



PLANT COMMUNITY CLASSIFICATION FOR VEGETATION ON BLM LANDS,
PRYOR MOUNTAINS, CARBON COUNTY, MONTANA

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ABSTRACT

The Pryor Mountains provide desert-like habitats unique in Montana and contribute significantly to the overall biological diversity of the state and the region. This study developed a classification of vegetation types on USDI Bureau of Land Management lands in the south Pryor Mountains, Carbon County, Montana. Additionally, endemic and globally rare vegetation types were identified. Using a combination of two-way indicator species analysis (TWINSpan) and detrended correspondence analysis (DCA) 33 vegetation types were identified among the 197 study plots. Comparisons with a "comprehensive" listing of vegetation types of the western United States revealed that 9 of the types from the Pryor Mountains had not been reported from elsewhere and 14 are rare globally. This concentration of rare vegetation types, in combination with previously documented occurrences of rare plant species, highlight the significant biodiversity values of the Pryor Mountains.

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INTRODUCTION

The Pryor Mountain Desert region has a flora and vegetation unique in Montana (Dorn 1978, Kratz 1988, Lesica et al. 1984). The arid climate and unusual and varied soils provide desert-like habitats that are otherwise unknown in Montana. Furthermore, this region lies at the north end of the Bighorn Basin, a broad trough that extends south to the Red Desert of southern Wyoming. The Bighorn Basin has undoubtedly been a migrational pathway for desert plants (Dorn 1978). For these reasons numerous species of desert plants reach the northern limit of their range in the Pryor Mountain Desert (Lichvar et al. 1985). Many of these species occur nowhere else in the state. Furthermore, many plant communities common in the Great Basin deserts reach their northern limit here (Kratz 1988), and some community types may be endemic to the area. Peripheral populations of species and their habitats are often important areas for genetic divergence and speciation (Mayr 1963). In addition, monitoring peripheral populations and communities can provide insight into incipient changes throughout their main geographic range. As such, the area makes an important contribution to the overall biological diversity of the state and the region.

Floristic and ecological studies have been conducted in the area of the Pryor Mountains in the past. Dorn (1978) made plant collections in the area and reported the occurrence of many species with Great Basin Desert affinities. South (1980) provided a general description of common vegetation types and their relationship to landscape features. In the mid-1980's researchers at the University of Wyoming conducted a study of the flora and vegetation of Bighorn Canyon National Recreation Area (NRA), a narrow corridor along the Bighorn River on the east side of the Pryor Mountains (Lichvar et al. 1985, Knight et al. 1987). Their studies contributed a great deal to our knowledge of the area. Finally, Kratz (1988) described four "Great Basin-type" communities from the area based on a few carefully selected stands. These studies produced a comprehensive list of species present in the area and provided general descriptions of many of the plant communities. Unfortunately, the exact locations of the peripheral, disjunct and endemic species on most of the public land in the area remained unknown. Furthermore, a formal plant community classification compatible with regional schemes was still not available. Thus, land managers are not able to determine which communities should receive priority for conservation management. Finally, locations of these rare communities on public lands is not known. A comprehensive management plan for this unique area cannot be achieved without this information.

The purpose of our study is to provide the USDI Bureau of Land Management (BLM) with the information necessary to properly manage public lands in the Pryor Mountain Desert Region to

protect ecological values and biological diversity. There are six goals to our studies:

- (1) conduct a thorough floristic inventory,
- (2) map locations of putatively rare plant populations to determine which are truly rare in the area and the habitat requirements of truly rare species
- (3) develop a formal community classification system and provide descriptions of these communities based on field samples
- (4) use the classification system to determine which communities are endemic or rare in Montana or the region
- (5) develop a vegetation map for the study area
- (6) use maps of rare species and plant communities to delineate areas critical for protecting the biological values of the area.

We completed (1) and (2) in 1991 with a floristic survey of the study area, mapping of target species locations, and habitat descriptions (Lesica and Achuff 1992). This paper presents a classification system and descriptions for community types (vegetation types) for public lands administered by the BLM in the Pryor Mountains and the Bighorn Basin of Montana. In addition, we evaluate the state and global distribution of these communities. Goals (5) and (6) will be met in subsequent years as funding becomes available.

THE STUDY AREA

The Pryor Mountain Desert lies at the north end of the Bighorn Basin in south-central Montana and adjacent Wyoming. It is bordered on the north by the Pryor Mountains, a northwest extension of the Bighorn Mountain Range. The Pryors are a large dome-shaped range rising to nearly 9,000 feet, composed of Paleozoic sedimentary formations, principally Madison limestone. Numerous canyons incised in the limestone occur on the south slope of the range. The east boundary of the Pryor Mountain Desert is formed by the Bighorn River which has formed a spectacular canyon in the sedimentary formations of the Bighorn-Pryor uplift. The slopes of the Bighorn Mountains rise abruptly on the east side of the River. This portion of the river has been impounded, and it and a strip of land 2 to 6 miles wide on the west side comprise Bighorn Canyon National Recreation Area administered by the U. S. Park Service. The valley of the Clarks Fork of the Yellowstone River forms the west boundary of the Pryor Mountain Desert. Just to the west of the Clarks Fork is the east slope of the Beartooth Mountains which rise to over 12,500 feet. The Pryor Mountain region lies in the rain shadow produced by this massive uplift. The southern border of the region is formed by the valley of the Shoshone River in Wyoming.

