by the Wyoming Natural Diversity Database, Laramie, WY.

Fertig, W. and G. Beauvais. 1999. Wyoming Plant and Animal Species of Special Concern. Wyoming Natural Diversity Database, Laramie, WY.

Fertig, W., C. Refsdal, and J. Whipple. 1994. Wyoming Rare Plant Field Guide. Wyoming Rare Plant Technical Committee, Cheyenne, WY. No pagination.

Fischer, William C. and Bruce D. Clayton. 1983. Fire ecology of Montana forest habitat types east of the Continental Divide. USDA Forest Service General Technical Report INT-141. Intermountain Forest and Range Experiment Station, Ogden UT. 83 pp.

Freeouf, Jerry A. (editor). 1996. Ecoregions and subregions of Region 2 - subsections, State of Wyoming. 1:1,000,000-scale map prepared by USDA Forest Service, Natural Resource Information Team. Revised May 1996.

Hitchcock, C. L. and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, WA. 730 pp.

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. Lakewood CO. 429 pp.

Kirkpatrick, R. S. 1987. A flora of the southeastern Absarokas, Wyoming. Unpublished Master's Thesis, University of Wyoming, Laramie, WY.

Kuchler, A. W. 1966. Potential natural vegetation. Pp. 90-91 in: Gerlach, A. D. (ed.). 1970. The national atlas of the United States of America. USDI Geological Survey, Washington, DC.

- Love, J. D. and A. C. Christiansen. 1985. Geologic Map of Wyoming. USDI Geological Survey, Reston, VA. 1:500,000 scale.
- McNab, W. Henry and Peter E. Avers (compilers). 1994. Ecological subregions of the United States: section descriptions. USDA Forest Service administrative publication WO-WSA-5. 267 pp.
- Mills, S. and W. Fertig. 1996. Field guide to rare and sensitive plants of the Shoshone National Forest. Unpublished report prepared by the Wyoming Natural Diversity Database, Laramie, WY. No pagination.
- Peet, Robert K. 1988. Forests of the Rocky Mountains. Chapter 3 in: Barbour, Michael G. and William Dwight Billings (editors). 1988. North American terrestrial vegetation. Cambridge University Press. 434 pp.
- Snow, N. 1992-1994. The vascular flora of southeastern Yellowstone National Park and the headwaters region of the Yellowstone River, Wyoming. The Wasmann Journal of Biology 50(1-2): 52-95.
- Steele, Robert, Stephen V. Cooper, David M. Ondov, David W. Roberts, and Robert D. Pfister. 1983. Forest habitat types of eastern Idaho - western Wyoming. USDA Forest Service General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden UT. 122 pp.
- Tweit, Susan J. and Kent E. Houston. 1980. Grassland and shrubland habitat types of the Shoshone National Forest. USDA Forest Service, Shoshone National Forest, Cody WY. 143 pp.
- USDA Forest Service Region 2. 1993. Research Natural Area Guide for the Rocky Mountain Region, USDA Forest Service. Review draft. Rocky Mountain Region, Lakewood, CO. 38 pp.
- Vanderhorst, J. and B. L. Heidel. 1998. Conservation status of *Lomatium attenuatum* Evert (Apiaceae) in Montana. Unpublished report prepared for the Bureau of Land Management by the Montana Natural Heritage Program, Helena, MT. 20 pp. + app.
- Weber, W. A. 1982. Mnemonic three-letter acronyms for the families of vascular plants: a device for more effective herbarium curation. Taxon 31 (1): 74-88.
- Welsh, S. L., N. D. Atwood, S. Goodrich, and L. C. Higgins. 1993. A Utah Flora, second edition, revised. Brigham Young University, Provo, UT. 986 pp.

## APPENDIXES

APPENDIX 1. MAPS OF THE POTENTIAL GRIZZLY CREEK RESEARCH NATURAL  
AREA.

Figure 1. Contour map showing complexes of Kuchler (1966) vegetation types and SAF cover types (Eyre 1980) in the potential Grizzly Creek RNA.

Kuchler/SAF Types	Map Symbol
Wheatgrass-needlegrass shrubsteppe (M) with sparsely-vegetated slopes (M), and Douglas fir forest (=SAF Interior Douglas fir) (m)	50
Douglas fir forest (=SAF Interior Douglas fir) (M) with Wheatgrass-needlegrass shrubsteppe (M), Fescue-wheatgrass (m), and sparsely-vegetated slopes (m)	11/50
Douglas fir forest (=SAF Interior Douglas fir) (M) with Fescue-wheatgrass (M) and sparsely-vegetated slopes (m)	11/43
Western spruce-fir forest (=SAF Engelmann spruce-subalpine fir (M) with sparsely-vegetated slopes (M)	14

Figure 2. Contour map showing complexes of plant communities in the potential Grizzly Creek RNA. Synonyms for community names are listed in Appendix 5.

