

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

Prepared for the

Shoshone National Forest, USDA Forest Service

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March, 2011

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INTRODUCTION

This report presents information on the rare plants and the vegetation types in the potential Sheep Mesa 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 Sheep Mesa, 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 Sheep Mesa RNA (Jones and Fertig 1999). The information from that earlier report has been updated in several ways. First, the proposed boundary of this potential RNA may differ slightly 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

A primary objective 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 Sheep Mesa 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 Sheep Mesa RNA are alpine plateaus and cirques; high-elevation forests of whitebark pine, Engelmann spruce, and lodgepole pine; and mid-elevation forests of Douglas-fir. Three perennial streams flow northward from Sheep Mesa at the southern end of the area to the North Fork of the Shoshone River at the northern end. Eight rare vascular plant species tracked by the Wyoming Natural Diversity Database occur in the alpine zone on Sheep Mesa or on sparsely-vegetated slopes in the northern part of the area.

LOCATION

The potential Sheep Mesa RNA is located within the Shoshone National Forest in northwestern Wyoming. The approximate center of the potential RNA is at latitude 44°23'50"N and longitude 109°47'40"W.

The potential RNA includes all or parts of the following sections (all on the 6th Principal Meridian): Township 50 North, Range 108 West, Section 1; T51N, R107W, Sections 5, 6, 7, 8, 9, 10, 11, 16, 17, 18, 19, 20, 21, 29, 30, 31; T51N, R108W, Sections 1, 2, 11, 12, 13, 14, 15, 23, 24, 25, 26, 35, 36; T52N, R107W, Sections 28, 29, 30, 31, 32; T52N, R108W, Section 26.

BOUNDARY

The proposed boundary of the potential RNA (Figure 2) follows drainage divides and other topographical features, except at the northern end.

AREA

The total area of the potential Sheep Mesa RNA is 15,332 acres (6,205 ha).¹

ELEVATION

The elevation of the potential Sheep Mesa RNA ranges from approximately 6,600 feet (2,012 meters) on the North Fork of the Shoshone River at the northern end to 12,085 feet (3,683 meters) on Fortress Mountain at the southern end.

ACCESS

The potential Sheep Mesa RNA may be reached on public roads. From Cody, Wyoming, travel on U.S. Highway 14/16/20 west approximately 40 miles (64 km) to the Shoshone National Forest Blackwater Pond Picnic Area. To reach the eastern half of the potential RNA from the picnic area, travel south approximately 1.5 miles (2.5 km) on Low Standard Forest Road 435, then south an additional 1 mile (1.6 km) on Forest Trail 758 to the intersection with Forest Trail 775, then south an additional 0.75 mile (1.2 km) on Forest Trail 775 to the northern boundary of the potential RNA. To reach the western half of the potential RNA from the Blackwater Pond Picnic Area, cross the Shoshone River on Low Standard Forest Road 435, then pick a route on foot west approximately 3 miles (4.8 km) to the mouth of Sheep Creek and Forest Trail 789. The western half of the potential RNA may also be reached by traveling west on U.S. Highway 14/16/20 approximately 7 miles (11 km) to Low Standard Forest Road 446, then picking a route on foot east on the south side of the Shoshone River approximately 4 miles to the mouth of Sheep Creek and Forest Trail 789.

ECOREGION

The potential Sheep Mesa 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.

1. The area of the potential Sheep Mesa 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,.

USDI Geological Survey 7.5 minute topographic Quadrangle Maps: Clayton Mountain., Wyo.; Chimney Rock, Wyo.; Sheep Mesa, Wyo.

AREA BY COVER-TYPE

This information on plant associations, habitat types, Kuchler vegetation types, and Society of American Foresters forest cover-types is based on 1998 field work conducted by Natural Diversity Database biologists, reported in an earlier document (Jones and Fertig 1999), and revised to reflect new names for plant associations. 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 (Jones and Fertig 1999) 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, No date) as backgrounds. The areas of these various cover-types were computed in the ArcMap™ software.

PLANT ASSOCIATIONS²

The major plant associations are alpine turf dominated by Ross's avens, and forests and woodlands dominated by Engelmann spruce, lodgepole pine, or Douglas-fir (Table 1, Figure 3). The southern quarter of the potential RNA is vegetated with a mosaic of the *Geum rossii* – *Trifolium* spp. Association on drier and windblown sites and mesic alpine vegetation (association undetermined) on protected sites (especially in the bottoms of cirques). At upper tree-line and below, the vegetation is a mix of *Pinus albicaulis* / *Ribes montigenum* Association (mainly on west-facing slopes) and *Picea engelmannii* / *Ribes montigenum* Association. Lodgepole pine forest, of the *Pinus contorta* / *Vaccinium scoparium* Association and the *Pinus contorta* / *Arnica cordifolia* Association, is the common vegetation type in the subalpine zone. The whitebark pine, Engelmann spruce, and lodgepole pine forest types merge with each other, and in many stands, the overstory includes all three tree species, along with Douglas-fir at the lower elevations. Barren cliffs and scree slopes are common in the subalpine zone and above.

Fire burned in the eastern part of the potential RNA in the mid-20th century, and that burned area is now vegetated largely with lodgepole pine forest. This vegetation probably belongs to the same plant associations as does the unburned lodgepole pine vegetation.

Douglas-fir forests and woodlands are the major vegetation type at lower elevations, both on uplands and on riparian sites. This vegetation comprises the *Pseudotsuga menziesii* / *Spiraea betulifolia* Association, *Pseudotsuga menziesii* / *Symphoricarpos albus* Association, and the *Pseudotsuga menziesii* / *Acer glabrum* Association. Patches of the *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Association and the *Festuca idahoensis* - *Leucopoa kingii* Association are common in the Douglas-fir woodlands. Small stands of the *Alnus incana* / *Equisetum arvense* Association grow along the perennial streams.

KUCHLER VEGETATION TYPES

The potential Sheep Mesa Research Natural Area supports vegetation in five Kuchler (1964) types (Figure 4), three of which – Alpine Meadow, Spruce-Fir Forest, and Pine-Douglas fir Forest – are mapped on 89% of the area (Table 2). The Lodgepole Pine and Wheatgrass-Needlegrass Shrubsteppe types cover smaller areas.

2. Names of plant associations are from NatureServe (2010).

HABITAT TYPES

Habitat types in the *Abies lasiocarpa* Series and the *Pseudotsuga menziesii* Series (Steele *et al.* 1983) cover most of the potential RNA (Figure 5, Table 3). Grassland and shrubland habitat types (Tweitt and Houston 1980) are common in the northern part of the area (Figure 5). The southern part of the area, above upper tree-line, has not been classified into habitat types.

SOCIETY OF AMERICAN FORESTERS COVER TYPES

Three forest cover types (Eyre 1980) – Engelmann Spruce-Subalpine Fir (206), Lodgepole Pine (218), and Interior Douglas-Fir (210) – account for 60% of the vegetation in the potential RNA (Table 4, Figure 6). The Whitebark Pine (208) type is the remaining forest cover type in the area. The alpine vegetation at the southern end of the area and the grass-and-shrub dominated vegetation at lower elevation are not included in this cover type classification.

Table 1. Occurrence of plant associations in complexes mapped in the potential Sheep Mesa Research Natural Area. See Figure 3. “M” in a cell indicates that a plant association is a major component of a complex, and “m” indicates that it is a minor component.

Plant Associations	Complexes							
	Alpine. 3,706 ac, 500 ha	Whitebark pine. 890 ac, 360 ha	Engelmann spruce. 2,893 ac, 1,171 ha	Lodgepole pine, unburned. 3,070 ac, 1,242 ha	Lodgepole pine, burned. 1,026 ac, 415 ha	Douglas-fir, upland. 3,085 ac, 1,248 ha	Douglas-fir, riparian. 195 ac, 79 ha	Upland shrub & grass. 467 ac, 189 ha
Herbaceous								
<i>Festuca idahoensis</i> - <i>Leucopoa kingii</i> Herbaceous Association				m		M		M
<i>Geum rossii</i> - <i>Trifolium</i> spp. Herbaceous Association	M	m	m					
Mesic alpine (association unknown)	m	m	m					
Shrub								
<i>Alnus incana</i> / <i>Equisetum arvense</i> Shrub Association							m	
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Association				m		M		M
Forest & Woodland								
<i>Picea engelmannii</i> / <i>Equisetum arvense</i> Forest Association				m			m	
<i>Picea engelmannii</i> / <i>Ribes montigenum</i> Forest Association		m	M					
<i>Pinus albicaulis</i> Woodland Association		M	m					
<i>Pinus contorta</i> / <i>Arnica cordifolia</i> Forest Association					M		m	m
<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Forest Association			m	M				
<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> Forest Association						M		
<i>Pseudotsuga menziesii</i> / <i>Spiraea betulifolia</i> Forest Association				m		M		m
<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i> Forest Association						M	M	m

Table 2. Kuchler vegetation types in the potential Sheep Mesa Research Natural Area. See Figure 4.

Vegetation Type (Kuchler 1964)	Acres	Hectares
Alpine Meadow	3,706	1,500
Spruce-Fir Forest	3,783	1,531
Lodgepole Pine, unburned	1,026	415
Lodgepole Pine, burned	161	65
Pine-Douglas fir	6,189	2,505
Wheatgrass-Needlegrass Shrubsteppe	467	189

Table 3. Habitat type complexes in the potential Sheep Mesa 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.