Our study area consists of all lands administered by the BLM in the Pryor Mountains and that portion of the Pryor Mountain Desert north of the Wyoming border. Elevations are ca. 4,000

feet at the southwest end of the study area and reaching nearly 8,800 feet on the crest of the Pryors. Wetlands and riparian areas are very limited in the study area, and we made no attempt to sample these rare but important communities. We did not conduct surveys on Bighorn Canyon N.R.A. or on private lands within the study area.

The oldest formation outcropping in the study area is the Madison limestone which forms the south slopes of the Pryor Mountains. On more level terrain south of the mountain slopes, younger formations overlie the Madison limestone. These are Paleozoic and late Mesozoic sediments, predominantly sandstones and shales. The red sandstones and siltstones interbedded with thin lenses of gypsum of the Chugwater formation are particularly conspicuous (Richards 1955). A geologic history of the area is provided by Knight et al. (1987).

Soils of the study area are predominantly Entisols, Mollisols, and Aridisols (Kratz 1988). In general, soils in the northeast portion of the Pryor Mountains Desert are sandy or silty and often calcareous, while those in the south and west portions have a higher clay content and are often saline. Very sandy soils occur locally where they weather from sandstone outcrops. Productivity of the vegetation is low due to the arid climate. As a result, soil development is minimal and organic matter is low. Shallow soils formed over Chugwater sandstone are particularly barren. The soils of forests, woodlands, and subalpine grasslands in the study area are mostly derived from calcareous parent materials and vary from sandy loams to loams and from clay loams to clays.

Climate in the lower portion of the study area is semi-arid. Bridger, Montana, 10 miles north of the west end of the study area at 3,680 feet, receives an average of 12.7 inches of precipitation annually, and mean daily temperatures for January and July are 21.5°F and 70.5°F respectively (NOAA 1982). Lovell, Wyoming, 10 miles south of the east end of the study area at 3,800 feet, receives an average of 7.1 inches of precipitation annually. Daily temperatures averaged 16.8° F in January and 71.8°F in July (Knight et al. 1987). Spring and early summer rainfall accounts for two-thirds of the annual precipitation, the balance coming as snow (Knight et al. 1987). The Pryor Mountains are undoubtedly cooler and moister. Mean annual precipitation on the crest of the Pryor Mountains is estimated to be 20 inches (USDA-SCS 1981).

MATERIALS AND METHODS

Data Collection

Field sampling took place in the summers of 1991 and 1992 on BLM lands in Carbon County, Montana, south and southeast of the town of Bridger and east of the Clarks Fork of the Yellowstone River. The 1991 work was done as an adjunct to the study by Lesica and Achuff (1992) that focused on describing the distribution of vascular plant species of special concern and limited distribution. The 1992 sampling focused on filling in remaining gaps in the characterization of vegetation types.

Sampling focused on rare or previously undescribed communities and on common communities in particularly good condition. To minimize the confounding nature of heavy disturbance on vegetation occurrence, areas severely over-grazed, herbicide treated, mechanically disturbed, artificially seeded, or irrigated were not sampled. Plots were established within portions of stands that appeared to be relatively uniform in topography and vegetation structure. Within an area, one to five plots were chosen to represent the contrasting vegetation composition on differing geomorphic facets.

Plot selection focused on contemporary stands of vegetation without reference to successional relationships among stands. We did not attempt to confine our sampling to remnants of presettlement vegetation.

All data were recorded on Montana Natural Heritage Program (MTNHP) Community Survey Forms (DeVelice 1991). Additionally, MTNHP Reconnaissance Soil Characterization Forms were completed during the 1992 sampling. The Community Survey Forms are similar to the general plot data and ocular plant species data forms used by the USDA Forest Service (USDA 1987). Complete lists and canopy cover estimates of vascular plant species were recorded within each 375 m² circular study plot. Site information such as altitude, slope, aspect, parent material, landform, and erosion characteristics were also recorded for each plot.

A 20 inch deep reconnaissance soil pit was excavated at the 1992 sample sites and information was collected to determine soil subgroup and general physical properties (e.g., texture; coarse fragment content). Additionally, surficial (top 2 to 6 inches) soil samples were collected in 1992 for pH and electrical conductivity (a measure of free salts) determinations. pH and electrical conductivity measurements were made using 2:1 aqueous suspensions of the soil samples collected in 1992. These suspensions were equilibrated for at least 15 minutes before measurements were taken with a temperature-compensated digital Myron L DCH4 meter.

Data Analysis

Analysis focused on using a combination of (1) classification, to determine community types, and (2) ordination (gradient analyses), to describe general patterns of communities in relation to environmental factors. Classification was accomplished using two-way indicator species analysis (TWINSPAN; Hill 1979a) in the CEP MS-DOS computer package (Mohler 1987). Ordination was achieved using the detrended correspondence analysis (DCA) algorithm in the CANOCO computer package (Ter Braak 1988). The input data were species cover variables recorded in each plot. Both TWINSPAN and DCA are based on the same mathematical strategy (i.e., reciprocal averaging; Hill 1979a,b) and thus offer direct comparisons between the results of ordination and classification.

All default options in the TWINSPAN algorithm were used except that pseudospecies cut levels were set at 0, 2, and 20 percent cover and pseudospecies weights were changed from 1 1 1 to 1 2 4 (i.e., pseudospecies at the second and third cut levels were given twice and four-times, respectively, the weight of pseudospecies at cut level one). Also, all default options were used in running DCA except that rare species were downweighted. Initially, the entire data matrix of 197 stands and 365 species was analyzed. Subsequently, to reduce the amount of variation being considered, which is substantial in the whole matrix, the species list was thinned to the 194 most characteristic species and analyses were conducted on forest/woodland, woodland, and shrubland/grassland subgroups.

