

PLANTS AND VEGETATION OF THE  
POTENTIAL BALD RIDGE RESEARCH NATURAL AREA  
WITHIN THE SHOSHONE NATIONAL FOREST,  
PARK COUNTY, WYOMING

Prepared for the

Shoshone National Forest, USDA Forest Service

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## **INTRODUCTION**

This report presents information on the rare plants and the vegetation types in the potential Bald Ridge Research Natural Area (RNA). The information is arranged in the structure used in a research natural area establishment report, to allow its easy incorporation into an RNA establishment report for Bald Ridge, should the area be designated as a research natural area.

Much of the information in this report is derived from an earlier report about the potential Bald Ridge RNA (Fertig and Bynum 1994). The information from that earlier report has been updated in several ways. First, the proposed boundary of this potential RNA may differ from that shown in the original report, as a result of changes made by Forest Service staff. Second, when necessary, names of vascular plant species have been converted to those used in the PLANTS database (USDA, Natural Resources Conservation Service 2009), which is now the standard for plant names used by U.S. Department of Agriculture agencies. Third, names of plant associations have been brought up to date. Fourth, new information about rare plants, within the potential RNA and outside it, has been included. This information may have changed our understanding of the distribution of some plants in the potential RNA, and may have caused some plant species to be dropped from the list of rare plants in the area. Fifth, the maps of cover-types have been digitized using digital raster graphic files (i.e., digital topographic maps) and true-color aerial photographs as backgrounds, and boundaries of cover-types have been changed slightly during digitizing when the topographic maps and aerial photographs indicated mistakes in the original maps. Consequently, the area covered by each cover-type may have changed slightly.

## **LAND MANAGEMENT PLANNING**

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## **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 Bald Ridge 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 Bald Ridge RNA are the steep-sided, limestone and sandstone ridge, supporting a matrix vegetation of foothills grassland that contains stands of limber pine and Douglas-fir. A substantial part of the grassland is early post-fire vegetation, having burned in the 1996 Dano Fire. The windblown, sparsely vegetated top of the ridge and the grassland on the slopes below support populations of four rare vascular plant species.

## LOCATION

The potential Bald Ridge RNA is located within the Shoshone National Forest in northwestern Wyoming (Figure 1). 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): T55N, R104W, Sections 1 and 2; T56N, R104W, Sections 13, 23, 24, 25, 26, 35, and 36.

## BOUNDARY

The boundary of the potential Bald Ridge RNA is drawn primarily along topographic features (Figure 2). On the western and northwestern sides of the area, the proposed boundary runs along the lower parts of the steep cliffs of the Clark's Fork River canyon. On the east, the boundary of the potential RNA follows the boundary of the Shoshone National Forest. The boundary on the southern end follows broad ridge lines.

## AREA

The total area of the potential Bald Ridge RNA is 2,964 acres (1,200 ha).<sup>1</sup>

## ELEVATION

The elevation of the potential Bald Ridge RNA ranges from approximately 4,700 feet (1,433 meters) at the northern end to 8,633 feet (2,631 meters) atop Bald Peak, the highest point on the ridgeline of Bald Ridge.

## ACCESS

The potential Bald Ridge RNA lies approximately 23 miles (37 km) northwest of Cody, Wyoming and may be reached on public routes. The most direct route from Cody proceeds north on Wyoming Highway 120 about 16 miles (52 km) to the intersection with Wyoming Highway 296 (the Chief Joseph Scenic Highway), thence west on Highway 296 approximately 11 miles (36 km) to Forest Service Road 100 (an unimproved dirt road), thence north on Road 100 for about 6 miles (20 km) to the southern end of the proposed RNA. The rest of the area can be reached on foot or horseback.

## ECOREGION

The potential Bald Ridge RNA lies within the Southern Rocky Mountain Steppe-Open Woodland-Coniferous Forest-Alpine Meadow Province, Yellowstone Highlands Section, Absaroka Sedimentary Mountains Subsection (M331Ai) 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.

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1. The area of the potential Bald Ridge RNA was computed by WYNDD staff with the ESRI® ArcMap™ 9.3 software, using a digital version of the boundary supplied by the Forest Service.

## AREA BY COVER-TYPE

This information on plant associations, habitat types, Kuchler vegetation types, and Society of American Foresters forest cover-types is based largely on field work conducted by Natural Diversity Database biologists, reported in an earlier document (Fertig and Bynum 1994), revised to reflect new information and names for plant associations and plant species. Maps of these cover-types were digitized on-screen by Natural Diversity Database staff, using the ESRI® ArcMap™ 9 software; boundaries are based on the hand-drawn map in the earlier report (Fertig and Bynum 1994) and were digitized using digital raster graphic files (digital topographic maps) and 2009 National Agriculture Imagery Program true-color aerial photographs (USDA, Farm Services Administration, Aerial Photography Field Office) as backgrounds. The areas of these various cover-types were computed in the ArcMap™ software.

## PLANT ASSOCIATIONS

The major plant associations in the potential Bald Ridge RNA are listed in Table 1 and mapped in Figure 3. Grass-dominated vegetation of the *Pseudoroegneria spicata* - *Poa secunda* (bluebunch wheatgrass-Sandberg bluegrass) association covers over 20% of the area and accounts for much of the potential RNA on the eastern slopes of Bald Ridge. The 1996 Dano Fire increased the amount of this grassland association by over 50% of its original area. Small patches of shrub and shrub steppe vegetation in the *Artemisia tridentata* ssp. *vaseyana*/*Pseudoroegneria spicata* association occur in the grassland matrix, in draws and swales.

Woodlands in the *Pinus flexilis*/*Juniperus communis* association form a mosaic with the grassland in the southeastern quarter of the potential RNA. This woodland was a major vegetation type in the northeastern part of the area before the 1996 fire. Douglas-fir woodlands in the *Pseudotsuga menziesii*/*Juniperus communis* association also grow in the southeastern part of the area and they, too, were more common before the 1996 fire. These two woodland associations merge into each other and the tree overstory often is a mix of *Pinus flexilis* and *Pseudotsuga menziesii*.

Much of the potential RNA, west of the crest of Bald Ridge, consists of cliffs and talus with scattered patches of conifer woodland. This woodland appears to be a mix of the *Pseudotsuga menziesii*/*Juniperus communis* association and the *Picea engelmannii*/*Juniperus communis* association. These two conifer associations merge into one another, and tree overstory with both *Picea* and *Pseudotsuga* is common.

Table 1. Occurrence of plant alliances and associations in complexes mapped in the potential Bald Ridge Research Natural Area. See Figure 3. “M” in a cell indicates that a plant alliance or association is a major component of a complex, and “m” indicates that it is a minor component of the complex. Names of alliances and associations are from NatureServe (2010).

Plant Association	Complex Names and Areas					
	Foothill Grassland, unburned (418 acres, 169 ha)	Foothill Grassland, burned (244 acres, 99 ha)	Limber pine Woodland (292 acres, 118 ha)	Douglas-fir Woodland (72 acres, 29 ha)	Douglas-fir – Engelmann spruce Woodland (549 acres, 222 ha)	Sparsely vegetated (1,390 acres, 562 ha)
Herbaceous						
<i>Pseudoroegneria spicata</i> - <i>Poa secunda</i> Herbaceous	M	M				m
Shrub						
<i>Artemisia tridentata</i> spp. <i>vaseyana</i> / <i>Pseudoroegneria spicata</i> shrub	m					
Forest & Woodland						
<i>Pinus flexilis</i> / <i>Juniperus communis</i> Woodland			M			m
<i>Pseudotsuga menziesii</i> / <i>Juniperus communis</i> Woodland				M	M	m
<i>Picea engelmannii</i> / <i>Juniperus communis</i> woodland					m	m

### KUCHLER VEGETATION TYPES

The most common Kuchler type (Kuchler 1964) in the potential Bald Ridge Research Natural Area is the Alpine Meadow and Barren type (Table 2), which includes the sparsely vegetated cliffs and slopes west of the crest of Bald Ridge (Figure 4). The grassland vegetation east of the ridge belongs to the Foothills Prairie type, and the small patches of sagebrush shrubland are included in that type as well. Because of the predominance of Douglas-fir in the woodlands throughout the area, even those where limber pine or Engelmann spruce contribute more canopy cover to the overstory, tall of the woodlands in the potential RNA are mapped as Kuchler’s Douglas fir Forest type.