Habitat Types (Steele <i>et al.</i> 1983, Tweit & Houston 1980)	Complexes							
	Alpine. 3,706 ac, 500 ha	<i>A. lasiocarpa</i> / <i>R. montigenum</i> . 890 ac, 360 ha	<i>P. engelmannii</i> / <i>R. montigenum</i> . 2,893 ac, 1,171 ha	<i>A. lasiocarpa</i> Series, unburned. 3,070 ac, 1,242 ha	<i>A. lasiocarpa</i> Series, burned. 1,026 ac, 415 ha	<i>Pseudotsuga menziesii</i> Series, upland. 3,085 ac, 1,248 ha	<i>Pseudotsuga menziesii</i> Series, riparian. 195 ac, 79 ha	Upland shrub & grass. 467 ac, 189 ha
Shrub								
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> habitat type				m		M		M
Forest & Woodland								
<i>Picea engelmannii</i> / <i>Equisetum arvense</i> habitat type				m			m	
<i>Picea engelmannii</i> / <i>Ribes montigenum</i> habitat type		m	M					
<i>Abies lasiocarpa</i> / <i>Ribes montigenum</i> habitat type, <i>Pinus albicaulis</i> phase		M	m					
<i>Abies lasiocarpa</i> / <i>Arnica cordifolia</i> habitat type, <i>Arnica cordifolia</i> phase				M		m		m
<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> habitat type			m	M				
<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> habitat type						M		
<i>Pseudotsuga menziesii</i> / <i>Spiraea betulifolia</i> habitat type, <i>Spiraea betulifolia</i> phase				m		M		m
<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i> habitat type						M	M	m

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

Cover Type (Eyre 1980)	Acres	Hectares
Whitebark pine (208)	890	360
Engelmann spruce-subalpine fir (206)	2,893	1,171
Lodgepole pine (218), unburned	3,070	1,242
Lodgepole pine (218), burned	1,026	415
Interior Douglas-fir (210)	3,281	1,328
None	4,173	1,689

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 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 Sheep Mesa RNA. This figure was produced from data extracted from the nation-wide map of ecological systems, 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.

Several ecological systems have been mapped in substantial amounts in the potential RNA (Table 5). The Barren system, the Rocky Mountain Alpine Turf system, and the Rocky Mountain Alpine Dwarf-Shrubland system cover most of the area above upper tree-line. The forested portion of the potential RNA is mapped primarily as the Middle Rocky Mountain Montane Douglas-fir Forest and Woodland system, the Northern Rocky Mountain Subalpine Woodland and Parkland system, and the Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland system.

Mapping a substantial amount of the subalpine woodland and parkland system in the potential RNA seems to be at odds with information gathered during the field survey of the area (Jones and Fertig 1999). Researchers in the Landfire Program caution that the national Landfire Project information should be augmented with knowledge of local conditions (http://www.landfire.gov/dp_quality_assessment.php), and the field survey suggests that the subalpine woodland and parkland should actually be mapped as the Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland Ecological System, the Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland Ecological System, or the Rocky Mountain Lodgepole Pine Forest Ecological System. All three are mapped elsewhere in the potential RNA.

Three additional systems -- Agriculture-Cultivated Crops and Irrigated Agriculture, Agriculture-Pasture and Hay, and Northern Rocky Mountain Conifer Swamp -- are erroneously mapped in the potential RNA. There is no agricultural land in the potential RNA, and field work turned up no evidence of swamp vegetation. The putative presence of these systems in the area is a consequence of the automatic classification of pixels on satellite images.

Table 5. Ecological systems in the potential Sheep Mesa 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.

Ecological Systems	Acres	Hectares
Barren	1,630	660
Inter-Mountain Basins Montane Sagebrush Steppe	231	94
Middle Rocky Mountain Montane Douglas-fir Forest & Woodland	3,409	1,380
Northern Rocky Mountain Subalpine Deciduous Shrubland	241	98
Northern Rocky Mountain Subalpine Woodland and Parkland	4,730	1,914
Rocky Mountain Alpine Dwarf-Shrubland	924	374
Rocky Mountain Alpine Turf	1,465	593
Rocky Mountain Lodgepole Pine Forest	329	133
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	872	353
Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	447	181
Rocky Mountain Subalpine-Montane Mesic Meadow	580	235
Snow-Ice	160	65
<i>Agriculture-Cultivated Crops and Irrigated Agriculture</i>	<i>< 1</i>	<i>< 1</i>
<i>Agriculture-Pasture and Hay</i>	<i>10</i>	<i>4</i>
<i>Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland</i>	<i>< 1</i>	<i>< 1</i>
<i>Northern Rocky Mountain Conifer Swamp</i>	<i>3</i>	<i>1</i>
<i>Northern Rocky Mountain Mesic Montane Mixed Conifer Forest</i>	<i>19</i>	<i>8</i>
<i>Northern Rocky Mountain Montane-Foothill Deciduous Shrubland</i>	<i>31</i>	<i>13</i>
<i>Northern Rocky Mountain Subalpine-Upper Montane Grassland</i>	<i>71</i>	<i>29</i>
<i>Rocky Mountain Aspen Forest and Woodland</i>	<i>30</i>	<i>12</i>
<i>Rocky Mountain Montane Riparian Systems</i>	<i>< 1</i>	<i>< 1</i>
<i>Rocky Mountain Poor-Site Lodgepole Pine Forest</i>	<i>< 1</i>	<i>< 1</i>
<i>Rocky Mountain Subalpine/Upper Montane Riparian Systems</i>	<i>10</i>	<i>4</i>
<i>Southern Rocky Mountain Montane-Subalpine Grassland</i>	<i>137</i>	<i>55</i>

PHYSICAL AND CLIMATIC CONDITIONS

PHYSICAL SETTING

The potential Sheep Mesa RNA is located in the valley of the North Fork of the Shoshone River, and includes parts or all of the valleys of three tributary streams (Mesa Creek, Sheep Creek, and Blackwater Creek) flowing into the river from the south. The southern third of the area contains gently-rolling alpine surfaces and cirques, with over 1,000 feet (305 m) of relief. The northern two-thirds of the

area consist of valleys of the northward-flowing streams, with moderately-steep side slopes punctuated by cliffs and talus deposits. Local relief in the valleys is 1,000 feet to 2,000 feet (300 m to 600 m).

GEOLOGY

The bedrock in the potential RNA is Tertiary volcanic rock (Love and Christiansen 1985). In the northern half of the area, this rock is the andesitic Wapiti Formation. In the southern half of the area, the rock consists of younger volcanic rocks lying atop the Wapiti Formation: trachyandesite of the Trout Peak Formation, and the conglomerate and tuff of the Wiggins Peak Formation.

SOILS

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CLIMATE

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DESCRIPTION OF VALUES

VEGETATION

With its long elevation gradient and rough topography, and the mid-20th century burn, the potential Sheep Mesa RNA encompasses much of the vegetation pattern widespread throughout the Absaroka Mountains portion of the Shoshone National Forest. The area illustrates well the nature of vegetation change in this mountainous landscape: plant species composition and vegetation structure vary gradually with changes in elevation or along gentle topographic gradients, but abruptly from one slope to another in rough topography and from the unburned area into the burned area.

FLORA

Plant Species List

A list of 296 vascular plant species documented in the potential RNA is included in Table 6.

Threatened, Endangered, and Sensitive Plant Species

There are no federally listed Threatened or Endangered plant species found in the Sheep Mesa potential Research Natural Area.

Two species on the USDA Forest Service Region 2 Sensitive plant species list are reported from the area. Information about each is summarized below. The heritage ranks, assigned by the Wyoming Natural Diversity Database, are explained in Appendix 1.

Penstemon absarokensis (Absaroka beardtongue)

Heritage Rank: G2/S2.

Federal Status: USFS R2 Sensitive (USDA Forest Service 2009).

Geographic Range: Endemic to the Absaroka Mountains in Park County, Wyoming. An isolated population from the northeastern Wind River Range in Fremont County, Wyoming may represent a different, undescribed taxon according to Dorn (1989).

Habitat: Steep volcanic scree and talus slopes in sparsely vegetated openings in Douglas-fir/limber pine woodlands, and also in creek bottoms (Mills and Fertig 1996, Beatty *et al.* 2003a).

Comments: Walter Fertig discovered four small colonies of Absaroka beardtongue on the divide between Blackwater Creek and the North Fork of the Shoshone River in 1997 (Fertig 1998). This population

consisted of widely scattered individuals and was restricted to sparsely vegetated volcanic scree slopes. It appears that most colonies are outside of RNA boundaries.

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

Heritage Rank: G4T2/S2.

Federal Status: USFS Region 2 Sensitive (USDA Forest Service 2009).

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

Habitat: Openings in Douglas-fir/limber pine woodlands, on sparsely vegetated ridges and on scree and talus slopes of volcanic andesite (Fertig 1997, Marriott and Lyman 2006).

Comments: This species was first collected locally in 1987 by Erwin Evert. It was found in 1997 by Walter Fertig in two separate areas, including one with 7 small colonies in the potential RNA scattered along the divide between Sheep Creek and Blackwater Creek and on the ridges above the North Fork of the Shoshone River. Colonies range from 30 to nearly 400 individuals, making the potential RNA one of the largest known populations (Fertig 1997).

Six additional plants listed as species of special concern or watch list species by WYNDD (Heidel 2007) are also known from the potential RNA. The status of each of these species is summarized below. Habitat may also exist for a seventh species, *Lomatium attenuatum* (Absaroka biscuitroot) on andesite cliffs at the north end of the potential RNA. No populations of this species were located during 1997 surveys, although the species is known from the slopes of Clayton Mountain, approximately 1.5 miles to the southwest of the potential RNA (Fertig 1997).

Botrychium ascendens (Upward-lobed moonwort)

Heritage Rank: G2G3/S1.

Federal Status: USFS Region 4 Sensitive (Intermountain Region).

Geographic Range: Widely scattered from the Yukon east to Ontario and south to California (Fertig *et al.* 1994). In Wyoming it is disjunct in the Absaroka and northern Wind River Ranges in Fremont County and in the Bighorn Range in Johnson County (Houston *et al.* 2001, Beatty *et al.* 2003b).

Habitat: Short and tall riparian willow communities at montane elevation, with much moss, gravel, and cobble ground cover, on volcanic or granitic alluvium. In the potential Sheep Mesa Research Natural Area, it was collected in montane forest on moss.

Comments: Erwin Evert collected this species along the Blackwater Creek Trail in 1982, and the material was annotated by W. Wagner.

Castilleja nivea (Snow paintbrush)

Heritage Rank: G3/S2 (WYNDD watch list).

Federal Status: None.

Geographic Range: Regional endemic of the Beartooth and Absaroka Mountains in Hot Springs and Park Counties, Wyoming and in adjoining Montana.