In some instances, a particular TWINSPAN class included a plot or plots that, based on field experience and DCA patterns, appeared to be better placed in a different existing TWINSPAN class. These plots were repositioned in the classification as appropriate.

In addition to helping refine the TWINSPAN classification, DCA ordination assisted in describing and interpreting general patterns of vegetation communities and environment. For example, DCA extracts the dominant compositional gradients from the species data matrix. The environmental controls of these compositional gradients are then interpreted based on comparisons with the site data.

Taxonomic Considerations

Nomenclature generally follows Great Plains Flora Association (1986). Nomenclature for taxa not listed in this manual follows Dorn (1988). Scientific names of all species observed in this study and their code names, number of occurrences, and importance values are listed in Appendix A.

RESULTS

General Vegetation Overview

Lowest portions of the study area, generally between 4,000 and 5,000 feet, occur in outwash plains and low hills on the south side of the Pryor Mountains. Shrublands dominated by species of sagebrush (Artemisia tridentata, A. pedatifida, A. nova, A. spinescens), rabbitbrush (Chrysothamnus nauseosus, C. viscidiflorus), saltbush (Atriplex nuttallii, A. confertifolia) and greasewood (Sarcobatus vermiculatus) and grasslands dominated by bluebunch wheatgrass (Agropyron spicatum) and cushion plant forbs are the principle vegetation in this zone. Utah juniper (Juniperus osteosperma) and limber pine (Pinus flexilis) woodlands predominate between 4,500 and 6,500 feet in the foothills and on rocky ridges south of the mountains. Rocky Mountain juniper (J. scopulorum) replaces Utah juniper near the Clark's Fork of the Yellowstone River. With increasing precipitation, woodlands give way to Douglas-fir forest which dominates in the montane zone at ca. 6,000 to 8,000 feet. The subalpine zone, at 8,000 to 9,000 feet, is occupied by a mosaic of forest and grassland vegetation. Idaho fescue (Festuca idahoensis) grasslands predominate on gently rounded ridge crests. Warmer, more gentle slopes, often just below these grasslands, support mesic limber pine forests, while cooler, often steeper slopes are dominated by subalpine fir (Abies lasiocarpa) forests.

The Classification

Forests

1. Abies lasiocarpa/Arnica cordifolia c.t.
(ABILAS/ARNCOR; subalpine fir/heartleaf arnica)
(1 Stand)

Environment- ABILAS/ARNCOR is a minor type in the study area. It occurs on cool, moist benches and gentle upper slopes above 8,000 feet on limestone substrates. Adjacent warmer sites often support Abies lasiocarpa/Clematis columbiana while colder sites support Abies lasiocarpa/Ribes montigenum. Adjacent non-calcareous sites that are topographically similar often support Abies lasiocarpa/ Vaccinium scoparium.

Vegetation- Abies lasiocarpa is always well represented and Picea engelmannii, Pseudotsuga menziesii, and/or Pinus contorta may be co-dominant. Undergrowth vegetation varies from herb-rich patches beneath open forest canopies to sparse undergrowth beneath dense canopies. Dominant undergrowth herbs include Arnica cordifolia, Lupinus sericeus, Solidago multiradiata, Carex rossii, and Festuca idahoensis.

Soils- Soils underlying the ABILAS/ARNCOR type are generally derived from limestone. Ground surfaces have little bare soil exposed and rock cover seldom exceeding 10%. We collected no additional soils data for this type.

Other Studies- This type has been previously described east of the Continental Divide in Montana by Pfister et al. (1977). Similar communities occur in Idaho, Nevada, Oregon, and Wyoming (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G5/S5

2. Abies lasiocarpa/Clematis columbiana c.t.
(ABILAS/CLECOL; subalpine fir/virgin's bower)
(1 Stand)

Environment- ABILAS/CLECOL is a minor type in the study area. It occurs at the lower (warm, dry) limits of Abies lasiocarpa below 8,000 feet on limestone parent materials. The type is primarily found on the steep, northerly slopes below the crest of the Pryor Mountains. Adjacent cooler or more moist sites on calcareous substrate often support Abies lasiocarpa/Arnica cordifolia while warmer sites often support forests with Pseudotsuga menziesii or Pinus flexilis dominated overstories, or Potentilla fruticosa/Festuca idahoensis shrublands. Upslope, on colder sites lacking Pseudotsuga menziesii, the type intergrades to Abies lasiocarpa/Ribes montigenum.

Vegetation- Although Abies lasiocarpa is always present and reproducing successfully, stands are generally dominated by Pseudotsuga menziesii. Picea engelmannii is usually also present. Characteristic shrubs include Clematis columbiana and Spiraea betulifolia. Dominant undergrowth herbs include Arnica cordifolia, Aster foliaceus, and Viola canadensis. Bryophyte cover often exceeds 10% of the ground surface.

Soils- Soils underlying the ABILAS/CLECOL type are generally derived from limestone. Ground surfaces generally have little bare soil or rock exposed. We collected no additional soils data for this type.

Other Studies- This type has been previously described east of the Continental Divide in Montana by Pfister et al. (1977).

Natural Heritage Program Rank- G3/S3

3. Abies lasiocarpa/Ribes montigenum c.t.
(ABILAS/RIBMON; subalpine fir/mountain gooseberry)
(2 Stands)

Environment- ABILAS/RIBMON is common at elevations above 8,200 feet on plateau-like sites near the crest of the Pryor Mountains

and on the steep, northerly slopes below the crest. It occurs above the elevational limits of Pseudotsuga menziesii. Adjacent warmer sites generally support either Abies lasiocarpa/Clematis columbiana or Abies lasiocarpa/Arnica cordifolia. At the crest of the Pryors, ABILAS/RIBMON groves alternate with more exposed sites supporting Festuca idahoensis grasslands.