Communities	Map Symbol
Bluebunch wheatgrass (M), Basin big sagebrush/bluebunch wheatgrass (M), Black sagebrush/bluebunch wheatgrass (M), and sparsely-vegetated slopes (M), with Douglas-fir/bluebunch wheatgrass (m) and Balsam poplar - Douglas-fir (m)	1
Douglas-fir/bluebunch wheatgrass (M), Douglas-fir/Idaho fescue (M), and Douglas-fir/common snowberry (M), with Mountain big sagebrush/Idaho fescue (m), Mountain big sagebrush/bluebunch wheatgrass (m), Basin big sagebrush/bluebunch wheatgrass (m), Bluebunch wheatgrass (m), Thinleaf alder/red-osier dogwood (m), and sparsely-vegetated slopes (m)	2
Douglas-fir/Idaho fescue (M) and Douglas-fir/common snowberry (M) with Douglas-fir/bluebunch wheatgrass (m), Mountain big sagebrush/Idaho fescue (m), Bluebunch wheatgrass (m), and Thinleaf alder/red-osier dogwood (m), and sparsely-vegetated slopes (m)	3
Spruce-fir forest (M) and sparsely-vegetated slopes (M)	4

Sample plots

Locations of vegetation descriptions

## APPENDIX 2. PHOTOGRAPHS FROM THE POTENTIAL GRIZZLY CREEK RNA

### Photo WF1

Southern end of area; looking southeast down valley of unnamed creek between Horse Creek and Grizzly Creek. Vegetation is mosaic of Wyoming big sagebrush shrubland and bluebunch wheatgrass grassland. Trees in mid-ground are scattered Douglas-fir and Rocky Mountain juniper. Woodlands on distant slopes are Douglas-fir and limber pine.

### Photo 97GJ5.8

From western boundary of area looking northeast across Horse Creek. Vegetation is a mosaic of Douglas-fir woodlands, mountain big sagebrush shrubland, and bluebunch wheatgrass grassland.

### Photo WF2

Central part of the area, in drainage of Grizzly Creek. Vegetation is mosaic of Douglas-fir woodlands with mountain big sagebrush shrubland in openings.

### Photo WF3

Looking at the northern end of the area. Vegetation in foreground and mid-ground is mosaic of Douglas-fir woodlands with mountain big sagebrush shrublands in openings. At the northern end, the vegetation is patchy subalpine woodland with barren slopes and talus.

APPENDIX 3. CANOPY COVER OF PLANTS IN PLOTS AND AT LOCATIONS OF VEGETATION DESCRIPTIONS IN THE POTENTIAL GRIZZLY CREEK RESEARCH NATURAL AREA

Estimates of canopy cover from sample plots are shown in tables. The cover values for species are midpoints of the following cover classes:

<u>Cover Value</u>	<u>Range of Canopy Cover</u>
1	<1%
3	1% - 5%
10	5% - 15%
20	15% - 25%
30	25% - 35%
40	35% - 45%
50	45% - 55%
60	55% - 65%
70	65% - 75%
80	75% - 85%
90	85% - 95%
97	95% - 100%

The vegetation descriptions are for parts of stands and were not made for formal sample plots. At each location, the species in each stratum of the vegetation are listed approximately in order from those with the most canopy cover to those with the least.

Locations of sample plots and of vegetation descriptions are shown on Figure 2.

Table 3-1. Canopy cover (and height, for trees) of plants in Douglas-fir sample plots in the potential Grizzly Creek RNA. Single numbers in cells are canopy cover values; for trees, numerators are canopy cover values, and denominators are height in meters.

	1	2
	Psemen/ Elyspi	Psemen/ Fesida
Species		
TREES		
<i>Pseudotsuga menziesii</i>	40/20	50/25
DWARF SHRUBS		
<i>Chrysothamnus viscidiflorus</i>		1
<i>Symphoricarpos albus</i>	1	1
GRAMINOIDS		
<i>Carex rossii</i>	1	
<i>Elymus elymoides</i>	1	1
<i>Elymus spicatus</i>	3	1
<i>Festuca idahoensis</i>		20
<i>Koeleria macrantha</i>		1
<i>Leucopoa kingii</i>	1	30
<i>Oryzopsis exigua</i>	3	
<i>Poa cusickii</i>		1
<i>Poa interior</i>	1	1
<i>Poa secunda</i>		1
<i>Stipa nelsonii</i>	1	
FORBS		
<i>Achillea millefolium</i>		1
<i>Antennaria umbrinella</i>	1	1
<i>Arenaria congesta</i>		1
<i>Arnica cordifolia</i>		3
<i>Artemisia frigida</i>		1
<i>Aster adscendens</i>	1	
<i>Aster peregrinus</i>		1
<i>Astragalus miser</i>		20
<i>Balsamorhiza sagittata</i>	1	
<i>Campanula rotundifolia</i>	1	
<i>Chenopodium praticola</i>		1
<i>Cryptantha</i> sp.		1
<i>Delphinium nuttallianum</i>	1	1
<i>Disporum trachycarpum</i>		1
<i>Epilobium brachycarpum</i>	1	

Fragaria vesca		20
Geum triflorum		3
Heuchera cylindrica		1
Hieracium albiflorum	1	1
Mertensia viridis		3
Penstemon sp.		1
Phacelia sericea	1	
Phlox multiflora		1
Sedum lanceolatum		1
Senecio canus	1	
Silene douglasii	1	1
Taraxacum sp.		1
GROUND COVER		
Bare ground	1	20
Gravel	1	1
Rock	3	1
Litter	85	45
Wood	7	6
Moss		20
Basal vegetation	3	7

**Association acronyms:**

Psemen/Elyspi = Pseudotsuga menziesii/Elymus spicatus (Douglas-fir/bluebunch wheatgrass)

Psemen/Fesida = Pseudotsuga menziesii/Festuca idaoensis (Douglas-fir/Idaho fescue)

**Notes**

Plot 1: Lower part of gentle, south-facing slope. 10 m x 25 m. Photo 97GJ4.28.