Habitat: Alpine rocky tundra, meadows, and fellfields on gravelly limestone soils (Scott 1997), occasionally lower.

Comments: This species has been collected at opposite ends of Sheep Mesa. It was first collected in 1979 by Erwin Evert. In 1997, Walter Fertig discovered a small colony of snow paintbrush along the divide between Sheep Creek and the west fork of Blackwater Creek (Fertig 1998).

Draba crassa (Thick-leaf whitlow-grass)

Heritage Rank: G3/S2 (WYNDD watch list).

Federal Status: None.

Geographic Range: Rocky Mountains from southern Montana to northeastern Utah and central Colorado (Scott 1997). In Wyoming, it is known from the Absaroka, Teton, Gros Ventre, and Wind River Mountains.

Habitat: Alpine fellfields, cliffs, talus, and scree (Scott 1997).

Comments: Erwin Evert collected this species, in the potential RNA, on Sheep Mesa, in 1984. This population was not relocated in 1997.

Papaver kluanense (Alpine poppy)

PLANTS Database Accepted Name: *Papaver radicum* Rottb. ssp. *kluanense* (D. Löve) D.F. Murray (rooted poppy)

Other Synonyms: *Papaver lapponicum* var. *occidentale*

Heritage Rank: G3G4/S2.

Federal Status: None.

Geographic Range: Southeastern Alaska south in the Rocky Mountains to northern New Mexico (Kiger and Murray 1997). In Wyoming, it is known from the Absaroka, Bighorn, and Wind River Mountains.

Habitat: Alpine scree slopes, rocky ledges, and high mountain passes, rarely below 11,000 feet (Scott 1997).

Comments: Walter Fertig discovered a small population of 20-50 individuals in the potential RNA, in the alpine cirque at the head of the west fork of Blackwater Creek (Fertig 1998).

Potentilla uniflora (One-flower cinquefoil)

Heritage Rank: G5/S1.

Federal Status: None.

Geographic Range: Siberia and Alaska south intermittently in the Rocky Mountains to Montana, northwestern Wyoming, and Colorado. In Wyoming, it is known from the Absaroka, Gros Ventre, and Beartooth Mountains in Fremont, Hot Springs, Park, Sublette, and Teton Counties (Scott 1997).

Habitat: Alpine fellfields and tundra (Scott 1997).

Comments: Erwin Evert collected this species in the potential RNA, at the headwaters of Blackwater Creek (near Sheep Mesa) in 1982. This population was not relocated in 1997.

Silene kingii (King's campion)

Synonym: *Lychnis apetala*

Heritage Rank: G2G4QT?/S2

Federal Status: None.

Geographic Range: Circumpolar, in North America extending from Alaska to northern Quebec, and south in the Rocky Mountains to Alberta, northwestern Wyoming, and central Colorado. In Wyoming, it is known from the Absaroka and Wind River Mountains in Fremont and Park Counties.

Habitat: Alpine and subalpine talus slopes and fellfields (Scott 1997).

Comments: Erwin Evert collected this species in the potential RNA in 1984, on the divide between the headwaters of Blackwater and West Fork Blackwater Creeks. This population was not relocated in 1997. There is an undescribed variety in Wyoming but the Sheep Mesa material represents the type variety.

Six additional rare plant species were noted in the ecological evaluation of the potential Sheep Mesa RNA (Jones and Fertig 1999) that are no longer tracked by the Wyoming Natural Diversity Database (Heidel 2007). These species are *Kobresia simpliciuscula* (simple bog sedge) [*Carex bipartita* (Arctic

hare-foot sedge) in Jones and Fertig 1999], *Castilleja crista-gallii* (Cock's-comb paintbrush), *Conimitella williamsii* (Williams' miterwort), *Gayophytum humile* (Low ground-smoke), *Gentianella tenella* (Dane's dwarf gentian), and *Tephrosieris lindstroemii* (syn. *Senecio fuscatus*; Twice-hairy groundsel).

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 Sheep Mesa RNA (Wyoming Game and Fish Department, No date). The portion of the potential RNA inside the Washakie Wilderness Area is within the primary conservation area for grizzly bears (USDI, Fish and Wildlife Service, No date (a)).

Gray wolf (*Canis lupus*)

The potential Sheep Mesa RNA is within the Greater Yellowstone Recovery Area for the Northern Rocky Mountain Distinct Population Segment of the gray wolf (USDI, Fish and Wildlife Service, No date (b)), which is protected under the provisions of the federal Endangered Species Act.

Animal Species List

U.S. Forest Service staff will write this section

LANDS

The potential Sheep Mesa RNA is National Forest System land and is surrounded by National Forest System land of the Wapiti Ranger District of the Shoshone National Forest. Fifty-three percent of the area (8,111 acres; 3,283 ha) lies within the Washakie Wilderness Area.

IMPACTS AND POSSIBLE CONFLICTS

MINERAL RESOURCES

U.S. Forest Service staff will write this section.

GRAZING

U.S. Forest Service staff will write this section.

TIMBER

U.S. Forest Service staff will write this section.

WATERSHED VALUES

U.S. Forest Service staff will write this section.

RECREATION VALUES

U.S. Forest Service staff will write this section.

WILDLIFE AND PLANT VALUES

U.S. Forest Service staff will write this section.

TRANSPORTATION VALUES

U.S. Forest Service staff will write this section.

MANAGEMENT CONCERNS

U.S. Forest Service staff will write this section.

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Wyoming Game and Fish Department. No date. Approximate Distribution of Grizzly Bears in Wyoming (map). <http://gf.state.wy.us/wildlife/grizzlymanagement/index.asp>. Accessed March 8, 2011.

FIGURES

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

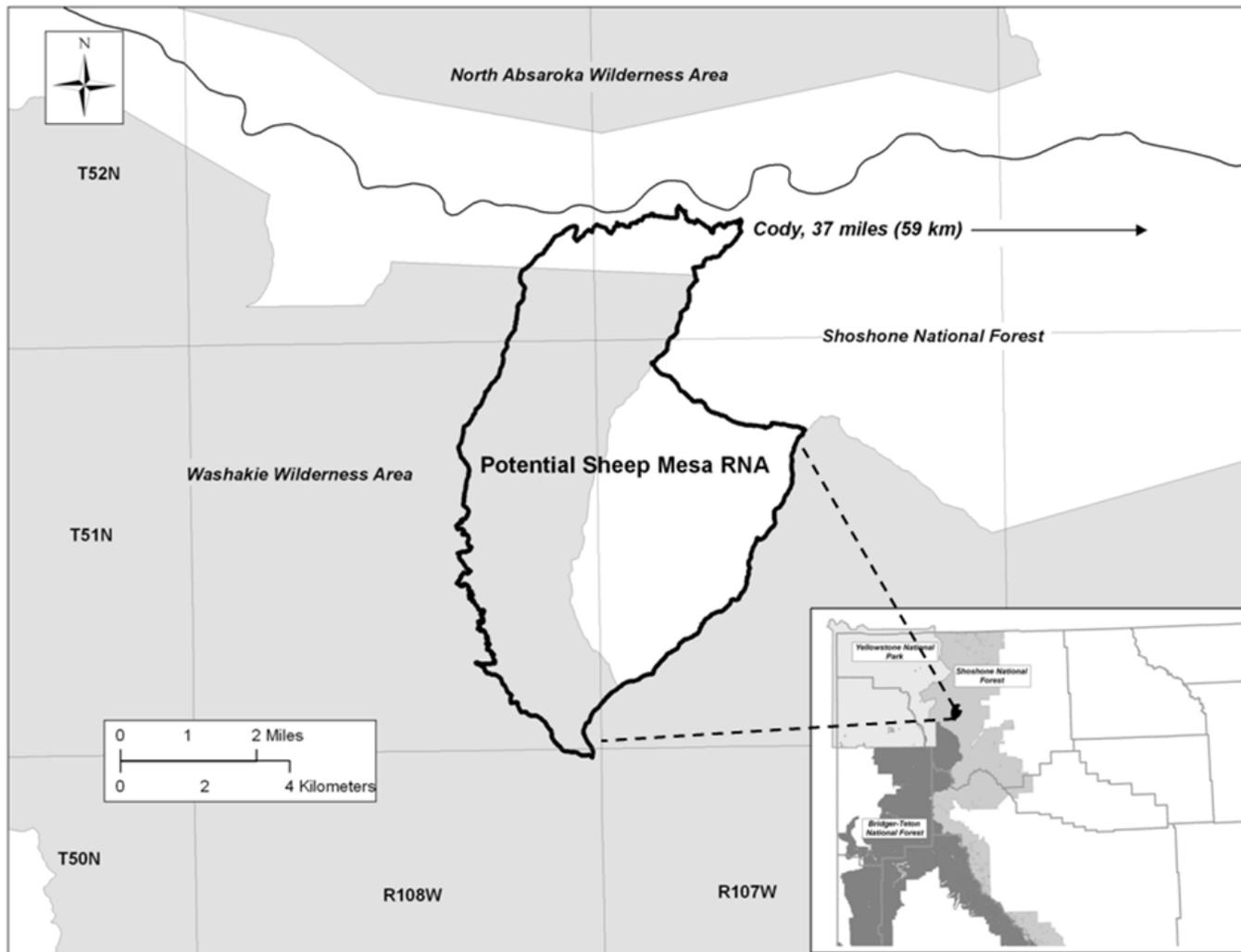


Figure 2. Proposed boundary of the potential SheepMesa Research Natural Area.