Table 2. Kuchler vegetation types mapped in complexes in the potential Bald Ridge Research Natural Area. See Figure 4. “M” in a cell indicates that a Kuchler type is a major component of a complex, and “m” indicates that it is a minor component of the complex.

Vegetation Type (Kuchler 1964)	Acres	Hectares
Foothills prairie ( <i>Agropyron-Festuca-Stipa</i> )	661	268
Douglas fir Forest ( <i>Pseudotsuga</i> )	913	370
Alpine Meadow and Barren	1,390	562

## HABITAT TYPES

Grass vegetation in the southeastern part of the potential RNA grows on the *Agropyron spicatum*-*Poa sandbergii* habitat type (Tweit and Houston 1980) (Figure 5). The area of this habitat type is less than the area of grassland, though, because much of the grassland in the northeastern part of the area grows (at least hypothetically) on the *Pinus flexilis*/*Juniperus communis* habitat type (Steele *et al.* 1983); that part of the potential RNA is now grass vegetation instead of limber pine woodland because of the 1996 Dano Fire. Like the *Pinus flexilis*/*Juniperus communis* habitat type, the *Pseudotsuga menziesii*/*Juniperus communis* habitat type is a major type in the area. A third conifer habitat-type, the *Picea engelmannii*/*Hypnum revolutum* type, is a minor type on the cliffs west of Bald Ridge.

Table 3. Occurrence of habitat types and series mapped in complexes in the potential Bald Ridge Research Natural Area. See Figure 5. “M” in a cell indicates that a habitat type is a major component of a complex, and “m” indicates that it is a minor component of the complex.

Habitat Types	Complexes (map units)				
	<i>A. spicatum</i> – <i>P. sandbergii</i> Habitat Type (418 acres, 169 ha)	<i>P. flexilis</i> / <i>J. communis</i> Habitat Type (536 acres, 217 ha)	<i>P. menziesii</i> / <i>J. communis</i> Habitat Type (72 acres, 29 ha)	<i>P. menziesii</i> & <i>P. engelmannii</i> Hab. Types (549 acres, 222 ha)	Cliffs & talus, <i>P. flexilis</i> , <i>Pseudotsuga</i> (1,390 acres, 562 ha)
Herbaceous					
<i>Agropyron spicatum</i> – <i>Poa sandbergii</i>	M		m		m
Forest & Woodland					
<i>Pinus flexilis</i> / <i>Juniperus communis</i>		M			
<i>Pseudotsuga menziesii</i> / <i>Juniperus communis</i>			M		m
<i>Picea engelmannii</i> / <i>Hypnum revolutum</i>				m	m

## SOCIETY OF AMERICAN FORESTERS COVER TYPES

Only two Society of American Foresters forest cover types (Eyre 1980) occur in the potential Bald Ridge RNA (Table 4 and Figure 6). The Interior Douglas-fir type (210) is the more common of the two, and encompasses the woodlands dominated by Douglas-fir or co-dominated by Douglas-fir and Engelmann spruce. The Limber Pine (219) type includes the limber pine woodlands on the eastern slopes of the potential RNA. The grassland vegetation in the area does not fall into the SAF forest cover type classification.

Table 4. Society of American Foresters Cover Types in the potential Bald Ridge Research Natural Area. See Figure 6.

Cover Type (Eyre 1980)	Acres	Hectares
Limber Pine (219)	292	118
Interior Douglas-Fir (210)	621	251

## ECOLOGICAL SYSTEMS

The U.S. Forest Service’s Landscape Fire and Resource Management Planning Tools Project (Landfire Project) (<http://www.landfire.gov/>) uses ecological systems as a way to display general vegetation/ environment types nation-wide. Descriptions of those ecological systems are available at <http://www.natureserve.org/explorer/servlet/NatureServe?init=Ecol>. Figure 7 shows the distribution of ecological systems in the potential Bald Ridge RNA. This figure was produced from data extracted from the nation-wide map of ecological systems and a few additional cover-types, updated to 2008 (<http://landfire.cr.usgs.gov/viewer/>). Two changes were made to those data in producing Figure 7: the area originally mapped as the *Pseudotsuga menziesii* Plant Alliance was re-classified to the Middle Rocky Mountains Montane Douglas-fir Forest and Woodland Ecological System, and the area originally mapped as the *Artemisia tridentata* ssp. *vaseyana* Plant Alliance was re-classified as the Inter-Mountain Basins Montane Sagebrush Steppe Ecological System. Table 5 shows the area of each ecological system within the potential RNA.

Researchers in the Landfire Project caution that the information from the project should be augmented with knowledge of local conditions ([http://www.landfire.gov/dp\\_quality\\_assessment.php](http://www.landfire.gov/dp_quality_assessment.php)), and information from the field surveys (reported in Fertig and Bynum 1994) suggests that ecological systems have been mis-mapped in a substantial part of the potential RNA. Nine ecological systems have each been mapped over at least 1% of the potential RNA, and an additional 11 ecological systems each have been mapped on less than 1% of the area (Table 5). Mapping of the most common system, the Barren system, appears to be correct. The Middle Rocky Mountain Montane Douglas-fir Forest and Woodland System, the second-most common system on the map, seems to be over-represented: the field survey suggests that the stands of this system in the southeastern part of the RNA should be mapped as the Rocky Mountain Foothill Limber Pine-Juniper Woodland system.

Much of the non-forested vegetation in the eastern part of the potential RNA is mapped as the Inter-Mountain Basins Montane Sagebrush Steppe system (especially in the burned part of the area), but this vegetation contains little sagebrush and actually belongs to Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland system, which is mapped as a minor type in the area. In the southeastern part of the area, the grassland is mapped as the Rocky Mountain Subalpine-Montane Mesic Meadow, but this grassland vegetation, too, would be better mapped as the Lower Montane-Foothill-Valley Grassland system. There is no evidence from the field surveys of widespread dominance by exotic plants, and so the Introduced Upland Vegetation-Perennial Grassland and Forbland system mapped in the eastern part of the potential RNA also should be mapped as Lower Montane-Foothill-Valley Grassland.

The Northern Rocky Mountain Montane-Foothill Deciduous Shrubland system is mapped in substantial amounts on the cliffs in the western part of the area. Information from the field survey is insufficient to evaluate this part of the map, but examination of the 2001 National Agricultural Imagery Program suggests that this vegetation actually consists of patches of conifer seedlings or saplings. An additional error in the Landfire data-set is the putative presence in this area of the Northern Rocky



Table 5. Ecological systems in the potential Bald Ridge Research Natural Area. See Figure 7. Normal type-face indicates systems that each cover at least 1% of the area, and italic type-face indicates systems that each cover < 1% of the area.

<b>Ecological System</b>	<b>Acres</b>	<b>Ha</b>
Barren	979	396
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	636	257
Inter-Mountain Basins Montane Sagebrush Steppe	620	251
Rocky Mountain Subalpine-Montane Mesic Meadow	239	97
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	237	96
Introduced Upland Vegetation-Perennial Grassland and Forbland	76	31
Rocky Mountain Foothill Limber Pine-Juniper Woodland	58	24
Northern Rocky Mountain Subalpine-Upper Montane Grassland	45	18
Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	35	14
<i>Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland</i>	2	1
<i>Inter-Mountain Basins Big Sagebrush Shrubland</i>	14	6
<i>Inter-Mountain Basins Semi-Desert Shrub-Steppe</i>	2	1
<i>Northern Rocky Mountain Conifer Swamp</i>	1	0
<i>Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland</i>	5	2
<i>Northern Rocky Mountain Subalpine Deciduous Shrubland</i>	7	3
<i>Rocky Mountain Aspen Forest and Woodland</i>	1	1
<i>Rocky Mountain Lodgepole Pine Forest</i>	5	2
<i>Rocky Mountain Montane Riparian Systems</i>	1	0
<i>Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland</i>	1	1
<i>Rocky Mountain Subalpine/Upper Montane Riparian Systems</i>	2	1

Mountain Conifer Swamp system. Field work turned up no evidence of swamp vegetation. The putative presence of this system in the area is a consequence of the automatic classification of pixels on satellite images.

## PHYSICAL AND CLIMATIC CONDITIONS

### PHYSICAL SETTING

The potential Bald Ridge RNA is located on the north-south trending Bald Ridge, formed by eastward-dipping sedimentary rocks. The slopes on the eastern side of the ridge face predominantly eastward and range from gentle to moderately steep. The slopes on the western side of the ridge have been eroded into steep cliffs and benches by the Clark's Fork of the Yellowstone River and its tributaries. Bald Ridge forms the eastern edge of the Absaroka Mountains in this area.