Vegetation- Abies lasiocarpa and Picea engelmannii co-dominate the overstory. Pinus contorta and Pseudotsuga menziesii are absent. In addition to Ribes montigenum, characteristic undergrowth species include Arnica cordifolia, Galium boreale, Pyrola secunda, and Clematis columbiana (the later in stands intergrading to Abies lasiocarpa/Clematis columbiana). Bryophyte cover may exceed 30% of the ground surface and soil lichen cover may exceed 3%.

Soils- Soils underlying the ABILAS/RIBMON type are derived from a variety of parent materials. Ground surfaces generally have little bare soil and rock cover of 10% or less. The soil subgroup at our single soil characterization site was a Typic Cryoboroll. The single pH measurement was 6.2, and conductivity was 142 uhmos/cm² (1 stand).

Other Studies- This type has been previously described in the Pryor Mountains, the Centennial Mountains, and the Gravelly Range of Montana by Pfister et al. (1977). Similar communities occur in Colorado, Idaho, Utah, and Wyoming (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G5/S4

4. Abies lasiocarpa/Vaccinium scoparium c.t.
(ABILAS/VACSCO; subalpine fir/grouse whortleberry)
(1 Stand)

Environment- This is one of the most abundant forest vegetation types in Montana but is relatively uncommon within the study area. It was found on cold, gentle slopes and ridges above 8,000 feet. Adjacent sites on calcareous parent materials that are topographically similar often support Abies lasiocarpa/Arnica cordifolia.

Vegetation- Abies lasiocarpa and Picea engelmannii co-dominate the overstory. Pinus contorta is usually present. The undergrowth is dominated by a low shrub layer of Vaccinium scoparium. Most other species in the undergrowth have less than 2% cover. Arnica cordifolia cover sometime equals or exceeds 20%. Bryophyte cover often exceeds 20% of the ground surface.

Soils- Soils underlying the ABILAS/VACSCO type are usually derived from non-calcareous parent materials. Ground surfaces

generally have little bare soil or rock exposed. We collected no additional soils data for this type.

Other Studies- This is one of the most common subalpine forest types in the Rocky Mountains and has been documented by numerous authors. Similar communities occur in Arizona, Colorado, Idaho, New Mexico, Oregon, Utah, Washington, and Wyoming (Bourgeron and Engelking 1992). In Montana, ABILAS/VACSCO has been described near and east of the Continental Divide by Pfister et al. (1977).

Natural Heritage Program Rank- G5/S5

5. Pinus flexilis/Festuca idahoensis c.t.
(PINFLE/FESIDA; limber pine/Idaho fescue)
(1 Stand)

Environment- PINFLE/FESIDA is common on dry, wind-exposed, upper slopes and ridges at elevations around 8,000 feet. Adjacent drier sites predominantly feature Festuca idahoensis grasslands or the Pinus flexilis/Juniperus communis type.

Vegetation- Pinus flexilis dominates the tree stratum on most sites. Pseudotsuga menziesii is often well represented. The undergrowth is dominated by Festuca idahoensis and is often forb-rich. Characteristic species in the Pryor Mountains include Achillea millefolium, Agoseris glauca, Aster conspicuus, and Galium boreale. Juniperus communis may be well represented in stands transitional to the Pinus flexilis/Juniperus communis type. Combined bryophyte and lichen cover seldom exceeds 5% of the ground surface.

Soils- Soils underlying the PINFLE/FESIDA type are usually derived from calcareous parent materials. Ground surfaces generally have little bare soil and rock cover of 10% or less. The soil subgroup at our single soil characterization site was a Argic Cryoboroll. The single pH measurement was 6.8, and conductivity was 161 uhmos/cm² (1 stand).

Other Studies- This type has been previously described east of the Continental Divide in Montana by Pfister et al. (1977). Similar communities occur in Idaho and Wyoming (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G5/S5

6. Pinus flexilis/Juniperus communis c.t.
(PINFLE/JUNCOM; limber pine/common juniper)
(4 Stands)

Environment- PINFLE/JUNCOM generally occurs on southerly slopes and ridges at elevations between 6,500 and 8,000 feet. Adjacent

non-forest vegetation includes Festuca idahoensis grasslands and Artemisia tridentata shrublands.

Vegetation- Pinus flexilis dominates the tree layer or is co-dominant with Pseudotsuga menziesii. Juniperus scopulorum may be well represented. The undergrowth is primarily composed of dry-site shrubs and forbs. Juniperus communis is well represented to abundant, and Berberis repens is common. Characteristic graminoids include Calamagrostis rubescens, Carex rossii, Leucopoa kingii, and Poa nervosa. However, rarely does the cover of any given graminoid species exceed 5%. Forbs commonly found are Arnica cordifolia, Aster conspicuus, Galium boreale, Senecio streptanthifolius, and Solidago sparsiflora. Combined cover of lichens and bryophytes is generally less than 5%.

Soils- PINFLE/JUNCOM is predominantly found on limestone derived soils. Total surface cover of bare soil, gravel, and rock was less than 5%. Surface litter plus downed wood cover averaged 90%. Soil subgroups encountered at the two soil characterization sites were Calcic and Argic Cryroborolls. Surface textures were clay loams. Soils had high pH values (7.4 to 7.5) and conductivity ranged from 190 to 230 uhmos/cm² (2 stands).