Plot 2: Upper part of north-facing slope. 10 m x 25 m. No photo.

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Table 3-2. Canopy cover of plants in sagebrush sample plots in the potential Grizzly Creek RNA.

	3	4	5	6
	Atv/ Elyspi	Atv/ Elyspi	Artnov/ Elyspi	Att/ Elyspi
Species				
SHRUBS				
Artemisia tridentata ssp. tridentata				30
Pinus flexilis		1		
DWARF SHRUBS				
Artemisia nova	1		10	
Artemisia tridentata ssp. vaseyana	10	10		
Chrysothamnus nauseosus	1	1	1	1
Chrysothamnus viscidiflorus		1	1	1
Symphoricarpos oreophilus		1		
GRAMINOIDS				
Bromus tectorum*	3	1	3	10
Carex stenophylla		1		1
Danthonia unispicata	1			
Elymus cinereus				1
Elymus spicatus	10	10	20	10
Elymus trachycaulus var. trachycaulus				10
Festuca idahoensis	3			
Koeleria macrantha	10	10	1	
Leucopoa kingii	1			
Oryzopsis hymenoides	1	1	1	
Poa secunda	10	10		
Stipa comata		3	1	10
FORBS				
Allium cernuum	1			
Allium sp.		1		
Antennaria micropophylla	3	1	1	1
Arenaria congesta	1			
Artemisia frigida		1	1	1
Astragalus miser	3	1		
Calchortus sp.	1			
Castilleja sp.	1	1		1
Chenopodium sp.				1
Comandra umbellata		3		1
Crepis sp.			1	1

Dodecatheon pulchellum	1			
Epilobium brachycarpum	1		1	
Erigeron sp.		1	1	
Eriogonum pauciflorum	1	1		
Eriogonum umbellatum	1	1		
Fritillaria atropurpurea			1	
Haplopappus acaulis	1			
Lappula redowskii		1		1
Lithospermum ruderale				1
Machaeranthera canescens		1	1	
Mentzelia sp.			1	
Oenothera sp.			1	
Opuntia polyacantha		1	1	
Orobanche fasciculata		1	1	
Oxytropis sp.		1		
Penstemon sp.			1	
Phlox hoodii	1	1		
Polygonum douglasii	1		1	
Sedum lanceolatum	1			
Senecio canus			1	1
Silene douglasii		1		
Stephanomeria tenuifolia	1		1	
Taraxacum sp.				1
Tragopogon dubius*		1	1	
GROUND COVER				
Bare ground	66	81	1	30
Gravel	25	3	81	1
Rock	10	1	4	1
Litter	5	7	3	60
Wood		5	1	2
Moss	1	1		
Basal vegetation	2	3	3	2

**Association acronyms:**

Atv/Elyspi = Artemisia tridentata ssp. vaseyana/Elymus spicatus  
(Mountain big sagebrush/bluebunch wheatgrass)

Artnov/Elyspi = Artemisia nova/Elymus spicatus (Black  
sagebrush/bluebunch wheatgrass)

Att/Elyspi = Artemisia tridentata ssp. tridentata/Elymus spicatus  
(Basin big sagebrush/bluebunch wheatgrass)

Plot 3: Middle of moderately-steep, northeast-facing slope, above  
plot 4. 10 m x 30 m. Photo 97GJ5.9.

Plot 4: Foot of northeast-facing slope, below plot 3. 10 m x 30  
m. Photo 97GJ5.9.

Plot 5: Lower portion of southwest-facing slope. This vegetation  
accounts for ca. 15% of slope; remainder is rock outcrop,

bluebunch wheatgrass vegetation herbaceous, mountain big sagebrush/bluebunch wheatgrass shrub vegetation. 10 m x 20 m. Photo 97GJ5.10

Plot 6: Alluvial fan at foot of southwest-facing slope. One patch of patchy vegetation type. 10 m x 30 m. No photo

Table 3-3. Size-class structure of trees in sample plots.

Plot 1; 10 m x 25 m				DBH,	INCHES	
SPECIES	<Breast Height	<5"	<9"	<14"	<21"	<36"
Juniperus scopulorum, live	5	18				
Juniperus scopulorum, dead		2				
Pinus flexilis, dead		1				
Pseudotsuga menziesii, live		2	5	1	3	
Pseudotsuga menziesii, dead			2		2	

Plot 2; 10 m x 25 m				DBH,	INCHES	
SPECIES	<Breast Height	<5"	<9"	<14"	<21"	<36"
Juniperus scopulorum, live	3	2				
Pseudotsuga menziesii, live		23	9	2	1	
Pseudotsuga menziesii, dead		23	2	1		

## VEGETATION DESCRIPTIONS

Numbers following species names indicate canopy cover classes shown on page 31.