### GEOLOGY

Bald Ridge is at the northern end of a series of ridges of Paleozoic and Mesozoic sedimentary

strata on the eastern flank of the Absaroka Mountains (Lageson and Spearing 1988). Strata east of the crest of Bald Ridge are primarily limestone, dolomite, and red shale of the Mississippian Madison and Amsden formations (Pierce 1965). The escarpment on the west side of Bald Ridge is composed of bands of Paleozoic sediments overlying Precambrian granite gneiss and granite. These sedimentary formations are composed of siltstone, conglomerate, shale, limestone, and dolomite. The exposed formations, from the summit to the base of the escarpment, are the Madison, Three Forks, Jefferson, Bighorn, Grove Creek, Snowy Range, Pilgrim, Gros Ventre, and Flathead formations (Pierce 1965).

## **SOILS**

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## **CLIMATE**

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## **DESCRIPTION OF VALUES**

### **VEGETATION**

The potential Bald Ridge RNA contains a mosaic of bunchgrass vegetation, limber pine woodland, and Douglas-fir woodland grassland and woodland typical of the eastern foothills of the Absaroka Mountains. Recent fire (the 1996 Dano Fire) increased the amount of grassland at the expense of limber pine woodland. The vegetation may remain grassland for a very long time, given the widespread, severe mortality inflicted on limber pine in the Absaroka Mountains by bark beetles and white pine blister rust. The composition of the grassland vegetation and of the undergrowths in the woodlands likely is influenced by the carbonate content of the soils, derived from the limestone and dolomite that underlie much of the potential RNA.

### **FLORA**

#### Plant Species List

A list of 130 vascular plant species documented in the potential Bald Ridge Research Natural Area is included in Appendix 1.

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

There are no federally listed Threatened or Endangered plant species found in the potential Bald Ridge Research Natural Area. Two USDA Forest Service Region 2 Sensitive plant species are known from the area (Fertig and Bynum 1994, Heidel 2007). Four additional plant species either tracked by the Wyoming Natural Diversity Database or on the Database's watch list are also known from the area. The status of each of these species is briefly summarized below. The heritage ranks, assigned by the Wyoming Natural Diversity Database, are explained in Appendix 2.

Two regional endemic plant species formerly included in discussions of plants of interest in the potential Bald Ridge Research Natural Area, Jones's columbine (*Aquilegia jonesii*) and Kelseya (*Kelseya uniflora*), have been found to be more common than previously known and are no longer tracked by the Wyoming Natural Diversity Database as plant species of concern in the state. They have been dropped from this discussion.

***Androsace chamaejasme* var. *carinata*** (Sweet-flowered rock jasmine)

Heritage Rank: G5T4/S1S2.

Federal Status: Bridger-Teton NF Sensitive; Targhee NF Sensitive.

Geographic Range: Alaska and western Canada south in the Rocky Mountains to Colorado. In Wyoming, it is known from the Absaroka, Owl Creek, Teton, and Wind River Mountains in Fremont, Hot Springs, Park and Teton Counties.

Habitat: Montane rock crevices and rocky soils derived from limestone or dolomite, or occasionally in moist limey meadows or beneath shrub cover (Fertig *et al.* 1994).

Comments: This species is abundant on exposed limestone bedrock and shallow, rocky soils along the crest of Bald Ridge and in two smaller locations outside of the potential Research Natural Area. Potential habitat occurs farther east onto adjacent Bureau of Land Management lands.

***Antennaria aromatica*** (Aromatic pussytoes) WYNDD Watch List

Heritage Rank: G3G4/S3 (WYNDD Watch List).

Federal Status: None.

Geographic Range: Regional endemic of the northern Rocky Mountains from Alberta to northwestern Wyoming (Bayer 1989). In Wyoming, it is known from the Beartooth, Absaroka, Bighorn, Wind River, Gros Ventre, and Salt River and Wyoming Mountains in Big Horn, Fremont, Lincoln, Park, Sublette and Teton Counties.

Habitat: Limestone scree, talus, and rocky crevices near or above upper tree-line (Scott 1997).

Comments: Aromatic pussytoes occupies the same habitat as *Androsace chamaejasme* within the potential Bald Ridge Research Natural Area, but exhibits a more patchy distribution pattern.

***Castilleja nivea*** (Snow paintbrush)

Heritage Rank : G3/S2

Federal Status: None.

Geographic Range: Regional endemic of Montana and northwestern Wyoming. In Wyoming, it is known only from the Beartooth and Absaroka Mountains in Hot Springs and Park Counties.

Habitat: Alpine, subalpine, and montane rocky meadows, often on calcareous rock. In Wyoming it is found in montane and alpine habitats including rocky tundra, meadows, and fellfields on gravelly limestone soils at 6600-9200 feet.

Comments: Snow paintbrush was discovered in the potential Bald Ridge Research Natural Area for the first time in 1994 vegetation surveys.

***Eritrichium howardii*** (Howard forget-me-not)

Heritage Rank : G4/S2

Federal Status: None.

Geographic Range: Regional endemic of Montana and northern Wyoming. In Wyoming, it is known from the northern Absaroka and Bighorn Mountains in Johnson, Park and Sheridan Counties.

Habitat: Rocky slopes and ridges (Dorn 2001).

Comments: Howard forget-me-not is known to occur on the east side of the potential Research Natural Area (Jones 1991). Although estimates of abundance are lacking, it is suspected to be common.

***Pyrocoma carthamoides* var. *subsquarrosus* (Absaroka goldenweed)**

Synonyms: *Haplopappus carthamoides* var. *subsquarrosus*

Heritage Rank : G5T2T3/S2

Federal Status: USFS R2: Sensitive (Houston *et al.* 2001). It was formerly a Category 2 species for listing.

Geographic Range: Regional endemic of northwestern Wyoming and southwestern Montana (Fertig *et al.* 1994, Beatty *et al.* 2003). In Wyoming, it is known from the northern Absaroka Mountains of Park County.

Habitat: Open montane and foothill meadows, slopes, and ridges on sandstone or limestone (Fertig *et al.* 1994, Houston *et al.* 2001, Beatty *et al.* 2003).

Comments: Absaroka goldenweed is known from a few subpopulations in *Pseudoroegneria spicata* - *Poa secunda* grasslands in the southeastern corner of the potential Bald Ridge Research Natural Area and adjoining lands. Jones (1991) indicated that the taxon was uncommon in the local area.

***Shoshonea pulvinata* (Shoshonea)**

Heritage Rank : G2G3/S2

Federal Status: USFS Region 2: Sensitive (Houston *et al.* 2001). It was formerly a Category 2 species for listing.

Geographic Range: Regional endemic of southwestern Montana and northwestern Wyoming (Lyman 2005). In Wyoming, it is known from the Absaroka Mountains in Park County.

Habitat: Shallow, stony, calcareous soils of exposed limestone outcrops, ridgetops, and talus slopes (Fertig *et al.* 1994, Houston *et al.* 2001, Lyman 2005).

Comments: Shoshonea occurs in pockets of coarse soil in limestone outcrops along the crest of Bald Ridge and in two smaller sites on the southeast slope of the ridge. Marriott (1988) estimated that the Bald Ridge population contained over 10,000 individuals. Additional potential habitat exists on adjacent BLM lands.

The plant species of interest in the potential Bald Ridge Research Natural Area have not been resurveyed since the 1996 Dano Fire burned a substantial part of the area.

**FAUNA**

**Threatened, Endangered, and Sensitive Vertebrates**

Grizzly bear (*Ursos arctos*).

The grizzly bear is listed as threatened under the provisions of the federal Endangered Species Act (USDI Fish and Wildlife Service, No date). The approximate distribution area of the bear in Wyoming, as mapped by the Wyoming Game and Fish Department, includes the potential Bald Ridge RNA (Wyoming Game and Fish Department, No date). The area also lies within the Conservation Strategy Management Area for the Yellowstone Distinct Population Segment of the grizzly bear, within the area of suitable grizzly bear habitat, and within the area occupied by bears in 2004 (USDI Fish and Wildlife Service, No date).

**Animal Species List**

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**LANDS**

The potential Bald Ridge RNA is within the boundaries of the Clark's Fork Ranger District of the

Shoshone National Forest. Lands within the potential RNA are National Forest System lands, except that a small parcel (approximately 40 acres, or 16 ha) of private land may be included in the southeastern part of the area (Figure 1). The potential RNA is bordered by National Forest System lands on the northwest, west, and south. The eastern boundary of the potential RNA is also the boundary of the Shoshone National Forest, and nearly all the land to the east is public land managed by the USDI Bureau of Land Management. The exception is a tract of private land that shares approximately 370 yards (340 meters) of the potential RNA's southeastern boundary.