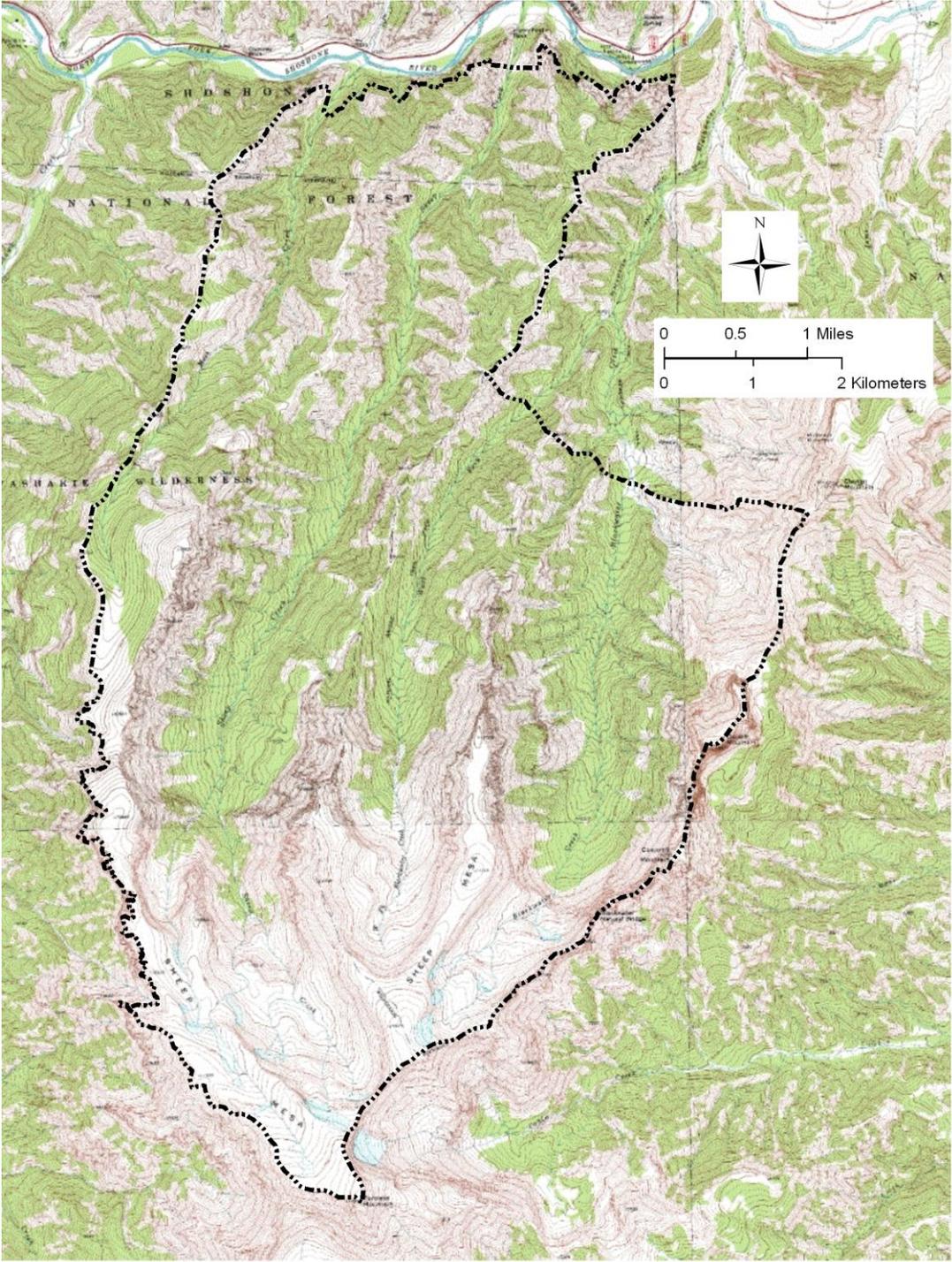


Figure 3. Complexes of plant associations in the potential Sheep Mesa Research Natural Area
The plant associations present in each complex are listed in Table 1.

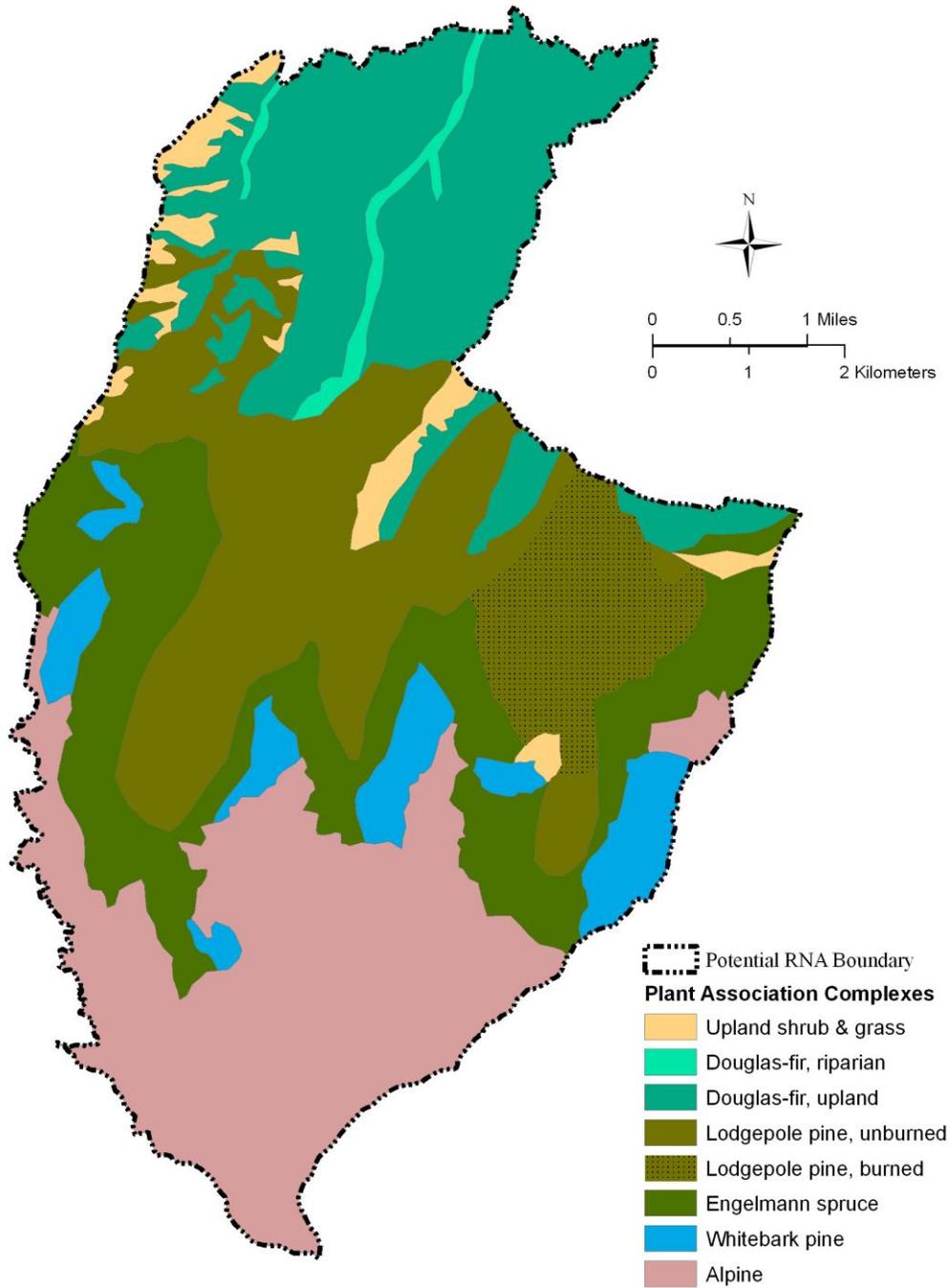


Figure 4. Kuchler vegetation types (Kuchler 1964) in the potential Sheep Mesa Research Natural Area. Areas of these types are listed in Table 2.

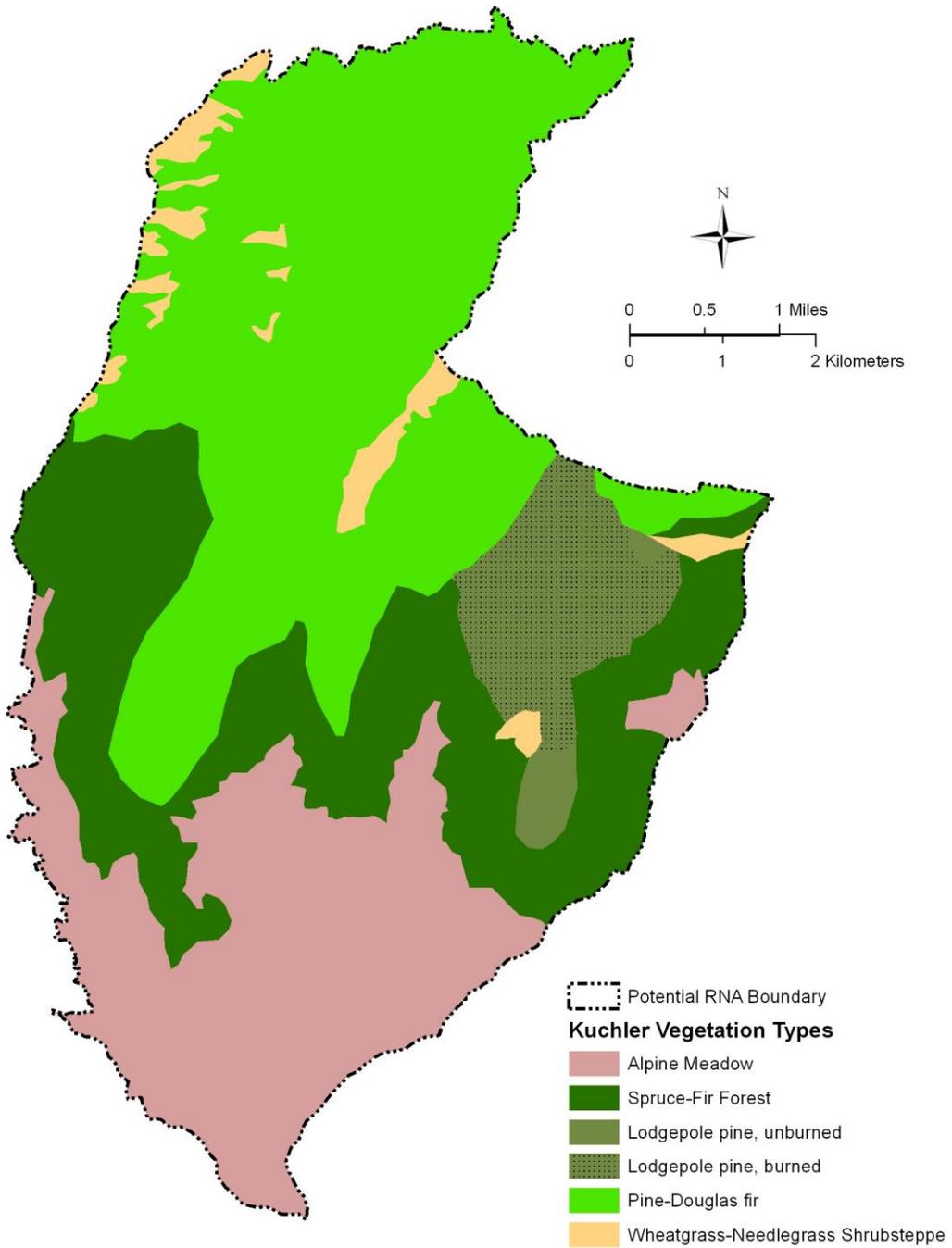


Figure 5. Complexes of habitat types in the potential Sheep Mesa Research Natural Area. The habitat types present in each complex are listed in Table 3.