**LOCATION 1.** Hill on east side of Horse Creek ca. 2.5 miles (4 km) north of Shoshone River.

VEGETATION TYPE: Mountain big sagebrush/Idaho fescue sparse shrubland

ELEVATION: 6900 feet (2103 meters). ASPECT: West

TOPOGRAPHIC POSITION: Lower slope

DESCRIPTION: Sparse shrub layer above a dense herbaceous layer dominated by grasses

Trees:

Shrubs: *Juniperus scopulorum* 5

Dwarf Shrubs: *Artemisia tridentata* ssp. *vaseyana* 10

Graminoids & Forbs: *Elymus spicatus* 30, *Festuca idahoensis* 10, *Balsamorhiza sagittata* 3

NOTES: This vegetation type forms a mosaic with rock outcrops and with patches of sparse bluebunch wheatgrass and cheatgrass with scattered Rocky Mountain juniper.

**LOCATION 2.** Tributary ca. 0.15 mile (0.24 km) east of Horse Creek, ca. 2.5 miles (4 km) north of the Shoshone River.

VEGETATION TYPE: Douglas-fir/common snowberry forest

ELEVATION: 6700 feet (2042 meters). ASPECT: West

TOPOGRAPHIC POSITION: Bottom of small valley

DESCRIPTION: Open woodland with dense shrub layer

Trees: *Pseudotsuga menziesii* 20, *Populus tremuloides* 1

Shrubs: *Rosa woodsii* 40, *Juniperus scopulorum* 3, *Ribes oxycanthoides* 1

Dwarf Shrubs: *Symphoricarpos albus* 40

Graminoids & Forbs: *Aster conspicuus* 60, *Elymus trachycaulus* var. *trachycaulus* 1, *Poa juncifolia* var. *ampla* 1, *Poa interior* 1

NOTES:

**LOCATION 3.** Tributary ca. 0.15 mile (0.24 km) east of Horse Creek, ca. 2.5 miles (4 km) north of the Shoshone River.

VEGETATION TYPE: Douglas-fir/Idaho fescue forest

ELEVATION: 6800 feet (2072 meters). ASPECT: Northwest

TOPOGRAPHIC POSITION: Lower half of slope

DESCRIPTION: Open woodland with a dense herbaceous layer

Trees: *Pseudotsuga menziesii*

Shrubs: *Juniperus scopulorum*

Dwarf Shrubs:

Graminoids & Forbs: *Festuca idahoensis*, *Leucopoa kingii*, *Geum triflorum*, *Antennaria* sp.

NOTES:

**LOCATION 4.** Horse Creek ca. 2.5 miles (4 km) north of the Shoshone River.

VEGETATION TYPE: Thinleaf alder/red-osier dogwood  
ELEVATION: 6600-6740 feet (2011-2054 meters). ASPECT: South  
TOPOGRAPHIC POSITION: Riparian zone in bottom of valley  
DESCRIPTION: Narrow fringe of riparian vegetation. Scattered trees above a tall alder shrub layer and a lower layer of dogwood and a patchy herbaceous layer.  
Trees: *Pseudotsuga menziesii*, *Populus balsamifera* (both scattered)  
Shrubs: *Alnus incana*, *Salix bebbiana* (sparse), *Salix lasiandra* (scattered) above *Cornus sericea*, *Rosa woodsii*  
Dwarf Shrubs:  
Graminoids & Forbs: *Equisetum arvense*, *Maianthemum stellatum*  
NOTES: This vegetation is somewhat patchy.

**LOCATION 5.** Slope ca. 0.25 mile (0.4 km) west of Horse Creek and ca. 2.5 miles (4 km) north of the Shoshone River.

**5a.**

VEGETATION TYPE: Bluebunch wheatgrass sparse vegetation  
ELEVATION: 7100-7200 feet (2164-2194 meters). ASPECT: South  
TOPOGRAPHIC POSITION: Rock outcrops on slope  
DESCRIPTION: Sparse bunchgrass vegetation in a mosaic of patches  
Trees:  
Shrubs:  
Dwarf Shrubs:  
Graminoids & Forbs: *Elymus spicatus*, *Oryzopsis hymenoides*, *Eriogonum pauciflorum*, *E. umbellatum*, *Bromus tectorum*  
NOTES:

**5b.**

VEGETATION TYPE: Douglas-fir/bluebunch wheatgrass  
ELEVATION: 7100-7200 feet (2164-2194 meters). ASPECT: South  
TOPOGRAPHIC POSITION: Talus cones  
DESCRIPTION: Scattered trees and shrubs above a sparse herbaceous layer  
Trees: *Pseudotsuga menziesii*, *Pinus flexilis*  
Shrubs: *Juniperus scopulorum*  
Dwarf Shrubs:  
Graminoids & Forbs: *Elymus spicatus*  
NOTES:

**5c.**

VEGETATION TYPE: Mountain big sagebrush/bluebunch wheatgrass  
ELEVATION: 7100-7200 feet (2164-2194 meters). ASPECT: South  
TOPOGRAPHIC POSITION: Draw  
DESCRIPTION: Patch of shrub-steppe vegetation in a mosaic of sparse vegetation and rock outcrops  
Trees:

Shrubs:

Dwarf Shrubs: *Artemisia tridentata* ssp. *vaseyana*

Graminoids & Forbs: *Elymus spicatus*

NOTES:

**5d.**

VEGETATION TYPE: Douglas-fir/bluebunch wheatgrass

ELEVATION: 7100-7200 feet (2164-2194 meters). ASPECT: North

TOPOGRAPHIC POSITION: Slope

DESCRIPTION: Patch of woodland restricted to north-facing slope

Trees: *Pseudotsuga menziesii*

Shrubs:

Dwarf Shrubs:

Graminoids & Forbs: *Elymus spicatus*, *Leucopoa kingii*

NOTES:

**LOCATION 6.** Slope ca. 0.35 mile (0.5 km) west of Horse Creek and  
ca. 0.35 mile (0.5 km) north of the Shoshone River

**6a.**

VEGETATION TYPE: Douglas-fir/bluebunch wheatgrass woodland

ELEVATION: 6400-6600 feet (1951-2012 meters). ASPECT: Northeast

TOPOGRAPHIC POSITION: Broad draw

DESCRIPTION: Open tree layer above moderately dense herbaceous  
layer.