## **IMPACTS AND POSSIBLE CONFLICTS**

### **MINERAL RESOURCES**

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### **GRAZING**

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### **TIMBER**

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### **WATERSHED VALUES**

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### **RECREATION VALUES**

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### **WILDLIFE AND PLANT VALUES**

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### **TRANSPORTATION VALUES**

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## **MANAGEMENT CONCERNS**

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## FIGURES



Figure 1. Location and boundary of the potential Bald Ridge Research Natural Area. The inset map shows position of the potential RNA within the Shoshone National Forest and the State of Wyoming.

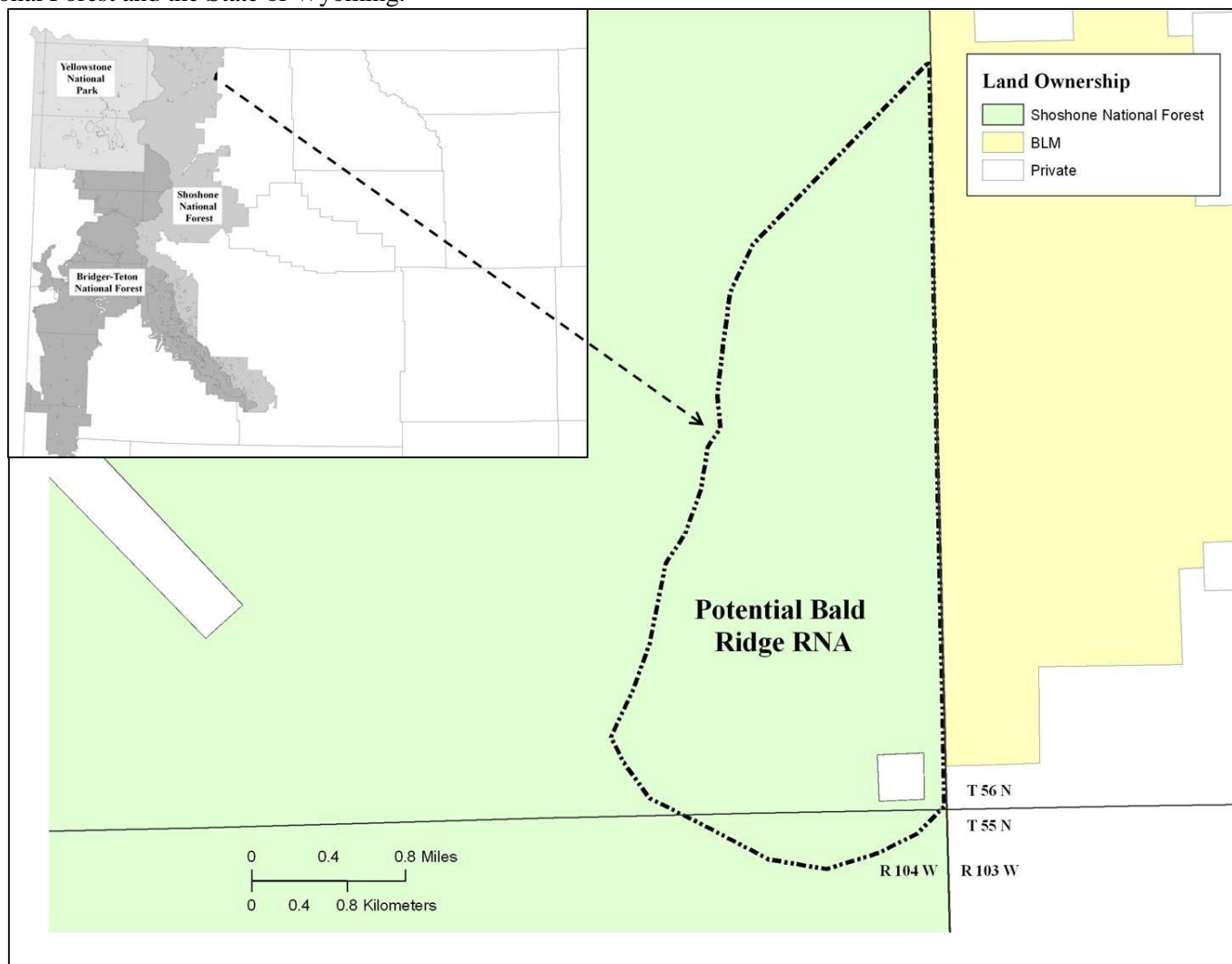


Figure 2. Proposed boundary of the potential Bald Ridge Research Natural Area.

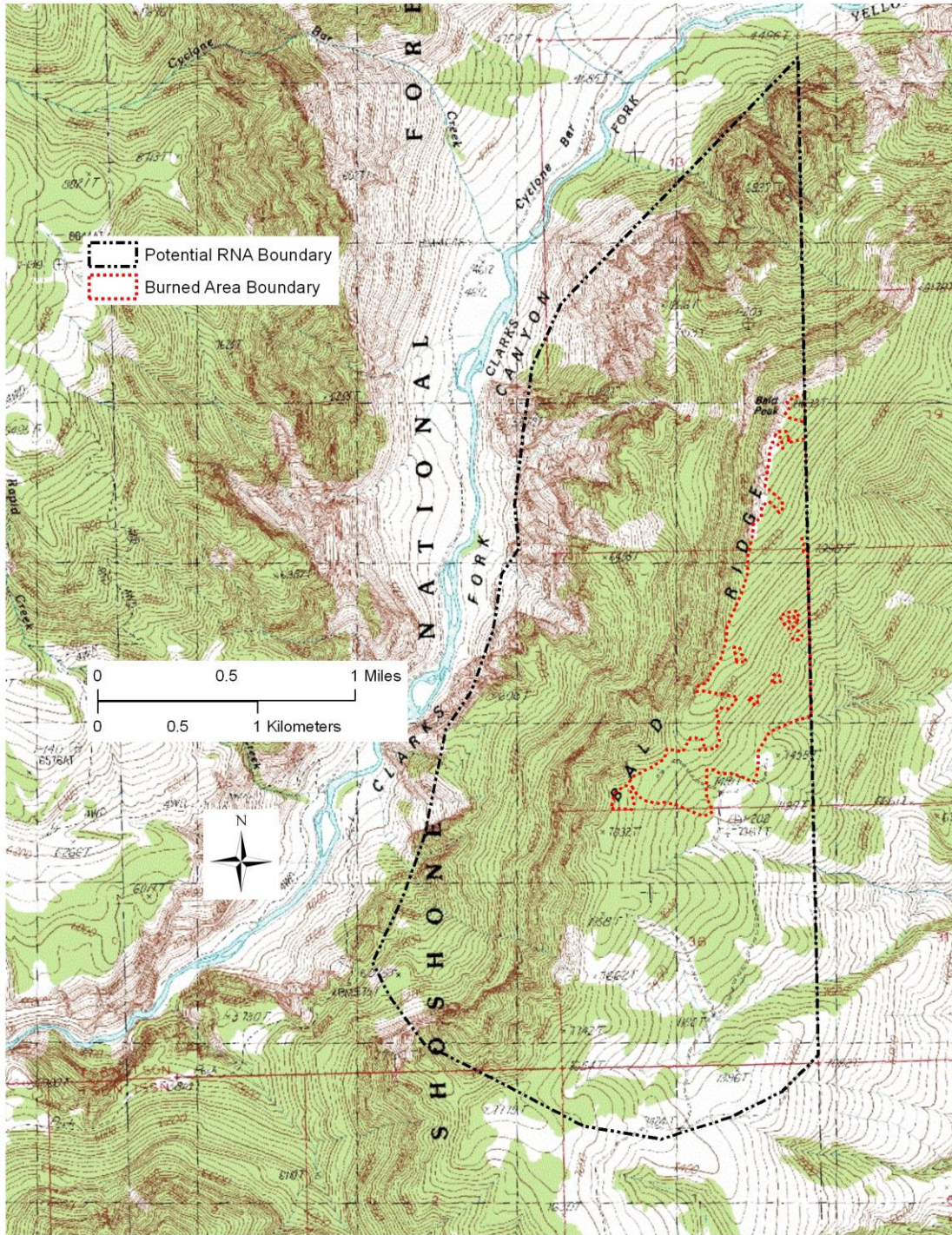


Figure 3. Complexes of plant associations in the potential Bald Ridge Natural Area. The plant associations present in each complex are listed in Table 1.