Other Studies- This type has been previously described as widespread in dry mountain areas east of the Continental Divide (including the Pryor Mountains) in Montana by Pfister et al. (1977). Similar communities occur in Colorado, Idaho, Nevada, and Wyoming (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G5/S4

7. Pseudotsuga menziesii/Agropyron spicatum c.t.
(PSEMEN/AGRSPI; Douglas-fir/bluebunch wheatgrass)
(1 Stand)

Environment- PSEMEN/AGRSPI is found on steep southerly slopes at elevations around 5,000 to 7,000 feet. Adjacent drier sites predominantly feature Agropyron spicatum grasslands or Artemisia arbuscula/Agropyron spicatum shrublands.

Vegetation- Pseudotsuga menziesii dominates the tree stratum. Pinus flexilis and Juniperus scopulorum are often present in minor amounts. The undergrowth is dominated by graminoids including Agropyron spicatum, Carex rossii, Leucopoa kingii, and Poa spp. Balsamorhiza sagittata is the most characteristic forb. Combined bryophyte and lichen cover seldom exceeds 5% of the ground surface.

Soils- Soils underlying the PSEMEN/AGRSPI type are generally derived from calcareous parent materials. Combined cover of bare soil, gravel, and rock on the ground surface ranges from 5 to

50%. The soil subgroup at our single soil characterization site was a Typic Argiboroll. The single pH measurement was 7.5, and conductivity was 215 uhmos/cm² (1 stand).

Other Studies- This type has been previously described in central and west-central Montana by Pfister et al. (1977). Similar communities occur in Idaho, Oregon, and Washington (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G5/S4

8. Pseudotsuga menziesii/Festuca idahoensis c.t.
(PSEMEN/FESIDA; Douglas-fir/Idaho fescue)
(1 Stand)

Environment- PSEMEN/FESIDA is found on dry sites at elevations around 5,500 to 6,000 feet. Conditions are generally cooler than those of the Pseudotsuga menziesii/Agropyron spicatum type. Adjacent drier sites often feature Artemisia arbuscula/Agropyron spicatum shrublands.

Vegetation- Pseudotsuga menziesii dominates the tree stratum on most sites. Pinus flexilis, Juniperus scopulorum, and J. osteosperma are often well represented (in the Pryor Mountains). The undergrowth is dominated by Festuca idahoensis, Symphoricarpos oreophilus, and Artemisia tridentata. High cover of Symphoricarpos suggests affinities between the PSEMEN/FESIDA and PSEMEN/SYMORE types. Characteristic forbs include Achillea millefolium and Phlox hoodii. Combined bryophyte and lichen cover may exceed 15% of the ground surface.

Soils- Soils underlying the PSEMEN/FESIDA type are generally derived from calcareous parent materials. Combined cover of bare soil, gravel, and rock on the ground surface ranges from 10 to 20%. The soil subgroup at our single soil characterization site was a Typic Argiboroll. The single pH measurement was 7.4, and conductivity was 255 uhmos/cm² (1 stand).

Other Studies- This type has been previously described primarily in west-central and southwestern Montana by Pfister et al. (1977). Similar communities occur in Idaho and Wyoming (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G5/S4

9. Pseudotsuga menziesii/Cercocarpus ledifolius c.t.
(PSEMEN/CERLED; Douglas-fir/curlleaf mountain mahogany)
(1 Stand)

Environment- PSEMEN/CERLED is found on dry, rocky ridges and upper slopes with shallow soils at elevations around 6,000 to

6,500 feet. Adjacent relatively moist drainages often support the Pseudotsuga menziesii/Symphoricarpos oreophilus type. PSEMEN/CERLED integrates to the Cercocarpus ledifolius/Agropyron spicatum type.

Vegetation- Pseudotsuga menziesii and Juniperus scopulorum form a very open tree layer (combined cover may be as low as 1 to 5%). The undergrowth is dominated by an abundance of Cercocarpus ledifolius. Agropyron spicatum is generally well represented. Other characteristic species include Carex rossii, Hymenoxys acaulis, Koeleria pyramidata, Musineon vaginatum, and Phlox hoodii. Combined bryophyte and lichen cover averages less than 20% of the ground surface.

Soils- Soils underlying the PSEMEN/CERLED type are derived from calcareous parent materials. Combined cover of gravel and rock on the ground surface generally exceeds 50% and bare soil cover exceeds 5%. Soils are typically shallow and the soil subgroup at our single soil characterization site was a Lithic Ustic Torriorthent. The single pH measurement was 7.5, and conductivity was 242 uhmos/cm² (1 stand).

Other Studies- This type has been previously described primarily in southwestern Montana by DeVelice (1992). Similar communities occur in Idaho, Utah, and Wyoming (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G3/S3

10. Pseudotsuga menziesii/Symphoricarpos oreophilus c.t.
(PSEMEN/SYMORE; Douglas-fir/mountain snowberry)
(3 Stands)

Environment- PSEMEN/SYMORE is found on northerly slopes and drainages at elevations between 5,000 to 6,500 feet. Vegetation on adjacent shallower soils and in drier situations includes the Pinus flexilis-Juniperus scopulorum and Artemisia arbuscula/Agropyron spicatum types.

Vegetation- Pseudotsuga menziesii dominates the tree stratum on most sites. Pinus flexilis and/or Juniperus scopulorum may be well represented. The undergrowth is generally very sparse with few species other than Symphoricarpos oreophilus ever exceeding 1% cover. Combined bryophyte and lichen cover may exceed 15% of the ground surface.