Trees: *Pseudotsuga menziesii* 30 (25 m tall, 7"-14" dbh)

Shrubs: *Juniperus scopulorum* 3 (5 m tall)

Dwarf Shrubs:

Graminoids & Forbs: *Elymus spicatus* 10, *Leucopoa kingii* 10, *Poa  
secunda* 3, *Festuca idahoensis* 1, *Stephanomeria tenuifolia* 1

NOTES: This stand is below the grass vegetation of 6b and across  
the valley from the grass vegetation at 6c.

**6b.**

VEGETATION TYPE: Bluebunch wheatgrass-King spikefescue

ELEVATION: 6600 feet (2012 meters). ASPECT: Northeast

TOPOGRAPHIC POSITION: Upper slope

DESCRIPTION: Open herbaceous vegetation with a sparse shrub layer

Trees:

Shrubs: *Juniperus scopulorum* 3

Dwarf Shrubs: *Artemisia tridentata* ssp. *vaseyana* 10

Graminoids & Forbs: *Elymus spicatus* 10, *Leucopoa kingii* 10, *Poa  
secunda* 3, *Festuca idahoensis* 3, *Stephanomeria tenuifolia* 1

NOTES: This stand is above the woodland at 6a and across the  
valley from the herbaceous vegetation at 6c.

**6c.** VEGETATION TYPE: Bluebunch wheatgrass  
ELEVATION: 6600 feet (2012 meters). ASPECT: Southeast  
TOPOGRAPHIC POSITION: Upper slope  
DESCRIPTION: Scattered trees above scattered shrubs and sparse herbaceous vegetation  
Trees: *Pinus flexilis* 3, *Pseudotsuga menziesii* 3  
Shrubs: *Juniperus scopulorum* 3  
Dwarf Shrubs: *Artemisia tridentata* ssp. *vaseyana* 1  
Graminoids & Forbs: *Elymus spicatus* 10, *Stipa nelsonii* 3, *Poa nervosa* 1  
NOTES: This stand is across the valley from the woodland at 6a and the herbaceous vegetation at 6c.

**LOCATION 7.** Slope ca. 0.25 mile (0.4 km) west of Horse Creek and ca. 0.25 mile (0.4 km) north of the Shoshone River  
VEGETATION TYPE: Douglas-fir/bluebunch wheatgrass  
ELEVATION: 6240-6440 feet (1902-1963 meters). ASPECT: North-northeast  
TOPOGRAPHIC POSITION: Slope  
DESCRIPTION: Open woodland with an open herbaceous understory  
Trees: *Pseudotsuga menziesii* 30 (15 m tall, 6"-12" dbh)  
Shrubs: *Juniperus scopulorum* 1  
Dwarf Shrubs:  
Graminoids & Forbs: *Elymus spicatus* 20, *Leucopoa kingii* 3  
NOTES:

**LOCATION 8.** Eastern side of broad valley across the Shoshone River from Horse Creek Picnic Area, to ca. 1 mile (1.6 km) north of the river  
VEGETATION TYPE: Black sagebrush/bluebunch wheatgrass  
ELEVATION: 6000-6400 feet (1829-1951 meters). ASPECT: Southwest  
TOPOGRAPHIC POSITION: Slope  
DESCRIPTION: Sparse shrub steppe  
Trees:  
Shrubs:  
Dwarf Shrubs: *Artemisia nova*  
Graminoids & Forbs: *Elymus spicatus*  
NOTES: This vegetation was observed from ca. 0.25 mile (0.4 km) across the river to the south and west, through binoculars. It appears to be the same type as the vegetation in plot 5.

**LOCATION 9.** Terrace north of Shoshone River, across River from Horse Creek Picnic Area  
VEGETATION TYPE: Basin big sagebrush/bluebunch wheatgrass  
ELEVATION: 5880-6000 feet (1792-1829 meters). ASPECT: South  
TOPOGRAPHIC POSITION: Gently-sloping fan and fluvial terrace  
DESCRIPTION: Tall shrub layer above an open herbaceous understory.

Trees:

Shrubs: *Artemisia tridentata* ssp. *tridentata*

Dwarf Shrubs:

Graminoids & Forbs: *Elymus spicatus*, *Stipa comata*, *Elymus trachycaulus* var. *trachycaulus*

NOTES: This vegetation was observed from ca. 500 feet (152 m) across the river to the south, through binoculars. It appears to be the same type as the vegetation on the fluvial terrace on the south side of the river (from which the observation was made), which is the same type as the vegetation in plot 6.