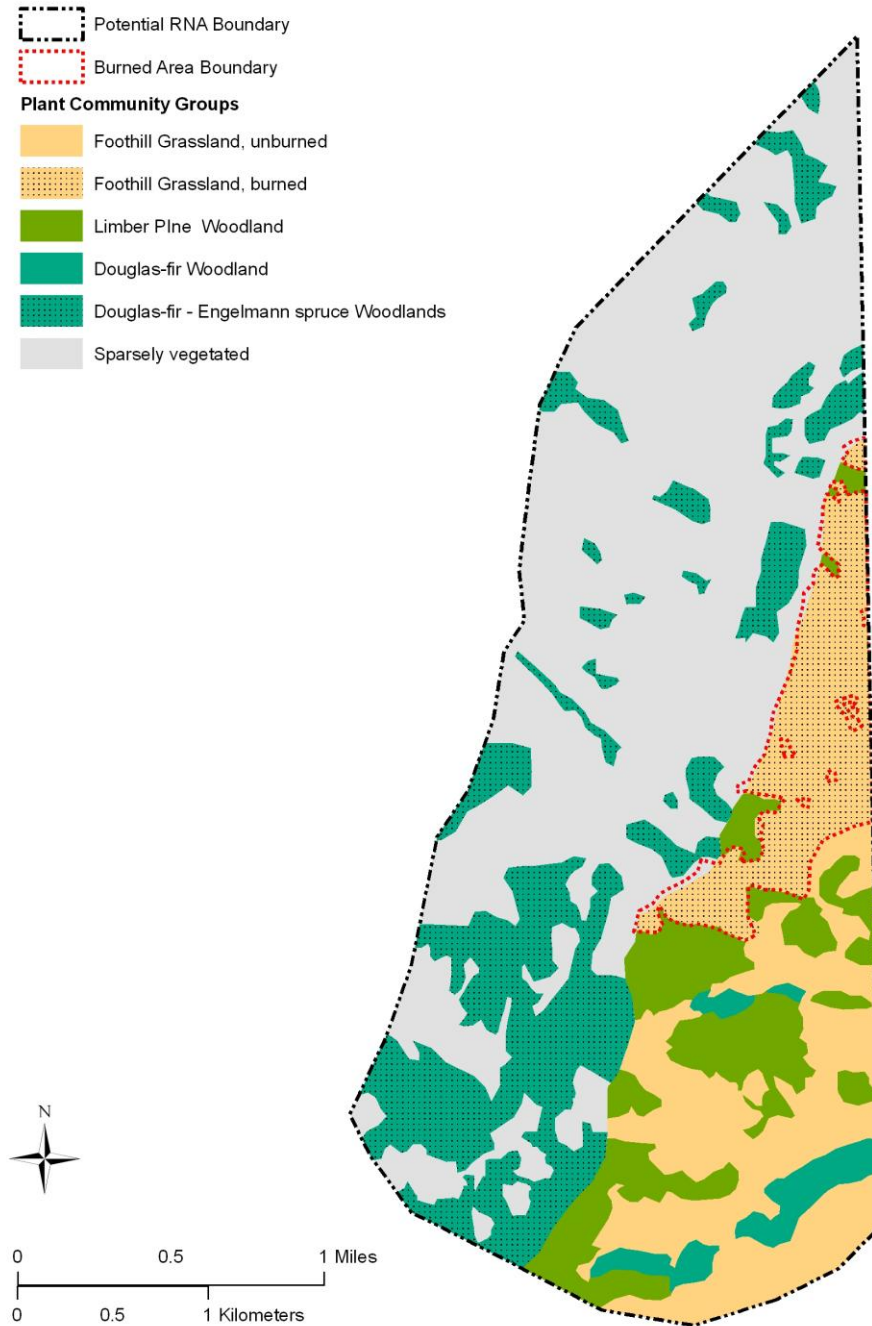


Figure 4. Complexes of Kuchler vegetation types (Kuchler 1964) in the potential Bald Ridge Research Natural Area. Areas of these types are listed in Table 2.

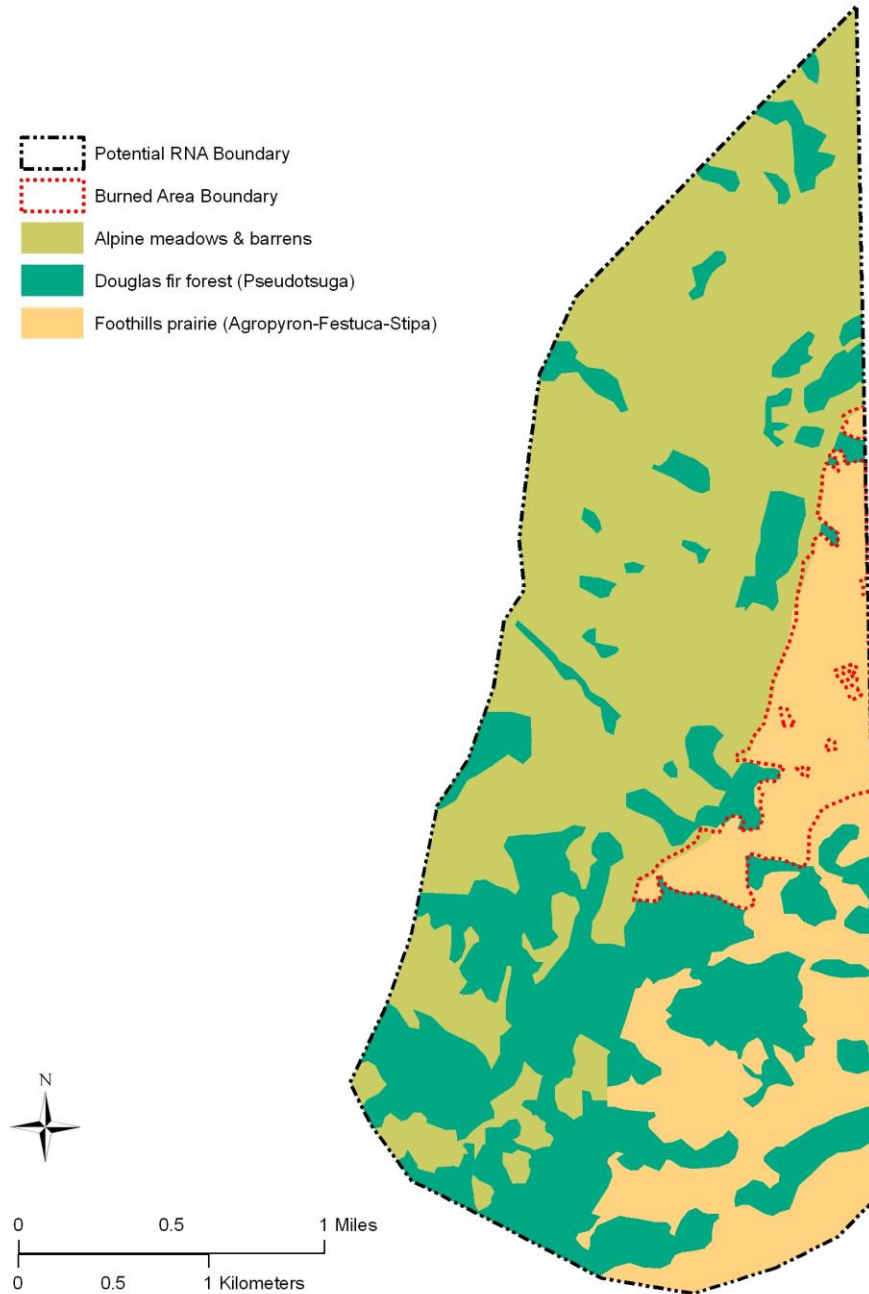


Figure 5. Complexes of habitat types (Steele *et al.* 1983, Tweit & Houston 1980) in the potential Bald Ridge Research Natural Area. The habitat types present in each complex are listed in Table 3.