Soils- Soils underlying the PSEMEN/SYMORE type are generally derived from calcareous parent materials (in the Pryor Mountains). Combined cover of bare soil, gravel, and rock on the ground surface is generally less than 5%. The soil subgroups at our two soil characterization sites were a Typic Argiboroll and a Calcic Cryboroll. Surface textures varied from loam to clay

loam. The pH measurements were 7.4 and 7.7, and conductivity was 275 and 218 uhmos/cm² (2 stands, respectively).

Other Studies- This type has been previously described primarily in southwestern Montana by Pfister et al. (1977). Similar communities occur in Colorado, Idaho, Oregon, Utah, Washington, and Wyoming (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G5/S3

Woodlands

11. Juniperus osteosperma/Agropyron spicatum c.t.
(JUNOST/AGRSPI; Utah juniper/Idaho fescue)
(26 Stands)

Environment- JUNOST/AGRSPI is common on gentle to moderately steep (and occasionally very steep) slopes at elevations between 4,300 and 6,000 feet. This type occurs on slopes of all aspects (but rarely northeasterly). Pinus flexilis woodlands occur on adjacent cooler sites. Adjacent sites with often deeper soils support the Juniperus osteosperma/Artemisia tridentata type or the Artemisia tridentata/Agropyron spicatum type.

Vegetation- We recognize two phases of the JUNOST/AGRSPI type, a Artemisia arbuscula phase and a Gutierrezia sarothrae phase. In both phases, Juniperus osteosperma is the only tree that is well represented and Agropyron spicatum is well represented in both phases. Artemisia nova is well represented in the ARTNOV phase but is absent from the GUTSAR phase. Gutierrezia sarothrae is generally present in both phases. Soil lichens are well represented in most stands, and bryophytes are common in some stands.

Soils- JUNOST/AGRSPI is found on generally shallow soils derived from limestone or calcareous sandstone. Combined cover of gravel and rock on the ground surface generally exceeds 50% and bare soil cover exceeds 20%. The soil subgroups at our seven soil characterization sites included Ustic Torriorthents, Lithic Ustic Torriorthents, Lithic Ustollic Haplargids, and Ustollic Calciorthids. Surface textures varied from loam to silty clay. pH varied from 7.4 to 7.9, and conductivity ranged from 200 to 310 uhmos/cm² (7 stands).

Other Studies- The Artemisia nova phase of this type has been described, in part, from the Pryor Mountains of Montana by Kratz (1988). Juniper woodlands were described for the adjacent Bighorn Canyon N.R.A. by Knight et al. (1987). Similar

communities occur in Idaho and Wyoming (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G3/S3

12. Juniperus osteosperma/Artemisia tridentata c.t.
(JUNOST/ARTTRI; Utah juniper/big sagebrush)
(6 Stands)

Environment- JUNOST/ARTTRI is generally found on southwesterly slopes at elevations between 4,000 to 5,500 feet. Upslope vegetation often features the Pinus flexilis-Juniperus osteosperma type. Downslope vegetation is often of the Artemisia tridentata/Agropyron spicatum or the A. tridentata/Stipa comata types.

Vegetation- Juniperus osteosperma is the only tree present and Artemisia tridentata is always well represented in the undergrowth. The only other species exceeding 1% cover on 50% or more of the study plots are Aristida purpurea and Poa sandbergii. Combined bryophyte and lichen cover is generally less than 5% of the ground surface.

Soils- Soils underlying the JUNOST/ARTTRI type are generally derived from calcareous sandstone. Combined cover of gravel and rock on the ground surface averages 60% and bare soil cover averages 20%. The soil subgroup at our single soil characterization site was a Ustic Torriorthent. The single pH measurement was 8.0, and conductivity was 202 uhmos/cm² (1 stand).

Other Studies- This type has not been previously described in Montana. Similar communities occur in Arizona, Colorado, Idaho, New Mexico, Nevada, Utah, and Wyoming (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G5/S3

13. Juniperus osteosperma/Cercocarpus ledifolius c.t.
(JUNOST/CERLED; Utah juniper/curlleaf mountain mahogany)
(8 Stands)

Environment- JUNOST/CERLED is found on dry, rocky ridges and slopes at elevations around 4,500 to 5,000 feet. The type integrades to Cercocarpus ledifolius/Agropyron spicatum and commonly adjoins the Juniperus osteosperma/Agropyron spicatum type.

Vegetation- Juniperus osteosperma is the only tree species present (canopy cover averages around 10%). The undergrowth is dominated by Cercocarpus ledifolius. Agropyron spicatum is

generally well represented. Other characteristic species include Gutierrezia sarothrae and Arenaria hookeri. Combined bryophyte and lichen cover averages less than 10% of the ground surface.

Soils- Soils underlying the JUNOST/CERLED type are derived from calcareous parent materials. Combined cover of gravel and rock on the ground surface generally exceeds 45% and bare soil cover exceeds 5%. Soils vary from shallow to deep and the soil subgroup at our two soil characterization sites were a Lithic Ustic Torriorthent and a Ustic Torriorthent. Surface texture was sandy loam. For the two stands where soil was sampled, pH measurements were 7.7 and 7.8, and conductivity was 221 and 198 uhmos/cm², respectively.

Other Studies- This type has not been previously described in Montana or elsewhere.