**LOCATION 10.** Slope ca. 0.25 mile (0.4 km) north of the Shoshone River, across the river from Horse Creek Picnic Area

VEGETATION TYPE: Bluebunch wheatgrass sparse vegetation

ELEVATION: 6000-6300 feet (1829-1920 meters). ASPECT: South

TOPOGRAPHIC POSITION: Slope

DESCRIPTION: Sparse bunchgrass vegetation

Trees:

Shrubs:

Dwarf Shrubs:

Graminoids & Forbs: *Elymus spicatus*

NOTES: This vegetation was observed from ca. 0.35 mile (0.6 km) across the river to the south, through binoculars. It appears to be the same type as the vegetation at location 5a.

**LOCATION 11.** Horse Creek ca. 0.7 mile (1.1 km) above its confluence with the Shoshone River

VEGETATION TYPE: Douglas-fir - Balsam poplar woodland

ELEVATION: 6040-6150 feet (1841-1874 meters). ASPECT: Southeast

TOPOGRAPHIC POSITION: Narrow floodplain and fluvial terraces

DESCRIPTION: Narrow (<75 feet, or 23 m, wide) fringe of riparian woodland. Trees form a patchy overstory above a moderately-dense shrub layer and a dense herbaceous layer. The trees are found mainly on the higher terrace; composition of the shrub layer differs between the floodplain and the terrace.

Trees: *Pseudotsuga menziesii* 20 (30 m tall), *Populus*

*balsamifera* 20 (15 m tall), *Pinus flexilis* 10 (15 m tall)

Shrubs: *Alnus incana* 30 (5 m tall), near channel; *Rosa woodsii* 30 (1 m tall), throughout; *Juniperus scopulorum* 5 (5 m tall), upper terrace.

Dwarf Shrubs:

Graminoids & Forbs: *Poa pratensis* 40 (upper terrace), *Equisetum arvense* 5 (floodplain)

NOTES:

**LOCATION 12.** Steep, south-facing hills south of Signal Peak, in the southeastern corner of the area.

**12a.**

VEGETATION TYPE: Narrowleaf cottonwood - Douglas-fir woodland  
ELEVATION: 6000 feet (1829 meters). ASPECT: South  
TOPOGRAPHIC POSITION: Narrow draws in south-facing slopes  
DESCRIPTION: Cottonwoods and Douglas-firs form a patchy overstory above a dense shrub layer.

Trees: *Populus angustifolia*, *Pseudotsuga menziesii*  
Shrubs: *Rosa sayi*, *Acer glabrum*, *Prunus virginiana*, *Cornus sericea*

Dwarf Shrubs:

Graminoids & Forbs:

NOTES: The community type to which this vegetation belongs is uncertain. The vegetation occurs as small patches along ephemeral stream channels and around springs.

**12b.**

VEGETATION TYPE: Sedge wetlands  
ELEVATION: 6000 feet (1829 meters). ASPECT: South  
TOPOGRAPHIC POSITION: South-facing slopes  
DESCRIPTION: Small patches (ca. 100 square meters) of herbaceous vegetation growing around springs

Trees:

Shrubs:

Dwarf Shrubs:

Graminoids & Forbs: *Carex stipata*, *Eleocharis* sp., *Juncus balticus*, *J. traceyi*

NOTES: The community type to which this vegetation belongs is uncertain.

**LOCATION 13.** Unnamed stream in the broad valley in the southwestern corner of the area.

VEGETATION TYPE: Water sedge-beaked sedge  
ELEVATION: 6200 feet (1890 meters). ASPECT: South  
TOPOGRAPHIC POSITION: Bottom of valley  
DESCRIPTION: Dense sedge vegetation growing along ephemeral stream. Small patches of shrubs contribute little cover.

Trees:

Shrubs: *Salix bebbiana*, *Rosa sayi*

Dwarf Shrubs:

Graminoids & Forbs: *Carex aquatilis*, *Carex rostrata* (C. *utriculata*), *C. lanuginosa*

NOTES:

#### APPENDIX 4. EXPLANATIONS OF RANKS USED BY THE WYOMING NATURAL DIVERSITY DATABASE

As part of the North American network of natural heritage programs, the Wyoming Natural Diversity Database (WYNDD) uses the natural heritage element ranking system developed by The Nature Conservancy. In this system, each element (in this case, species) is assigned a two-part rank that reflects its rarity and security both globally (the G part of the rank) and within a state or province (the S part of the rank). Both the global rank and the state rank can range from 1 (extremely rare or threatened) to 5 (common and secure). Ranks are defined as follows:

##### Global Ranks

- G1: Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals) or because of some factors making it especially vulnerable to extinction.
- G2: Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals) or because of factors making it very vulnerable to extinction.
- G3: Either very rare and localized throughout its range, or found locally (and perhaps abundantly at some sites) throughout a restricted range, or vulnerable to extinction throughout its range.
- G4: Apparently secure globally, although it may be quite rare in parts of its range, especially at the periphery.
- G5: Demonstrably secure globally and essentially ineradicable under present conditions.
- T: A "T" following the global rank (G#T#) refers to a rank assigned to a subspecific taxon. The number following the "G" is the rank of the species, and the number following the "T" is the rank of the subspecific taxon.
- Q: Taxonomic questions or problems exist about the taxon; more information is needed. A "G#Q" rank implies that the taxonomic distinctiveness of the taxon may be of questionable validity. A "G#T#Q" rank implies that the taxonomic distinctiveness of the subspecific taxon is of questionable validity.