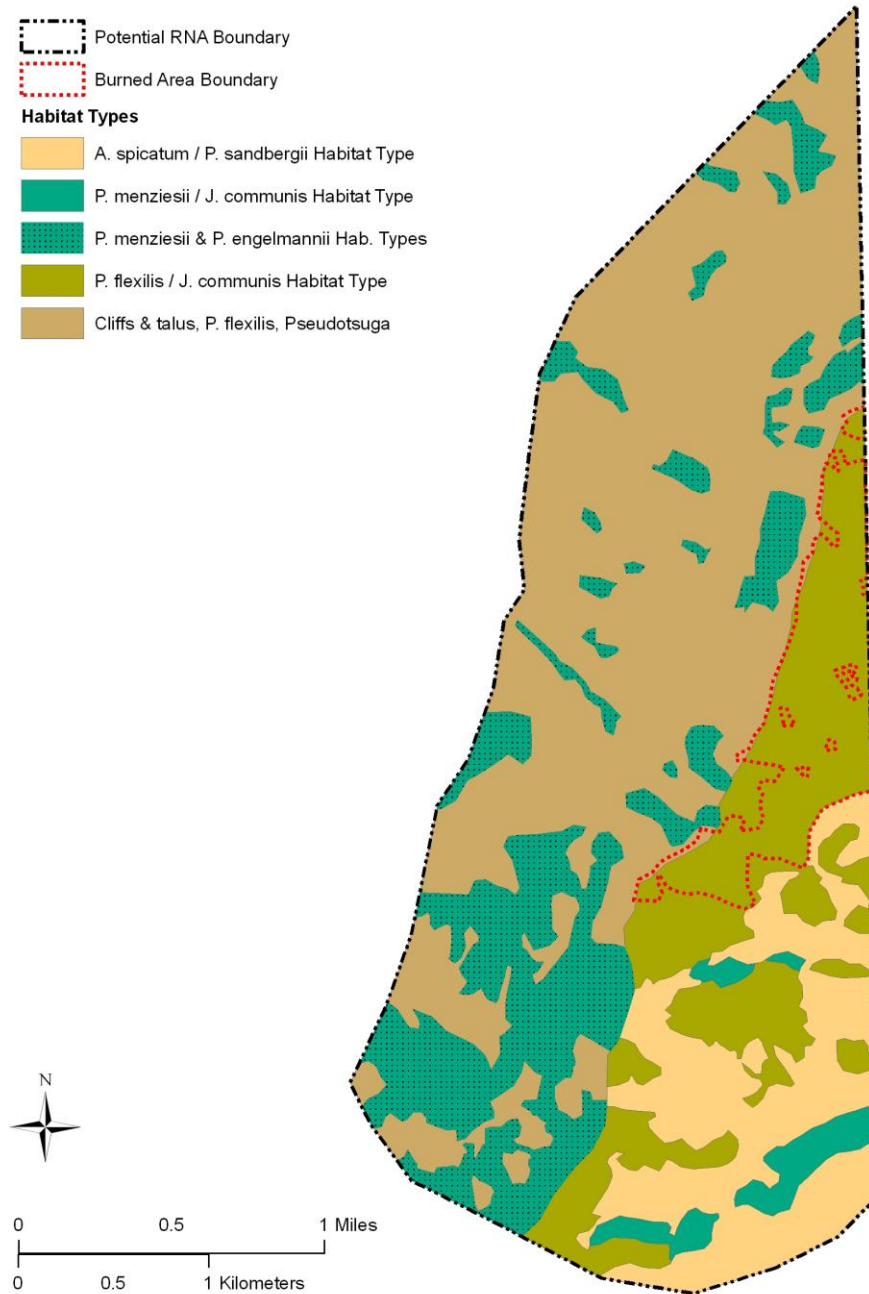


Figure 6. Society of American Foresters Cover Types (Eyre 1980) in the potential Bald Ridge Research Natural Area. Areas of these types are shown in Table 4.

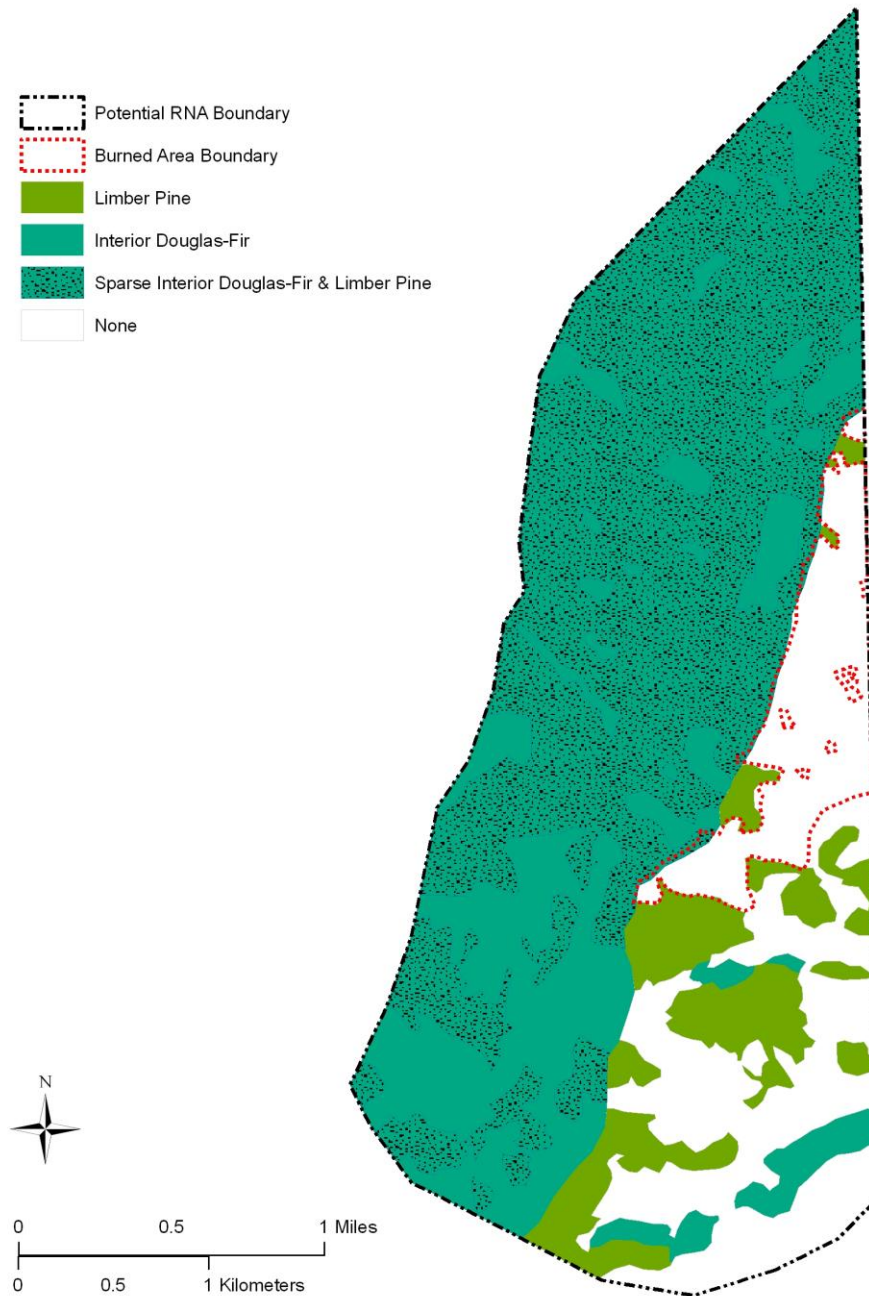


Figure 7. Ecological systems in the potential Bald Ridge Research Natural Area. See following page for legend. Areas of these types are listed in Table 5