Natural Heritage Program Rank- G3/S3

14. Juniperus scopulorum/Artemisia nova c.t.
(JUNSCO/ARTNOV; Rocky Mountain juniper/black sagebrush)
(1 Stand)

Environment- JUNSCO/ARTNOV is found on dry, rocky ridges and upper slopes with shallow soils at elevations around 6,000 to 6,500 feet. Adjacent relatively moist drainages often feature the Pseudotsuga menziesii/Symphoricarpos oreophilus type.

Vegetation- Juniperus scopulorum forms a open tree layer (total cover may be as low as 10%). The undergrowth is dominated by Artemisia nova. Agropyron spicatum, Koeleria pyramidata, and Poa sandbergii, are generally well represented. Total forb cover seldom exceeds 10%. Bryophytes and lichens cover less than 5% of the ground surface.

Soils- Soils underlying the JUNSCO/ARTNOV type are derived from calcareous parent materials. Combined cover of gravel and rock on the ground surface generally exceeds 50% and bare soil cover exceeds 5%. Soils are typically shallow and the soil subgroup at our single soil characterization site was a Lithic Ustic Torriorthent. The single pH measurement was 7.5, and conductivity was 211 uhmos/cm² (1 stand).

Other Studies- This type has not been previously described in Montana. A similar community occurs in Nevada (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G2/S2

15. Pinus flexilis-Juniperus osteosperma c.t.

(PINFLE-JUNOST; limber pine-Utah juniper)

(10 Stands)

Environment- PINFLE-JUNOST is common on mid slopes, upper slopes, and benches at elevations between 4,300 and 5,300 feet. Adjacent drier sites predominantly feature Juniperus osteosperma woodlands and Artemisia tridentata shrublands.

Vegetation- Pinus flexilis and Juniperus osteosperma are both well represented (no other tree species occur with cover exceeding 1%). Characteristic undergrowth species include Artemisia nova, Gutierrezia sarothrae, Petrophytum caespitosum, Agropyron spicatum, and Opuntia polyacantha. Combined bryophyte and lichen cover seldom exceeds 5% of the ground surface.

Soils- Soils underlying the PINFLE-JUNOST type are usually derived from calcareous sandstone. Combined cover of gravel and rock on the ground surface generally exceeds 70% and bare soil cover exceeds 10%. Soils are predominantly shallow and subgroups at our three characterization sites were all Lithic Ustic Torriorthents. Surface textures varied from loamy sand to sandy loam. pH measurements ranged from 7.5 to 8.0, and conductivity ranged from 212 to 230 uhmos/cm² (3 stands).

Other Studies- This type has not been previously described in Montana or elsewhere.

Natural Heritage Program Rank- G3/S3

16. Pinus flexilis-Juniperus scopulorum c.t.

(PINFLE-JUNSCO; limber pine-Rocky Mountain juniper)

(8 Stands)

Environment- PINFLE-JUNSCO is common on mid and upper slopes at elevations between 4,000 and 5,300 feet. Adjacent sites predominantly feature Artemisia spp. shrublands.

Vegetation- We recognize two phases of the PINFLE-JUNSCO type, a Artemisia arbuscula phase and a A. tridentata phase. In both phases, Pinus flexilis and Juniperus osteosperma are the only tree species that are well represented. Artemisia nova is abundant in the ARTNOV phase and in about half of the occurrences of the ARTTRI phase. Artemisia tridentata is well represented only in the ARTTRI phase. Gutierrezia sarothrae, Agropyron spicatum, Carex filifolia, Koeleria pyramidata, Poa sandbergii, Phlox hoodii, and Opuntia polyacantha are generally present to well represented in both phases. Combined bryophyte and lichen cover seldom exceeds 5% of the ground surface.

Soils- PINFLE-JUNSCO is generally found on soils derived from calcareous parent materials. Combined cover of gravel and rock on the ground surface generally exceeds 30% and bare soil cover exceeds 20%. The soil subgroups at our two soil characterization sites included a Lithic Ustic Torriorthent and a Ustollic Haplargid. Surface textures varied from loamy sand to sandy loam. pH values were 6.1 and 6.6, and conductivity values were 155 and 176 uhmos/cm² (2 stands).

Other Studies- This type has not been previously described in Montana. The type has close affinities with the Pinus flexilis/Agropyron spicatum and the P. flexilis/Festuca idahoensis types described by Pfister et al. 1977. However, unlike the Pfister et al. types, Artemisia nova and/or A. tridentata are well represented to abundant in the PINFLE-JUNSCO type. A similar community occurs in Oregon (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G4/S3

Shrublands

17. Artemisia nova/Agropyron spicatum c.t.
(ARTNOV/AGRSPI; black sagebrush/bluebunch wheatgrass)
(8 Stands)

Environment- ARTNOV/AGRSPI is common at 4,700 to 6,000 feet on gentle to moderately steep slopes of all aspects. This type is most common on ridgetops, benches and upper slopes, it also may be found on terraces and alluvial fans. Adjacent communities are often dominated by Juniperus osteosperma or Pinus flexilis where fractured bedrock is common near the surface. Adjacent sites with deeper soils are usually dominated by Artemisia tridentata.

Vegetation- This community is characterized by a moderate cover of shrubs ca. 1 foot tall and a fairly sparse understory of grasses and forbs. Artemisia nova was present in all stands and had a mean cover of 24%. Gutierrezia sarothrae was present in most stands but had a mean cover of only 1%. Other common shrubs include A. tridentata, A. frigida and Ceratoides lanata. Agropyron spicatum and Poa sandbergii were present in all stands with mean cover of 17% and 5% respectively. Koeleria pyramidata is common in some stands, and Stipa comata occurs in the majority of sites. Arenaria hookeri, Hymenoxys acaulis and Phlox hoodii are common forbs; Penstemon eriantherus is frequent, and Penstemon laricifolius is common in some stands. Bryophytes and lichens are usually present on the soil and are common in some stands.