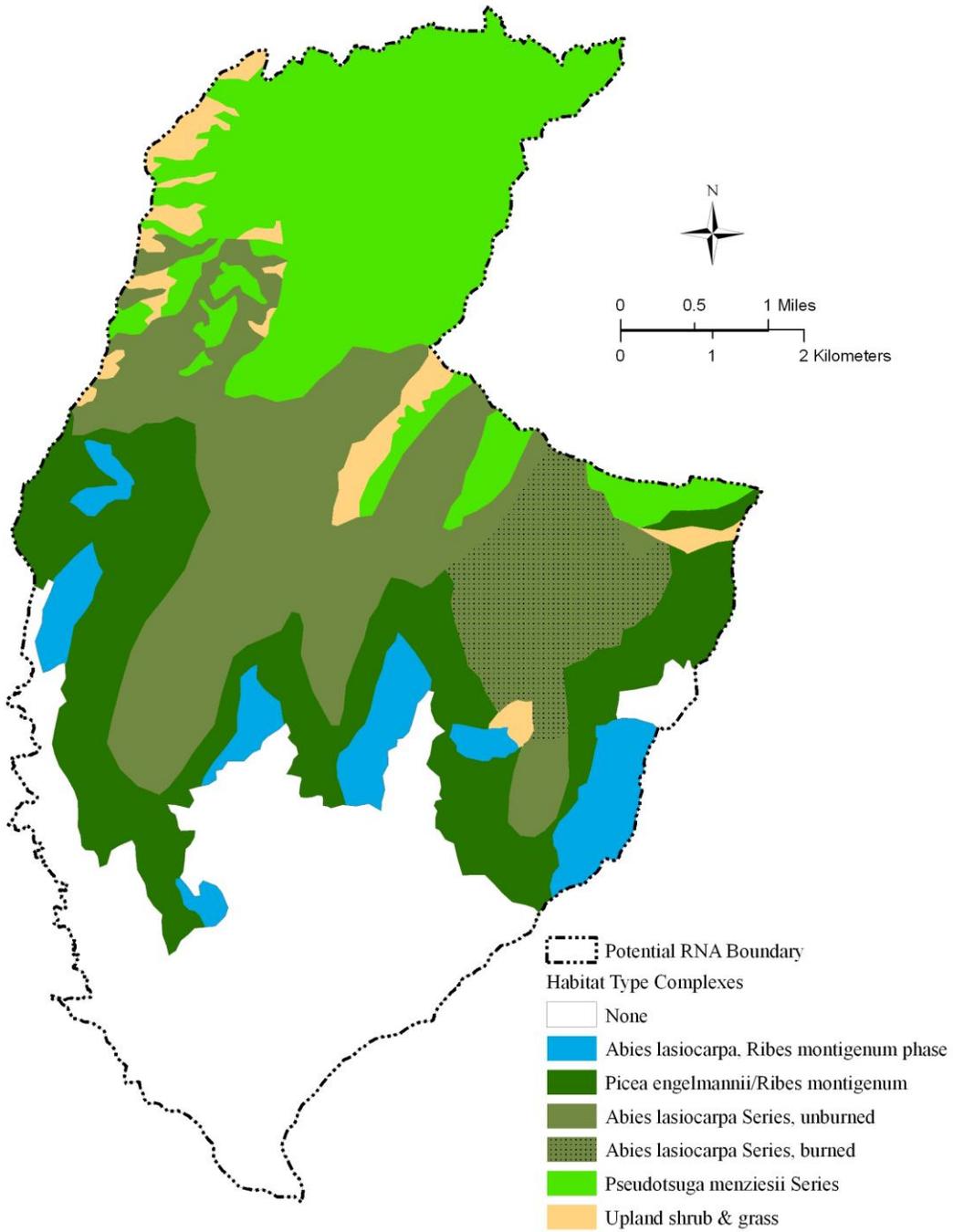


Figure 6. Society of American Foresters Cover Types in the potential Sheep Mesa Research Natural Area. Areas of these types are listed in Table 4.

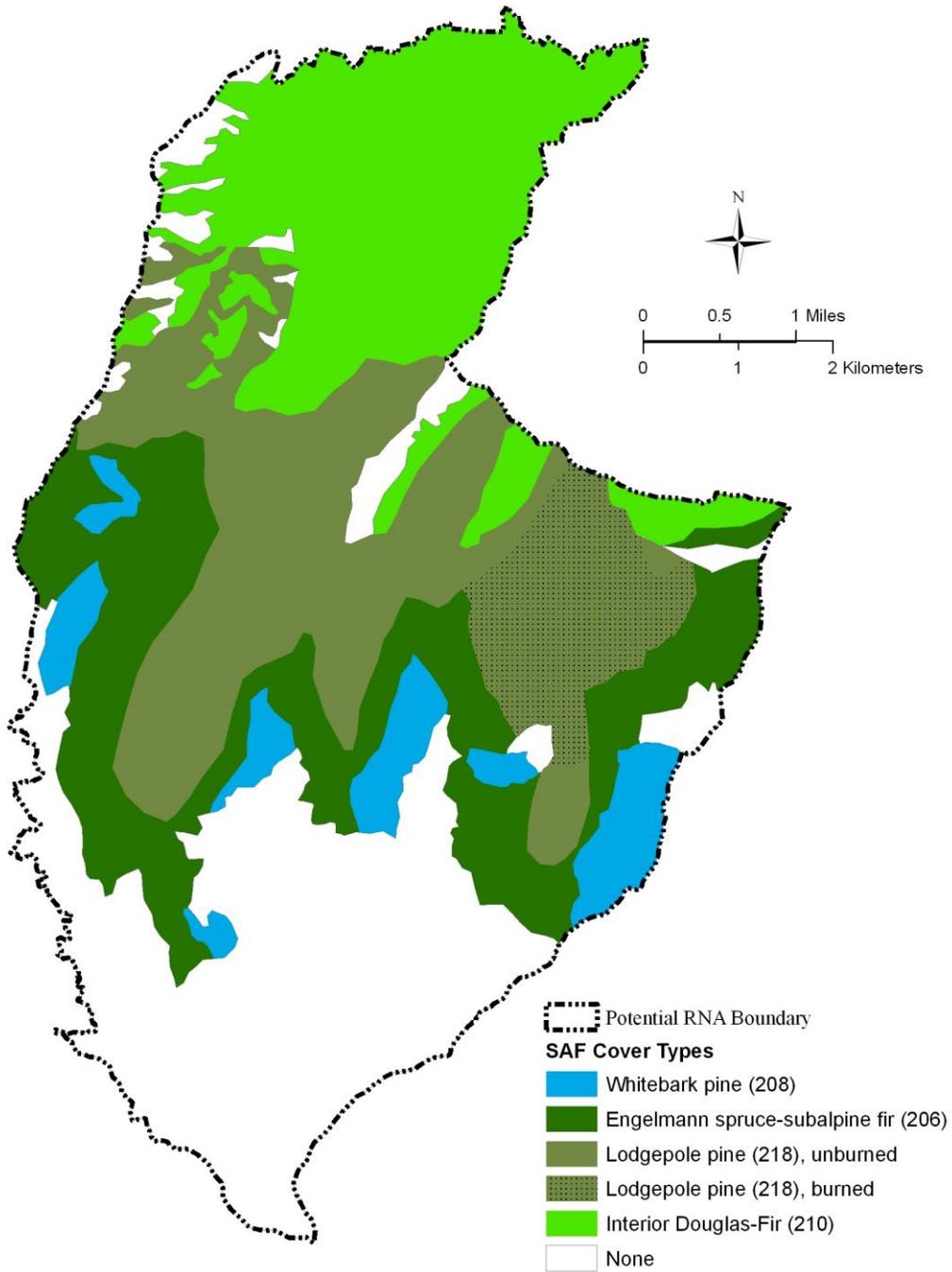
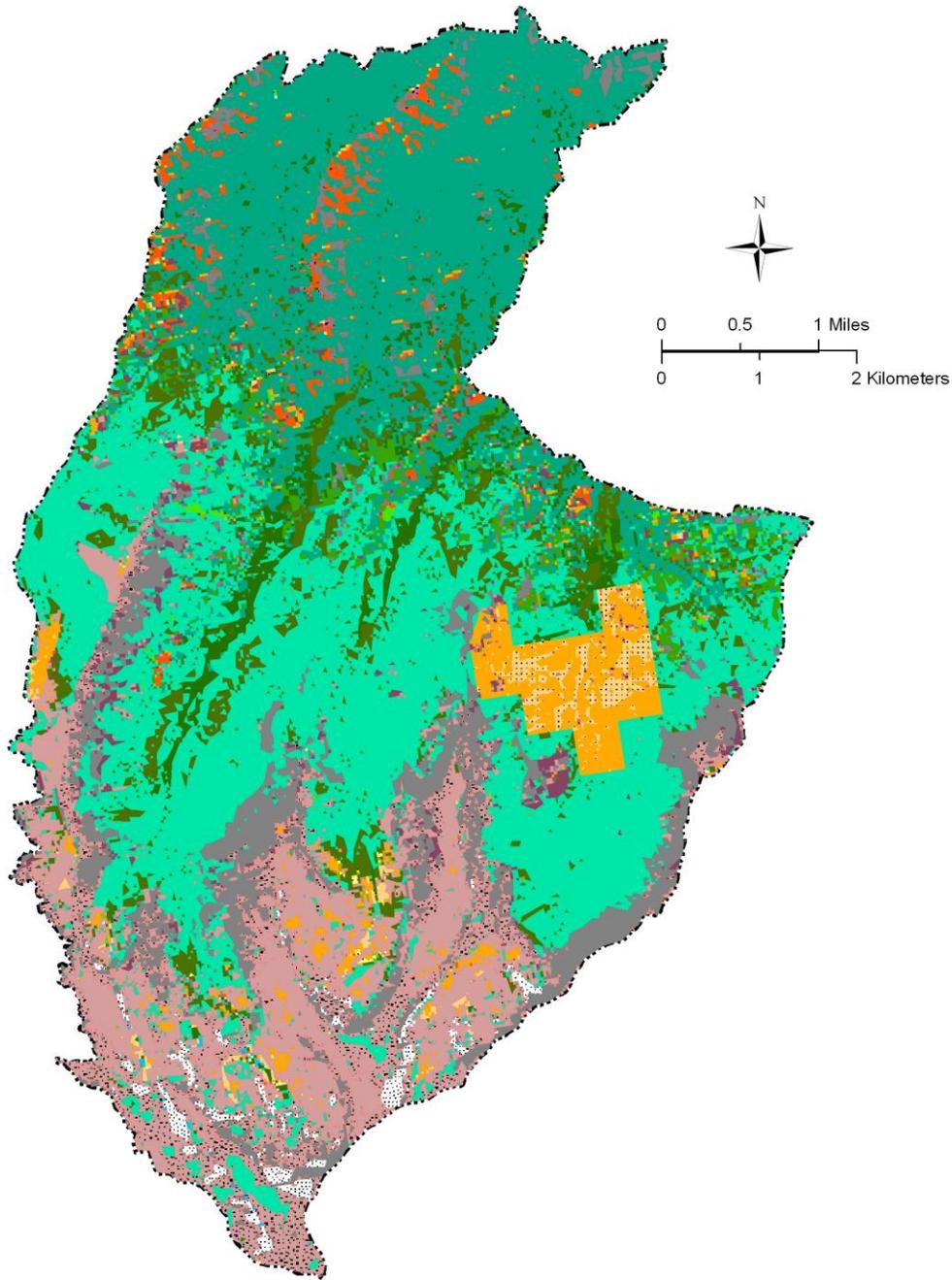