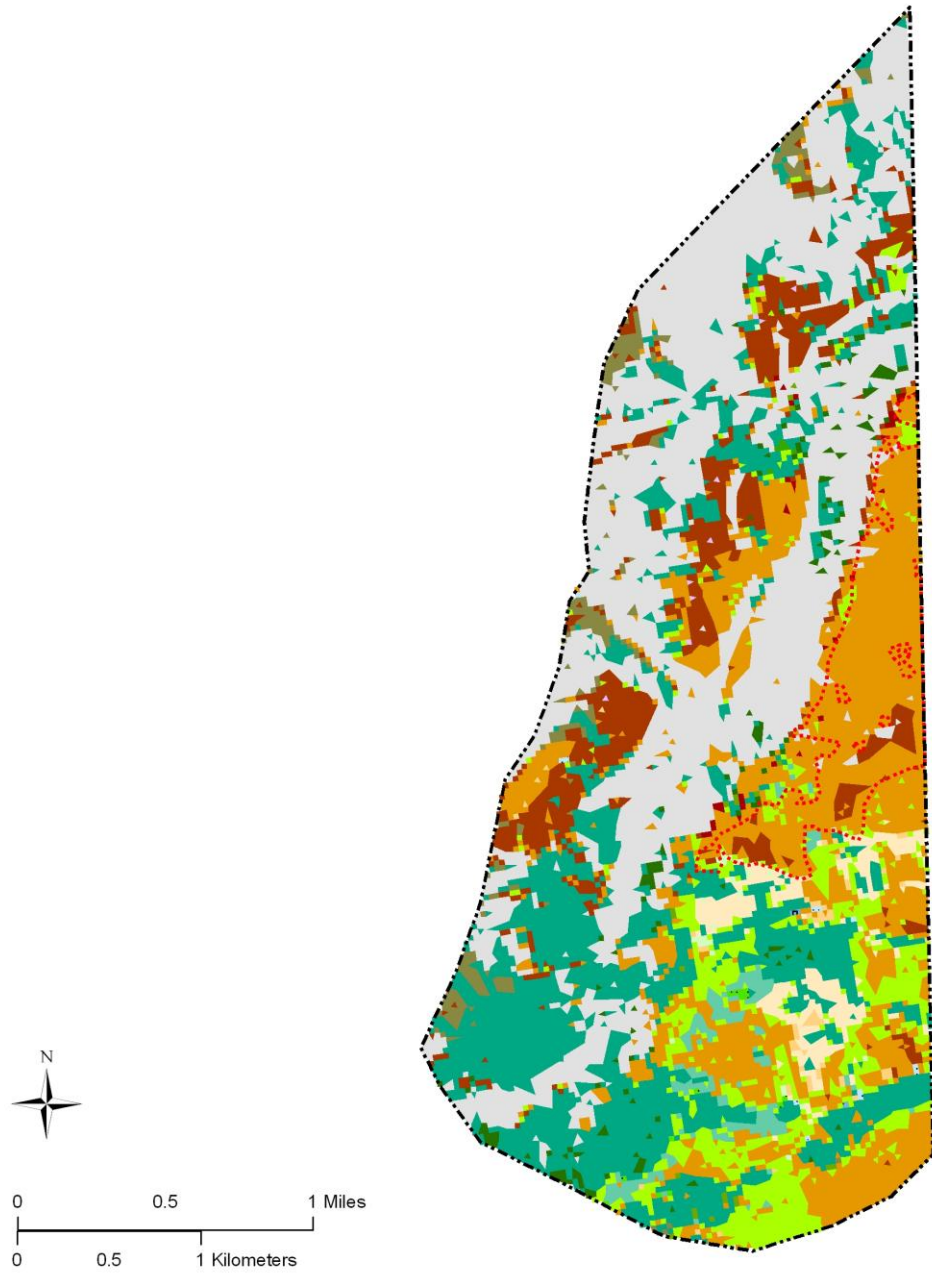


Figure 7 (continued). Legend for map of ecological systems in the potential Bald Ridge Research Natural Area. System names are listed alphabetically in two groups. Systems in the first group (“Barren” through “Rocky Mountain Subalpine-Montane Mesic Meadow”) each cover  $\geq 1\%$  of the area; systems in the second group each cover  $<1\%$  of the area.





## **APPENDICES**

**APPENDIX 1. VASCULAR PLANT SPECIES DOCUMENTED IN THE POTENTIAL BALD RIDGE RESEARCH NATURAL AREA.**

This list of plant species was compiled from several surveys of the area. Scientific and common names are from the PLANTS Database, September 2009 (USDA, Natural Resources Conservation Service, 2009). “!” indicates an introduced taxon.

<b>PLANTS Accepted Scientific Name with Author</b>	<b>PLANTS Common Name</b>
<b>Trees</b>	
<i>Picea engelmannii</i> Parry ex Engelm.	Engelmann spruce
<i>Picea glauca</i> (Moench) Voss	white spruce
<i>Pinus contorta</i> Douglas ex Louden	lodgepole pine
<i>Pinus flexilis</i> James	limber pine
<i>Populus tremuloides</i> Michx.	quaking aspen
<i>Pseudotsuga menziesii</i> (Mirb.) Franco var. <i>glauca</i> (Beissn.) Franco	Rocky Mountain Douglas-fir
<b>Shrubs</b>	
<i>Acer glabrum</i> Torr.	Rocky Mountain maple
<i>Artemisia frigida</i> Willd.	prairie sagewort
<i>Artemisia tridentata</i> Nutt. ssp. <i>vaseyana</i> (Rydb.) Beetle	mountain big sagebrush
<i>Dasiphora fruticosa</i> (L.) Rydb. ssp. <i>floribunda</i> (Pursh) Kartesz	shrubby cinquefoil
<i>Ericameria nauseosa</i> (Pall. ex Pursh) G.L. Nesom & Baird ssp. <i>nauseosa</i> var. <i>nauseosa</i>	rubber rabbitbrush
<i>Juniperus communis</i> L.	common juniper
<i>Juniperus horizontalis</i> Moench	creeping juniper
<i>Juniperus scopulorum</i> Sarg.	Rocky Mountain juniper
<i>Physocarpus monogynus</i> (Torr.) J.M. Coult.	mountain ninebark
<i>Ribes</i> L.	currant
<i>Rosa nutkana</i> C. Presl	Nootka rose
<i>Rubus idaeus</i> L. ssp. <i>strigosus</i> (Michx.) Focke	grayleaf red raspberry
<i>Shepherdia canadensis</i> (L.) Nutt.	russet buffaloberry
<i>Symphoricarpos oreophilus</i> A. Gray var. <i>utahensis</i> (Rydb.) A. Nelson	Utah snowberry
<b>Forbs</b>	
<i>Achillea millefolium</i> L. var. <i>occidentalis</i> DC.	western yarrow
<i>Agoseris glauca</i> (Pursh) Raf. var. <i>dasycephala</i> (Torr. & A. Gray) Jeps.	pale agoseris
<i>Allium</i> L.	onion
<i>Androsace chamaejasme</i> Wulfen ssp. <i>carinata</i> (Torr.) Hultén	sweetflower rockjasmine
<i>Anemone multifida</i> Poir.	Pacific anemone
<i>Antennaria aromatica</i> Evert	scented pussytoes
<i>Antennaria microphylla</i> Rydb.	littleleaf pussytoes
<i>Antennaria parvifolia</i> Nutt.	small-leaf pussytoes
<i>Aquilegia jonesii</i> Parry	Jones' columbine
<i>Arabis holboellii</i> Hornem. var. <i>pendulocarpa</i> (A. Nelson) Rollins	dropseed rockcress
<i>Arabis nuttallii</i> B.L. Rob.	Nuttall's rockcress
<i>Arenaria congesta</i> Nutt. var. <i>congesta</i>	ballhead sandwort
<i>Arenaria hookeri</i> Nutt.	Hooker's sandwort
<i>Arnica cordifolia</i> Hook.	heartleaf arnica
<i>Artemisia campestris</i> L.	field sagewort