### State Ranks

- S1: Critically imperiled in the state or province because of extreme rarity (5 or fewer occurrences or very few remaining individuals) or because of some factors making it especially vulnerable to extinction.
- S2: Imperiled in the state or province because of rarity (6 to 20 occurrences or few remaining individuals) or because of factors making it very vulnerable to extinction.
- S3: Rare or uncommon in the state (on the order of 21 to 100 occurrences).
- S4: Apparently secure in the state or province, with many occurrences.
- G5: Demonstrably secure in the state or province and essentially ineradicable under present conditions.
- SU: Possibly imperiled in the state but status is uncertain; more information needed before a numerical rank can be assigned.
- S?: Status uncertain due to lack of information. The "?" is usually combined with any of the numerical ranks, as in "S3?".

### Migratory Ranks

- B: A "B" following a rank (e.g., S3B) indicates that the rank refers to the breeding status of the species within the state. B ranks are usually assigned to birds.
- N: An "N" following a rank (e.g., S3N) indicates that the preceding rank refers to the non-breeding status of the species in the state. N ranks are usually assigned to birds.

A state rank of S2BS5N indicates that the species is rare in the state as a breeder, but abundant as a non-breeder.

APPENDIX 5. PLANT COMMUNITY TYPES IN THE POTENTIAL GRIZZLY CREEK RESEARCH NATURAL AREA

The communities are listed by common name. Citations following the common names refer to these sources:  
-- Johnston (1987): equivalent plant association from the list for USDA Forest Service Region 2;  
-- Anderson et al. (1998): equivalent plant association from the National Vegetation Classification;  
-- Tweit and Houston (1980): equivalent grassland or shrubland habitat type (if any);  
-- Steele et al. (1983): equivalent forest habitat type (if any);  
-- Federal Geographic Data Committee (1997): type in the hierarchy of the National Vegetation Classification Standard to which the association belongs;  
-- Kuchler (1966): Kuchler vegetation type to which the association belongs;  
-- Eyre (1980): Society of American Foresters forest cover type to which the association belongs (if any).

Douglas-fir/bluebunch wheatgrass

-- Johnston (1987): Unknown  
-- Anderson et al. (1998): Pseudotsuga menziesii/ Pseudoroegneria spicata woodland  
-- Tweit and Houston (1980): None  
-- Steele et al. (1983): Unknown  
-- Federal Geographic Data Committee (1997): II.A.4.N.b.; conical-crowned, natural/semi-natural, temperate or subpolar, needle-leaved, evergreen woodland  
-- Kuchler (1966): Douglas fir forest (Pseudotsuga)  
-- Eyre (1980): Interior Douglas-fir

Douglas-fir/common snowberry

-- Johnston (1987): Pseudotsuga menziesii/Symphoricarpos albus plant association  
-- Anderson et al. (1998): Pseudotsuga menziesii/ Symphoricarpos albus forest  
-- Tweit and Houston (1980): none  
-- Steele et al. (1983): Pseudotsuga menziesii/Symphoricarpos albus habitat type  
-- Federal Geographic Data Committee (1997): I.A.8.N.b.; conical-crowned, natural/semi-natural, temperate or subpolar, needle-leaved, evergreen, closed-canopy forest  
-- Kuchler (1966): Douglas fir forest (Pseudotsuga)  
-- Eyre (1980): Interior Douglas-fir

Douglas-fir/Idaho fescue

-- Johnston (1987): Pseudotsuga menziesii/Festuca idahoensis plant association  
-- Anderson et al. (1998): Pseudotsuga menziesii/Festuca

- idahoensis woodland
- Tweit and Houston (1980): None
  - Steele et al. (1983): Pseudotsuga menziesii/Festuca idahoensis habitat type
  - Federal Geographic Data Committee (1997): II.A.4.N.b.; rounded-crowned, natural/semi-natural, temperate or subpolar, needle-leaved, evergreen woodland
  - Kuchler (1966): Douglas fir forest (Pseudotsuga)
  - Eyre (1980): Interior Douglas-fir

#### Spruce-Fir Forest

- Johnston (1987): Unknown
- Anderson et al. (1998): Unknown
- Tweit and Houston (1980): None
- Steele et al. (1983): Unknown
- Federal Geographic Data Committee (1997): I.A.8.N.c.; conical-crowned, natural/semi-natural, temperate or subpolar, needle-leaved, evergreen woodland
- Kuchler (1966): Western spruce-fir forest (Picea-Abies)
- Eyre (1980): Unknown

#### Balsam poplar - Douglas-fir

- Johnston (1987): Unknown
- Anderson et al. (1998): Unknown
- Tweit and Houston (1980): None
- Steele et al. (1983): None
- Federal Geographic Data Committee (1997): II.C.3.N.a.; natural/semi-natural, mixed broad-leaved evergreen - cold-deciduous open tree canopy woodland.
- Kuchler (1966): Douglas fir forest (Pseudotsuga)?
- Eyre (1980): Interior Douglas-fir? Cottonwood-willow?