Figure 7. Ecological systems in the potential Sheep Mesa Research Natural Area. See following page for legend. Areas of these types are listed in Table 5.



The area of Rocky Mountain Subalpine-Montane Mesic Meadow with the rectilinear boundaries in the eastern part of the potential RNA appears in the original raster data set. It does not represent the vegetation on the ground and probably is an artifact of the automatic classification of pixels in the Landsat image.

Figure 7 (continued). Legend for map of ecological systems in the potential Sheep Mesa Research Natural Area. System names are listed alphabetically in two groups. Systems in the first group (“Barren” through “Snow-Ice”) 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 SHEEP MESA 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.

PLANTS Accepted Scientific Name with Author	PLANTS Common Name
Trees	
296	
<i>Abies lasiocarpa</i> (Hook.) Nutt.	subalpine fir
<i>Picea engelmannii</i> Parry ex Engelm.	Engelmann spruce
<i>Pinus albicaulis</i> Engelm.	whitebark pine
<i>Pinus contorta</i> Douglas ex Louden var. <i>latifolia</i> Engelm. ex S. Watson	lodgepole pine
<i>Pinus flexilis</i> James	limber pine
<i>Populus balsamifera</i> L.	balsam poplar
<i>Populus tremuloides</i> Michx.	quaking aspen
<i>Pseudotsuga menziesii</i> (Mirb.) Franco var. <i>glauca</i> (Beissn.) Franco	Rocky Mountain Douglas-fir
Shrubs	
<i>Acer glabrum</i> Torr.	Rocky Mountain maple
<i>Alnus incana</i> (L.) Moench ssp. <i>tenuifolia</i> (Nutt.) Breitung	thinleaf alder
<i>Artemisia tridentata</i> Nutt. ssp. <i>vaseyana</i> (Rydb.) Beetle	mountain big sagebrush
<i>Chrysothamnus viscidiflorus</i> (Hook.) Nutt. ssp. <i>viscidiflorus</i>	yellow rabbitbrush
<i>Ericameria nauseosa</i> (Pall. ex Pursh) G.L. Nesom & Baird ssp. <i>nauseosa</i>	rubber rabbitbrush
<i>Juniperus communis</i> L. var. <i>depressa</i> Pursh	common juniper
<i>Juniperus scopulorum</i> Sarg.	Rocky Mountain juniper
<i>Mahonia repens</i> (Lindl.) G. Don	creeping barberry
<i>Prunus virginiana</i> L. var. <i>melanocarpa</i> (A. Nelson) Sarg.	black chokecherry
<i>Rhus trilobata</i> Nutt.	skunkbush sumac
<i>Ribes cereum</i> Douglas var. <i>pedicellare</i> W.H. Brewer & S. Watson	whisky currant
<i>Ribes lacustre</i> (Pers.) Poir.	prickly currant
<i>Ribes montigenum</i> McClatchie	gooseberry currant
<i>Ribes oxycanthoides</i> L.	Canadian gooseberry
<i>Rosa acicularis</i> Lindl. ssp. <i>sayi</i> (Schwein.) W.H. Lewis	prickly rose
<i>Rosa woodsii</i> Lindl.	Woods' rose
<i>Rubus idaeus</i> L. ssp. <i>strigosus</i> (Michx.) Focke	grayleaf red raspberry
<i>Rubus parviflorus</i> Nutt.	thimbleberry
<i>Salix bebbiana</i> Sarg.	Bebb willow
<i>Salix lucida</i> Muhl. ssp. <i>caudata</i> (Nutt.) E. Murray	greenleaf willow
<i>Salix nivalis</i> Hook.	snow willow
<i>Salix petrophila</i> Rydb.	alpine willow
<i>Sambucus racemosa</i> L.	red elderberry
<i>Shepherdia canadensis</i> (L.) Nutt.	russet buffaloberry
<i>Spiraea betulifolia</i> Pall. var. <i>lucida</i> (Douglas ex Greene) C.L. Hitchc.	shinyleaf spirea
<i>Symphoricarpos oreophilus</i> A. Gray var. <i>utahensis</i> (Rydb.) A. Nelson	Utah snowberry
<i>Vaccinium scoparium</i> Leiberg ex Coville	grouse whortleberry

PLANTS Accepted Scientific Name with Author	PLANTS Common Name
Forbs	
<i>Achillea millefolium</i> L.	common yarrow
<i>Actaea rubra</i> (Aiton) Willd.	red baneberry
<i>Agoseris glauca</i> (Pursh) Raf. var. <i>dasycephala</i> (Torr. & A. Gray) Jeps.	pale agoseris
<i>Agoseris glauca</i> (Pursh) Raf. var. <i>laciniata</i> (D.C. Eaton) Smiley	false agoseris
<i>Allium brevistylum</i> S. Watson	shortstyle onion
<i>Allium cernuum</i> Roth	nodding onion
<i>Allium textile</i> A. Nelson & J.F. Macbr.	textile onion
<i>Androsace septentrionalis</i> L. ssp. <i>subulifera</i> (A. Gray) G.T. Robbins	pygmyflower rockjasmine
<i>Angelica</i> L.	angelica
<i>Antennaria lanata</i> (Hook.) Greene	woolly pussytoes
<i>Antennaria media</i> Greene	Rocky Mountain pussytoes
<i>Antennaria racemosa</i> Hook.	raceme pussytoes
<i>Antennaria rosea</i> Greene ssp. <i>pulvinata</i> (Greene) Bayer	pulvinate pussytoes
<i>Antennaria umbrinella</i> Rydb.	umber pussytoes
<i>Apocynum androsaemifolium</i> L.	spreading dogbane
<i>Aquilegia flavescens</i> S. Watson	yellow columbine
<i>Arabis drummondii</i> A. Gray	Drummond's rockcress
<i>Arabis holboellii</i> Hornem.	Holboell's rockcress
<i>Arabis lyallii</i> S. Watson	Lyall's rockcress
<i>Arenaria congesta</i> Nutt. var. <i>congesta</i>	ballhead sandwort
<i>Arenaria hookeri</i> Nutt. ssp. <i>hookeri</i>	Hooker's sandwort
<i>Arnica cordifolia</i> Hook.	heartleaf arnica
<i>Arnica gracilis</i> Rydb.	smallhead arnica
<i>Arnica latifolia</i> Bong.	broadleaf arnica
<i>Arnica longifolia</i> D.C. Eaton	spearleaf arnica
<i>Arnica parryi</i> A. Gray	Parry's arnica
<i>Artemisia frigida</i> Willd.	prairie sagewort
<i>Artemisia michauxiana</i> Besser	Michaux's wormwood
<i>Artemisia scopulorum</i> A. Gray	alpine sagebrush
<i>Astragalus agrestis</i> Douglas ex G. Don	purple milkvetch
<i>Astragalus alpinus</i> L.	alpine milkvetch
<i>Astragalus australis</i> (L.) Lam.	Indian milkvetch
<i>Astragalus miser</i> Douglas ex Hook. var. <i>decumbens</i> (Nutt. ex Torr. & A. Gray) Cronquist	prostrate milkvetch
<i>Astragalus miser</i> Douglas ex Hook. var. <i>hylophilus</i> (Rydb.) Barneby	woody milkvetch
<i>Astragalus vexilliflexus</i> Sheldon	bentflower milkvetch
<i>Balsamorhiza sagittata</i> (Pursh) Nutt.	arrowleaf balsamroot
<i>Besseyia wyomingensis</i> (A. Nelson) Rydb.	Wyoming besseyia
<i>Bupleurum americanum</i> J.M. Coult. & Rose	American thorow wax
<i>Camelina microcarpa</i> Andr. ex DC.	littlepod false flax
<i>Campanula rotundifolia</i> L.	bluebell bellflower
<i>Campanula uniflora</i> L.	arctic bellflower
<i>Castilleja crista-galli</i> Rydb.	mountainside Indian paintbrush
<i>Castilleja miniata</i> Douglas ex Hook.	giant red Indian paintbrush
<i>Castilleja nivea</i> Pennell & Ownbey	snow Indian paintbrush
<i>Castilleja rhexiifolia</i> Rydb.	splitleaf Indian paintbrush
<i>Castilleja pulchella</i> Rydb.	beautiful Indian paintbrush