## Appendix I (continued).

PLANTS Accepted Scientific Name with Author	PLANTS Common Name
<i>Astragalus flexuosus</i> Douglas ex G. Don	flexile milkvetch
<i>Astragalus kentrophyta</i> A. Gray var. <i>tegetarius</i> (S. Watson) Dorn	mat milkvetch
<i>Astragalus miser</i> Douglas ex Hook. var. <i>decumbens</i> (Nutt. ex Torr. & A. Gray) Cronquist	prostrate milkvetch
<i>Astragalus missouriensis</i> Nutt.	Missouri milkvetch
<i>Astragalus vexilliflexus</i> Sheldon	bentflower milkvetch
<i>Bupleurum americanum</i> J.M. Coult. & Rose	American thorum wax
<i>Calochortus gunnisonii</i> S. Watson	Gunnison's mariposa lily
<i>Calochortus nuttallii</i> Torr. & A. Gray	sego lily
<i>Campanula rotundifolia</i> L.	bluebell bellflower
<i>Castilleja linariifolia</i> Benth.	Wyoming Indian paintbrush
<i>Castilleja nivea</i> Pennell & Ownbey	snow Indian paintbrush
<i>Cerastium arvense</i> L.	field chickweed
<i>Clematis columbiana</i> (Nutt.) Torr. & A. Gray var. <i>tenuiloba</i> (A. Gray) J. Pringle	rock clematis
<i>Cymopterus nivalis</i> S. Watson	snowline springparsley
<i>Dodecatheon pulchellum</i> (Raf.) Merr.	darkthroat shootingstar
<i>Draba oligosperma</i> Hook.	fewseed draba
<i>Erigeron caespitosus</i> Nutt.	tufted fleabane
<i>Erigeron ochroleucus</i> Nutt. var. <i>scribneri</i> (Canby ex Rydb.) Cronquist	buff fleabane
<i>Eriogonum flavum</i> Nutt. var. <i>flavum</i>	alpine golden buckwheat
<i>Eriogonum ovalifolium</i> Nutt. var. <i>ochroleucum</i> (Small ex Rydb.) M. Peck	cushion buckwheat
<i>Eritrichium howardii</i> (A. Gray) Rydb.	Howard's alpine forget-me-not
<i>Eurybia conspicua</i> (Lindl.) G.L. Nesom	western showy aster
<i>Eurybia merita</i> (A. Nelson) G.L. Nesom	subalpine aster
<i>Fragaria vesca</i> L.	woodland strawberry
<i>Frasera speciosa</i> Douglas ex Griseb.	elkweed
<i>Gaillardia aristata</i> Pursh	common gaillardia
<i>Galium boreale</i> L.	northern bedstraw
<i>Gentiana affinis</i> Griseb.	pleated gentian
<i>Gentianella amarella</i> (L.) Boerner	autumn dwarf gentian
<i>Hedysarum sulphurescens</i> Rydb.	white sweetvetch
<i>Heterotheca villosa</i> (Pursh) Shinnars var. <i>minor</i> (Hook.) Semple	hairy false goldenaster
<i>Heuchera cylindrica</i> Douglas ex Hook.	roundleaf alumroot
<i>Hieracium albiflorum</i> Hook.	white hawkweed
<i>Hymenopappus filifolius</i> Hook. var. <i>luteus</i> (Nutt.) B.L. Turner	fineleaf hymenopappus
<i>Ipomopsis congesta</i> (Hook.) V.E. Grant ssp. <i>congesta</i>	ballhead ipomopsis
<i>Ipomopsis spicata</i> (Nutt.) V.E. Grant ssp. <i>capitata</i> (A.Gray) V.E. Grant	spiked ipomopsis
<i>Kelseya uniflora</i> (S. Watson) Rydb.	oneflower kelseya
<i>Lesquerella alpina</i> (Nutt.) S. Watson var. <i>alpina</i>	alpine bladderpod
<i>Ligusticum canbyi</i> (J.M. Coult. & Rose) J.M. Coult. & Rose	Canby's licorice-root
<i>Linum lewisii</i> Pursh	Lewis flax
<i>Lupinus argenteus</i> Pursh	silvery lupine
<i>Mertensia oblongifolia</i> (Nutt.) G. Don	oblongleaf bluebells

Appendix I (continued).

<b>PLANTS Accepted Scientific Name with Author</b>	<b>PLANTS Common Name</b>
<i>Minuartia obtusiloba</i> (Rydb.) House	twinflower sandwort
<i>Orobanche ludoviciana</i> Nutt. ssp. <i>ludoviciana</i>	Louisiana broomrape
<i>Orthilia secunda</i> (L.) House	sidebells wintergreen
<i>Osmorhiza depauperata</i> Phil.	bluntseed sweetroot
<i>Oxytropis besseyi</i> (Rydb.) Blank. var. <i>ventosa</i> (Greene) Barneby	Bessey's locoweed
<i>Packera cana</i> (Hook.) W.A. Weber & A. Löve	woolly groundsel
<i>Packera streptanthifolia</i> (Greene) W.A. Weber & A. Löve	Rocky Mountain groundsel
<i>Paronychia sessiliflora</i> Nutt.	creeping nailwort
<i>Penstemon arenicola</i> A. Nelson	sand penstemon
<i>Phacelia hastata</i> Douglas ex Lehm.	silverleaf phacelia
<i>Phlox hoodii</i> Richardson	spiny phlox
<i>Potentilla pensylvanica</i> L.	Pennsylvania cinquefoil
<i>Pterospora andromedea</i> Nutt.	woodland pinedrops
<i>Pteryxia hendersonii</i> (J.M. Coult. & Rose) Mathias & Constance	Henderson's wavewing
<i>Pteryxia terebinthina</i> (Hook.) J.M. Coult. & Rose var. <i>albiflora</i> (Torr. & A. Gray) Mathias	turpentine wavewing
<i>Pulsatilla patens</i> (L.) Mill. ssp. <i>multifida</i> (Pritz.) Zamels	cutleaf anemone
<i>Pyrola chlorantha</i> Sw.	greenflowered wintergreen
<i>Pyrocoma carthamoides</i> Hook. var. <i>subsquarrosa</i> (Greene) G. Brown & Keil	largeflower goldenweed
<i>Saxifraga bronchialis</i> L. ssp. <i>austromontana</i> (Wiegand) Piper	matted saxifrage
<i>Sedum lanceolatum</i> Torr.	spearleaf stonecrop
<i>Senecio integerrimus</i> Nutt. var. <i>exaltatus</i> (Nutt.) Cronquist	Columbia ragwort
<i>Shoshonea pulvinata</i> Evert & Constance	Shoshone carrot
<i>Silene menziesii</i> Hook. ssp. <i>menziesii</i> var. <i>viscosa</i> (Greene) C.L. Hitchc. & Maguire	Menzies' campion
<i>Solidago simplex</i> Kunth	Mt. Albert goldenrod
<i>Stenotus armerioides</i> Nutt. var. <i>armerioides</i>	thrift mock goldenweed
<i>Symphyotrichum foliaceum</i> (Lindl. ex DC.) G.L. Nesom var. <i>apricum</i> (A. Gray) G.L. Nesom	alpine leafybract aster
<i>Taraxacum officinale</i> F.H. Wigg.	common dandelion
<i>Tetranneuris acaulis</i> (Pursh) Greene var. <i>acaulis</i>	stemless four-nerve daisy
<i>Townsendia parryi</i> D.C. Eaton	Parry's Townsend daisy
<i>Tragopogon dubius</i> Scop.	yellow salsify
<i>Valeriana occidentalis</i> A. Heller	western valerian
<i>Viola vallicola</i> A. Nelson	sagebrush violet
<i>Zigadenus elegans</i> Pursh	mountain deathcamas
<i>Zigadenus venenosus</i> S. Watson var. <i>gramineus</i> (Rydb.) Walsh ex M. Peck	grassy deathcamas
<b>Graminoids</b>	
<i>Achnatherum nelsonii</i> (Scribn.) Barkworth ssp. <i>dorei</i> (Barkworth & Maze) Barkworth	Dore's needlegrass
<i>Achnatherum occidentale</i> (Thurb.) Barkworth	western needlegrass
<i>Bromus porteri</i> (J.M. Coult.) Nash	Porter brome
<i>Calamagrostis purpurascens</i> R. Br.	purple reedgrass
<i>Carex filifolia</i> Nutt.	threadleaf sedge
<i>Carex rossii</i> Boott	Ross' sedge

Appendix I (continued).

<b>PLANTS Accepted Scientific Name with Author</b>	<b>PLANTS Common Name</b>
<i>Carex rupestris</i> All.	curly sedge
<i>Danthonia intermedia</i> Vasey	timber oatgrass
<i>Elymus elymoides</i> (Raf.) Swezey	squirreltail
<i>Elymus lanceolatus</i> (Scribn. & J.G. Sm.) Gould ssp. <i>lanceolatus</i>	thickspike wheatgrass
<i>Elymus trachycaulus</i> (Link) Gould ex Shinnars ssp. <i>trachycaulus</i>	slender wheatgrass
<i>Festuca idahoensis</i> Elmer	Idaho fescue
<i>Koeleria macrantha</i> (Ledeb.) Schult.	prairie Junegrass
<i>Leucopoa kingii</i> (S. Watson) W.A. Weber	spike fescue
<i>Poa nemoralis</i> L. ssp. <i>interior</i> (Rydb.) W.A. Weber	inland bluegrass
<i>Poa secunda</i> J. Presl	Sandberg bluegrass
<i>Pseudoroegneria spicata</i> (Pursh) A. Löve ssp. <i>spicata</i>	bluebunch wheatgrass
<b>Ferns</b>	
<i>Cystopteris fragilis</i> (L.) Bernh.	brittle bladderfern
<i>Selaginella densa</i> Rydb.	lesser spikemoss

## **APPENDIX 2. 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.