#### Narrowleaf cottonwood - Douglas-fir

- Johnston (1987): Unknown
- Anderson et al. (1998): Unknown
- Tweit and Houston (1980): None
- Steele et al. (1983): None
- Federal Geographic Data Committee (1997): II.C.3.N.a.; natural/semi-natural, mixed broad-leaved evergreen - cold-deciduous open tree canopy woodland.
- Kuchler (1966): Douglas fir forest (Pseudotsuga)?
- Eyre (1980): Interior Douglas-fir? Cottonwood-willow?

#### Thinleaf alder/red-osier dogwood

- Johnston (1987): Alnus incana/Spide sericea plant association
- Anderson et al. (1998): Alnus incana/Cornus sericea shrubland
- Tweit and Houston (1980): None
- Steele et al. (1983): None
- Federal Geographic Data Committee (1997): III.B.2.N.c.; intermittently-flooded, natural/semi-natural, cold-deciduous shrubland

- Kuchler (1966): None
- Eyre (1980): None

Basin big sagebrush/bluebunch wheatgrass

- Johnston (1987): *Artemisia tridentata*/*Roegneria spicata* plant association
- Anderson et al. (1998): *Artemisia tridentata* ssp. *tridentata*/*Pseudoroegneria spicata* shrubland
- Tweit and Houston (1980): *Artemisia tridentata* ssp. *tridentata*/*Agropyron spicatum* habitat type
- Steele et al. (1983): None
- Federal Geographic Data Committee (1997): III.A.4.N.a.; natural/semi-natural, microphyllous, evergreen shrubland
- Kuchler (1966): Wheatgrass-needlegrass shrubsteppe (*Agropyron-Stipa-Artemisia*)
- Eyre (1980): None

Mountain big sagebrush/bluebunch wheatgrass

- Johnston (1987): *Artemisia tridentata*/*Roegneria spicata* plant association
- Anderson et al. (1998): *Artemisia tridentata* ssp. *vaseyana*/*Pseudoroegneria spicata* shrubland
- Steele et al. (1983): None
- Tweit and Houston (1980): *Artemisia tridentata* ssp. *vaseyana*/*Symphoricarpos albus* habitat type?
- Federal Geographic Data Committee (1997): III.A.4.N.a.; natural/semi-natural, microphyllous, evergreen shrubland.
- Kuchler (1966): Wheatgrass-needlegrass shrubsteppe (*Agropyron-Stipa-Artemisia*)
- Eyre (1980): none

Mountain big sagebrush/Idaho fescue

- Johnston (1987): *Artemisia tridentata*/*Festuca idahoensis* plant association
- Anderson et al. (1998): *Artemisia tridentata* ssp. *vaseyana*/*Festuca idahoensis* shrub herbaceous vegetation
- Tweit and Houston (1980): *Artemisia tridentata* ssp. *vaseyana*/*Festuca idahoensis* habitat type
- Steele et al. (1983): None
- Tweit and Houston (1980): *Artemisia tridentata* ssp. *vaseyana*/*Festuca idahoensis* habitat type
- Federal Geographic Data Committee (1997): V.A.7.N.e.; Medium-tall, natural/semi-natural, temperate or subpolar, perennial grassland with a sparse shrub layer.
- Kuchler (1966): Wheatgrass-needlegrass shrubsteppe (*Agropyron-Stipa-Artemisia*)
- Eyre (1980): none

Black sagebrush/bluebunch wheatgrass

- Johnston (1987): *Artemisia nova*/*Roegneria spicata* plant association
- Anderson et al. (1998): *Artemisia nova*/*Pseudoroegneria spicata* sparse dwarf shrubland
- Steele et al. (1983): None
- Tweit and Houston (1980): *Artemisia nova*/*Agropyron spicatum* habitat type
- Federal Geographic Data Committee (1997): IV.A.1.N.d.; Needle-leaved or microphyllous, natural/semi-natural, evergreen dwarf shrubland
- Kuchler (1966): Wheatgrass-needlegrass shrubsteppe (*Agropyron*-*Stipa*-*Artemisia*)
- Eyre (1980): none

Bluebunch wheatgrass

- Johnston (1987): Unknown
- Anderson et al. (1998): *Pseudoroegneria spicata* herbaceous vegetation
- Steele et al. (1983): None
- Tweit and Houston (1980): *Agropyron spicatum*-*Poa sandbergii* habitat type
- Federal Geographic Data Committee (1997): V.A.5.N.d.; Medium-tall bunch, natural/semi-natural, temperate or subpolar perennial grassland
- Kuchler (1966): Wheatgrass-needlegrass shrubsteppe (*Agropyron*-*Stipa*-*Artemisia*)
- Eyre (1980): none

Water sedge-beaked sedge

- Johnston (1987): *Carex aquatilis*/*Carex utriculata* plant association
- Anderson et al. (1998): *Carex aquatilis*-*Carex rostrata* herbaceous vegetation
- Tweit and Houston (1980): None
- Steele et al. (1983): None
- Federal Geographic Data Committee (1997): V.A.5.N.k.; seasonally-flooded, natural/semi-natural, temperate or subpolar, perennial graminoid vegetation
- Kuchler (1966): None
- Eyre (1980): None

APPENDIX 6. ELEMENT OCCURRENCE RECORDS FOR PLANT SPECIES OF  
SPECIAL CONCERN IN THE POTENTIAL GRIZZLY CREEK RNA.