PLANTS Accepted Scientific Name with Author	PLANTS Common Name
<i>Cerastium beerianum</i> Cham. & Schtdl. ssp. <i>earlei</i> (Rydb.) Hultén	Bering chickweed
<i>Chaenactis douglasii</i> (Hook.) Hook. & Arn. var. <i>douglasii</i>	Douglas' dustymaiden
<i>Chamerion angustifolium</i> (L.) Holub	fireweed
<i>Chenopodium foliosum</i> (Moench) Asch.	leafy goosefoot
<i>Chimaphila umbellata</i> (L.) W. Bartram ssp. <i>occidentalis</i> (Rydb.) Hultén	pipsissewa
<i>Cirsium eatonii</i> (A. Gray) B.L. Rob.	Eaton's thistle
<i>Cirsium scariosum</i> Nutt.	meadow thistle
<i>Clematis occidentalis</i> (Hornem.) DC. var. <i>grosseserrata</i> (Rydb.) J. Pringle	western blue virginsbower
<i>Collinsia parviflora</i> Lindl.	maiden blue eyed Mary
<i>Collomia linearis</i> Nutt.	tiny trumpet
<i>Collomia tenella</i> A. Gray	diffuse collomia
<i>Comandra umbellata</i> (L.) Nutt. ssp. <i>pallida</i> (A. DC.) Piehl	pale bastard toadflax
<i>Conimitella williamsii</i> (D.C. Eaton) Rydb.	Williams' miterwort
<i>Crepis acuminata</i> Nutt.	tapertip hawksbeard
<i>Cryptantha celosioides</i> (Eastw.) Payson	buttecandle
<i>Cryptantha torreyana</i> (A. Gray) Greene	Torrey's cryptantha
<i>Cymopterus acaulis</i> (Pursh) Raf.	plains springparsley
<i>Cymopterus nivalis</i> S. Watson	snowline springparsley
<i>Delphinium nuttallianum</i> Pritz. ex Walp.	twolobe larkspur
<i>Descurainia incana</i> (Bernh. ex Fisch. & C.A. Mey.) Dorn	mountain tansymustard
<i>Dodecatheon pulchellum</i> (Raf.) Merr.	darkthroat shootingstar
<i>Draba crassa</i> Rydb.	thickleaf draba
<i>Draba crassifolia</i> Graham	snowbed draba
<i>Draba ventosa</i> A. Gray	Wind River draba
<i>Epilobium brachycarpum</i> C. Presl	tall annual willowherb
<i>Epilobium canum</i> (Greene) P.H. Raven ssp. <i>garrettii</i> (A. Nelson) P.H. Raven	Garrett's firechalice
<i>Erigeron caespitosus</i> Nutt.	tufted fleabane
<i>Erigeron compositus</i> Pursh	cutleaf daisy
<i>Erigeron eatonii</i> A. Gray	Eaton's fleabane
<i>Erigeron peregrinus</i> (Banks ex Pursh) Greene ssp. <i>callianthemus</i> (Greene) Cronquist var. <i>callianthemus</i>	subalpine fleabane
<i>Erigeron rydbergii</i> Cronquist	Rydberg's fleabane
<i>Erigeron simplex</i> Greene	onestem fleabane
<i>Eriogonum ovalifolium</i> Nutt.	cushion buckwheat
<i>Eriogonum umbellatum</i> Torr. var. <i>majus</i> Hook.	sulphur-flower buckwheat
<i>Eriophyllum lanatum</i> (Pursh) Forbes	common woolly sunflower
<i>Eritrichium nanum</i> (Vill.) Schrad. ex Gaudin var. <i>elongatum</i> (Rydb.) Cronquist	arctic alpine forget-me-not
<i>Erysimum capitatum</i> (Douglas ex. Hook) Greene var. <i>capitatum</i>	sanddune wallflower
<i>Eucephalus elegans</i> Nutt.	elegant aster
<i>Eurybia conspicua</i> (Lindl.) G.L. Nesom	western showy aster
<i>Eurybia glauca</i> (Nutt.) G.L. Nesom	gray aster
<i>Fragaria vesca</i> L.	woodland strawberry
<i>Fritillaria atropurpurea</i> Nutt.	spotted fritillary
<i>Galium aparine</i> L.	stickywilly
<i>Gayophytum diffusum</i> Torr. & A. Gray ssp. <i>parviflorum</i> F.H. Lewis & Szweykowski	spreading groundsmoke
<i>Gayophytum humile</i> Juss.	dwarf groundsmoke
<i>Gentianella tenella</i> (Rottb.) Böerner	Dane's dwarf gentian

PLANTS Accepted Scientific Name with Author	PLANTS Common Name
<i>Geum macrophyllum</i> Willd. var. <i>perincisum</i> (Rydb.) Raup	largeleaf avens
<i>Geum rossii</i> (R. Br.) Ser. var. <i>turbinatum</i> (Rydb.) C.L. Hitchc.	Ross' avens
<i>Geum triflorum</i> Pursh	old man's whiskers
<i>Hackelia floribunda</i> (Lehm.) I.M. Johnst.	manyflower stickseed
<i>Hackelia patens</i> (Nutt.) I.M. Johnst.	spotted stickseed
<i>Hedysarum occidentale</i> Greene	western sweetvetch
<i>Heracleum maximum</i> Bartram	common cowparsnip
<i>Heuchera cylindrica</i> Douglas ex Hook. var. <i>cylindrica</i>	roundleaf alumroot
<i>Hieracium albiflorum</i> Hook.	white hawkweed
<i>Hieracium gracile</i> Hook.	slender hawkweed
<i>Linnaea borealis</i> L.	twinflor
<i>Linum lewisii</i> Pursh	Lewis flax
<i>Lomatium cous</i> (S. Watson) J.M. Coult. & Rose	cous biscuitroot
<i>Lomatium dissectum</i> (Nutt.) Mathias & Constance	fernleaf biscuitroot
<i>Lupinus argenteus</i> Pursh ssp. <i>spathulatus</i> (Rydb.) Hess & D. Dunn	silvery lupine
<i>Machaeranthera canescens</i> (Pursh) A. Gray	hoary tansyaster
<i>Maianthemum racemosum</i> (L.) Link	feathery false lily of the valley
<i>Mentzelia dispersa</i> S. Watson	bushy blazingstar
<i>Mentzelia laevicaulis</i> (Hook.) Torr. & A. Gray	smoothstem blazingstar
<i>Mertensia alpina</i> (Torr.) G. Don	alpine bluebells
<i>Mertensia ciliata</i> (James ex Torr.) G. Don	tall fringed bluebells
<i>Mertensia oblongifolia</i> (Nutt.) G. Don	oblongleaf bluebells
<i>Microsteris gracilis</i> (Hook.) Greene	slender phlox
<i>Mimulus guttatus</i> DC.	seep monkeyflower
<i>Mimulus lewisii</i> Pursh	purple monkeyflower
<i>Mimulus suksdorfii</i> A. Gray	Suksdorf's monkeyflower
<i>Minuartia austromontana</i> S.J. Wolf & Packer	Columbian stitchwort
<i>Minuartia nuttallii</i> (Pax) Briq.	Nuttall's sandwort
<i>Minuartia obtusiloba</i> (Rydb.) House	twinflor sandwort
<i>Moehringia lateriflora</i> (L.) Fenzl	bluntleaf sandwort
<i>Moneses uniflora</i> (L.) A. Gray	single delight
<i>Monotropa hypopithys</i> L.	pinemap
<i>Montia chamissoi</i> (Ledeb. ex Spreng.) Greene	water minerslettuce
<i>Myosotis asiatica</i> (Vesterg.) Schischkin & Sergievskaja	Asian forget-me-not
<i>Oenothera caespitosa</i> Nutt. ssp. <i>caespitosa</i>	tufted evening primrose
<i>Orthilia secunda</i> (L.) House	sidebells wintergreen
<i>Osmorhiza depauperata</i> Phil.	bluntseed sweetroot
<i>Oxyria digyna</i> (L.) Hill	alpine mountainsorrel
<i>Oxytropis besseyi</i> (Rydb.) Blank.	Bessey's locoweed
<i>Oxytropis campestris</i> (L.) DC. var. <i>cusickii</i> (Greenm.) Barneby	Cusick's locoweed
<i>Oxytropis sericea</i> Nutt.	white 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>Papaver radicum</i> Rottb. ssp. <i>kluanense</i> (D. Löve) D.F. Murray	rooted poppy
<i>Pedicularis bracteosa</i> Benth. var. <i>paysoniana</i> (Pennell) Cronquist	Payson's lousewort
<i>Pedicularis groenlandica</i> Retz.	elephanthead lousewort
<i>Penstemon absarokensis</i> Evert	Absaroka Range beardtongue

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<i>Penstemon attenuatus</i> Douglas ex Lindl. var. <i>pseudoprocerus</i> (Rydb.) Cronquist	small penstemon
<i>Penstemon deustus</i> Douglas ex Lindl.	scabland penstemon
<i>Penstemon eriantherus</i> Pursh var. <i>eriantherus</i>	fuzzytongue penstemon
<i>Penstemon procerus</i> Douglas ex Graham	littleflower penstemon
<i>Penstemon radicosus</i> A. Nelson	matroot penstemon
<i>Penstemon whippleanus</i> A. Gray	Whipple's penstemon
<i>Phacelia hastata</i> Douglas ex Lehm.	silverleaf phacelia
<i>Phacelia sericea</i> (Graham) A. Gray	silky phacelia
<i>Phlox hoodii</i> Richardson	spiny phlox
<i>Phlox multiflora</i> A. Nelson	flowery phlox
<i>Phlox pulvinata</i> (Wherry) Cronquist	cushion phlox
<i>Physaria didymocarpa</i> (Hook.) A. Gray	common twinpod
<i>Polemonium viscosum</i> Nutt.	sticky polemonium
<i>Polygonum bistortoides</i> Pursh	American bistort
<i>Polygonum douglasii</i> Greene ssp. <i>austiniae</i> (Greene) E. Murray	Austin knotweed
<i>Polygonum douglasii</i> Greene ssp. <i>douglasii</i>	Douglas' knotweed
<i>Polygonum viviparum</i> L.	alpine bistort
<i>Potentilla arguta</i> Pursh	tall cinquefoil
<i>Potentilla diversifolia</i> Lehm. var. <i>diversifolia</i>	varileaf cinquefoil
<i>Potentilla glandulosa</i> Lindl.	sticky cinquefoil
<i>Potentilla gracilis</i> Douglas ex Hook.	slender cinquefoil
<i>Potentilla nivea</i> L.	snow cinquefoil
<i>Potentilla ovina</i> Macoun ex J.M. Macoun var. <i>ovina</i>	sheep cinquefoil
<i>Potentilla uniflora</i> Ledeb.	oneflower cinquefoil
<i>Prosartes trachycarpa</i> S. Watson	roughfruit fairybells
<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>Ranunculus eschscholtzii</i> Schtdl.	Eschscholtz's buttercup
<i>Ranunculus gmelinii</i> DC.	Gmelin's buttercup
<i>Ranunculus pedatifidus</i> Sm. var. <i>affinis</i> (R. Br.) L.D. Benson	northern buttercup
<i>Rhodiola integrifolia</i> Raf. ssp. <i>integrifolia</i>	ledge stonecrop
<i>Rumex paucifolius</i> Nutt.	alpine sheep sorrel
<i>Saxifraga bronchialis</i> L. ssp. <i>austromontana</i> (Wiegand) Piper	matted saxifrage
<i>Saxifraga caespitosa</i> L. ssp. <i>monticola</i> (Small) A.E. Porsild	tufted alpine saxifrage
<i>Saxifraga cernua</i> L.	nodding saxifrage
<i>Saxifraga odontoloma</i> Piper	brook saxifrage
<i>Saxifraga rhomboidea</i> Greene	diamondleaf saxifrage
<i>Saxifraga rivularis</i> L.	weak saxifrage
<i>Sedum lanceolatum</i> Torr.	spearleaf stonecrop
<i>Senecio fremontii</i> Torr. & A. Gray	dwarf mountain ragwort
<i>Senecio integerrimus</i> Nutt.	lambstongue ragwort
<i>Senecio serra</i> Hook.	tall ragwort
<i>Senecio triangularis</i> Hook.	arrowleaf ragwort
<i>Sibbaldia procumbens</i> L.	creeping sibbaldia
<i>Silene drummondii</i> Hook.	Drummond's campion

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<i>Silene kingii</i> (S. Watson) Bocquet	King's campion
<i>Silene uralensis</i> (Rupr.) Bocquet ssp. <i>montana</i> (S. Watson) McNeill	apetalous catchfly
<i>Smelowskia calycina</i> (Stephan ex Willd.) C.A. Mey. var. <i>americana</i> (Regel & Herder) Drury & Rollins	American false candytuft
<i>Solidago multiradiata</i> Aiton var. <i>scopulorum</i> A. Gray	manyray goldenrod
<i>Stellaria longipes</i> Goldie	longstalk starwort
<i>Stellaria longipes</i> Goldie ssp. <i>longipes</i>	chickweed, starwort
<i>Stenotus acaulis</i> (Nutt.) Nutt.	stemless mock goldenweed
<i>Stephanomeria minor</i> (Hook.) Nutt. var. <i>minor</i>	narrowleaf wirelettuce
<i>Symphotrichum ascendens</i> (Lindl.) G.L. Nesom	western aster
<i>Symphotrichum foliaceum</i> (Lindl. ex DC.) G.L. Nesom	alpine leafybract aster
! <i>Taraxacum laevigatum</i> (Willd.) DC.	rock dandelion
<i>Tephrosia lindstroemii</i> (Ostenf.) A. Löve & D. Löve	fuscate groundsel
<i>Thalictrum fendleri</i> Engelm. ex A. Gray	Fendler's meadow-rue
<i>Tonestus lyallii</i> (A. Gray) A. Nelson	Lyall's goldenweed
<i>Townsendia condensata</i> Parry ex A. Gray var. <i>anomala</i> (Heiser) Dorn	cushion Townsend daisy
! <i>Tragopogon dubius</i> Scop.	yellow salsify
<i>Trifolium haydenii</i> Porter	Hayden's clover
<i>Trifolium nanum</i> Torr.	dwarf clover
<i>Trifolium parryi</i> A. Gray ssp. <i>montanense</i> (Rydb.) J.M. Gillett	Parry's clover
! <i>Trifolium pratense</i> L.	red clover
! <i>Trifolium repens</i> L.	white clover
<i>Urtica dioica</i> L.	stinging nettle
<i>Valeriana dioica</i> L.	marsh valerian
<i>Veronica americana</i> Schwein. ex Benth.	American speedwell
<i>Veronica wormskjoldii</i> Roem. & Schult.	American alpine speedwell
<i>Viola purpurea</i> Kellogg ssp. <i>venosa</i> (S. Watson) M.S. Baker & J.C. Clausen	goosefoot violet
Graminoids	
<i>Achnatherum hymenoides</i> (Roem. & Schult.) Barkworth	Indian ricegrass
<i>Achnatherum nelsonii</i> (Scribn.) Barkworth ssp. <i>dorei</i> (Barkworth & Maze) Barkworth	Dore's needlegrass
<i>Achnatherum occidentale</i> (Thurb.) Barkworth ssp. <i>occidentale</i>	western needlegrass
<i>Bromus ciliatus</i> L.	fringed brome
<i>Bromus inermis</i> Leyss. ssp. <i>pumpellianus</i> (Scribn.) Wagon var. <i>pumpellianus</i> (Scribn.) C.L. Hitchc.	Pumpelly's brome
<i>Bromus porteri</i> (J.M. Coult.) Nash	Porter brome
! <i>Bromus tectorum</i> L.	cheatgrass
<i>Calamagrostis canadensis</i> (Michx.) P. Beauv.	bluejoint
<i>Calamagrostis rubescens</i> Buckley	pinegrass
<i>Carex elynoides</i> T. Holm	blackroot sedge
<i>Carex haydeniana</i> Olney	cloud sedge
<i>Carex lachenalii</i> Schkuhr	twotipped sedge
<i>Carex macloviana</i> d'Urv.	Thickhead sedge
<i>Carex paysonis</i> Clokey	Payson's sedge
<i>Carex petasata</i> Dewey	Liddon sedge
<i>Carex rossii</i> Boott	Ross' sedge
<i>Carex scopulorum</i> T. Holm	mountain sedge
<i>Deschampsia cespitosa</i> (L.) P. Beauv.	tufted hairgrass

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<i>Elymus elymoides</i> (Raf.) Swezey	squirreltail
<i>Elymus glaucus</i> Buckley	blue wildrye
<i>Elymus scribneri</i> (Vasey) M.E. Jones	spreading wheatgrass
<i>Elymus trachycaulus</i> (Link) Gould ex Shinners	slender wheatgrass
<i>Festuca brachyphylla</i> Schult. ex Schult. & Schult. f. ssp. <i>brachyphylla</i>	alpine fescue
<i>Festuca brachyphylla</i> Schult. ex Schult. & Schult. f. ssp. <i>coloradensis</i> Frederiksen	Colorado fescue
<i>Festuca idahoensis</i> Elmer	Idaho fescue
<i>Festuca saximontana</i> Rydb. var. <i>saximontana</i>	Rocky Mountain fescue
<i>Glyceria striata</i> (Lam.) Hitchc.	fowl mannagrass
<i>Juncus drummondii</i> E. Mey.	Drummond's rush
<i>Kobresia simpliciuscula</i> (Wahlenb.) Mack.	simple bog sedge
<i>Koeleria macrantha</i> (Ledeb.) Schult.	prairie Junegrass
<i>Leucopoa kingii</i> (S. Watson) W.A. Weber	spike fescue
<i>Luzula parviflora</i> (Ehrh.) Desv.	smallflowered woodrush
<i>Luzula spicata</i> (L.) DC.	spiked woodrush
<i>Phleum alpinum</i> L.	alpine timothy
<i>Piptatherum exiguum</i> (Thurb.) Dorn	little ricegrass
<i>Poa arctica</i> R. Br. ssp. <i>grayana</i> (Vasey) A. Löve & D. Löve & Kapoor	arctic bluegrass
<i>Poa cusickii</i> Vasey ssp. <i>epilis</i> (Scribn.) W.A. Weber	Cusick's bluegrass
<i>Poa nemoralis</i> L. ssp. <i>interior</i> (Rydb.) W.A. Weber	inland bluegrass
<i>Poa pratensis</i> L.	Kentucky bluegrass
<i>Poa reflexa</i> Vasey & Scribn. ex Vasey	nodding bluegrass
<i>Poa secunda</i> J. Presl	Sandberg bluegrass
<i>Poa wheeleri</i> Vasey	Wheeler's bluegrass
<i>Pseudoroegneria spicata</i> (Pursh) A. Löve	bluebunch wheatgrass
<i>Trisetum spicatum</i> (L.) K. Richt.	spike trisetum
Ferns	
<i>Botrychium ascendens</i> W.H. Wagner	trianglelobe moonwort
<i>Botrychium simplex</i> E. Hitchc.	little grapefern
<i>Cystopteris fragilis</i> (L.) Bernh.	brittle bladderfern
<i>Equisetum arvense</i> L.	field horsetail
<i>Equisetum hyemale</i> L. var. <i>affine</i> (Engelm.) A.A. Eaton	scouringrush horsetail
<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.