Soils- ARTNOV/AGRSPI is generally found on shallow to moderately deep soils derived from limestone or calcareous sandstone, but

quartzite and shales are also parent materials supporting this type. Surface gravel is common to abundant. The soil subgroups at our three soil characterization sites included a Lithic Ustic Torriorthent, a Ustic Torriorthent, and a Ustollic Haplargid. Surface texture ranges from loam to clay-loam. In our stands pH varied from 7.3 to 7.8., and conductivity ranged from 201 to 237 $\mu\text{hos}/\text{cm}^2$ (3 stands).

Other Studies- Kratz (1988) reports this community type in the same study area. Knight et al. (1987) describe a black sagebrush steppe for the Bighorn Canyon NRA. This type is also reported for southwest Montana by Mueggler and Stewart (1980). Their type (Artemisia arbuscula/Agropyron spicatum), which was described from areas with higher rainfall, commonly has higher vegetation cover and greater species richness than our stands. Similar communities are described for much of the Intermountain West (Mueggler and Stewart 1980, Franklin and Dyrness 1973, Jensen et al. 1988, Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G5/S4

18. Artemisia pedatifida/Agropyron spicatum c.t.
(ARTPED/AGRSPI; birdfoot sagebrush/bluebunch wheatgrass)
(3 stands)

Environment- ARTPED/AGRSPI is a minor type in the study area, usually occurring on gentle to moderate slopes at 4,700 to 5,100 feet in the outwash plains and lower foothills. It is most abundant west of Crooked Creek. Adjacent communities on better drained soils are often dominated by Artemisia tridentata, while on heavier or more saline soils Atriplex nuttallii and Agropyron smithii are important species.

Vegetation- This type has a sparse cover of low shrubs with scattered clumps of grass intermixed. Artemisia pedatifida had a mean canopy cover of 17%. Artemisia tridentata and Ceratoides lanata were the only other frequent shrubs with mean covers of 2% and 1% respectively. Agropyron spicatum was the only common grass with a mean canopy cover of 21%. Forbs are not abundant, but Allium textile, Arenaria hookeri and Phlox hoodii are frequent species. Soil lichens are present but not abundant.

Soils- ARTPED/AGRSPI occurs on deep soils derived from shales or sandstone interbedded with shale or clay. Surface texture is clay loam to clay. We collected no additional soils data for this type.

Other Studies- Kratz describes an Artemisia pedatifida/Agropyron spicatum community type that probably includes both our ARTPED/AGRSPI and ARTPED-ATRNU types. Knight et al. (1987) do

not describe this type for the Bighorn Canyon NRA; however, it is described for Wyoming (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G3/S3

19. Artemisia pedatifida-Atriplex nuttallii c.t.
(ARTPED-ATRNU; birdfoot sagebrush-Gardner saltbush)
(9 Stands)

Environment- ARTPED-ATRNU is common on alluvial fans and terraces and occasionally moderate slopes at 4,100 to 5,000 feet in the outwash plains. It is most common in the south and west portions of our study area. In adjacent sites with less saline soils Agropyron spicatum rather than Atriplex nuttallii is codominant. Somewhat better-drained soils are dominated by Artemisia tridentata and Agropyron smithii. Sarcobatus vermiculatus may also be common on adjacent sites.

Vegetation- Typically this type has a moderate cover of low shrubs with sparse grass and forb components. Both Artemisia pedatifida and Atriplex nuttallii were present in all stands with mean canopy covers of 33% and 9% respectively. Artemisia tridentata was common in ca. 1/3 of the stands. Poa sandbergii and Agropyron spicatum each occurred in ca. half of the stands with mean cover of 20% and 3% respectively. Agropyron smithii and Poa juncifolia are common in some stands. Forbs are poorly represented. Allium textile, Musineon divaricatum and Platyschkurhia integrifolia are present in most stands, and Opuntia polyacantha and Vicia americana are common in some plots. Bryophytes and lichens are present but uncommon.

Soils- ARTPED-ATRNU occurs on deep soils derived from shales and clays interbedded with sandstone. Coarse fragments and gravels are absent, and surface texture varies from silt-loam to clay. The soil subgroup at all three soil characterization sites was Ustic Torriorthent. pH varied from 7.2 to 9.0, and conductivity ranged from 205 to 489 $\mu\text{hos}/\text{cm}^2$ (3 stands).

Other Studies- Kratz (1988) probably includes this community in his Artemisia pedatifida/Agropyron spicatum type described from the same area. Knight et al. (1987) do not describe this type for the Bighorn Canyon NRA, and it has not been described elsewhere (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G2/S2

20. Artemisia tridentata/Agropyron smithii c.t.
(ARTTRI/AGRSMI, big sagebrush/western wheatgrass)
(6 stands)

Environment- Alluvial fans, toeslopes and terraces in the southwest portion of the study area are often dominated by ARTTRI/AGRSMI. Elevations range from 4,100 to 4,800 feet. Adjacent communities include Artemisia tridentata/Agropyron spicatum on better drained soils, while Sarcobatus vermiculatus or Artemisia pedatifida may dominate on more saline soils.

Vegetation- This community has a moderately dense shrub layer 1 to 3 feet tall and a fairly continuous cover of rhizomatous grasses. Artemisia tridentata was present in but one all stand with a mean cover of 48%. Other shrub species are not common, but Chrysothamnus nauseosus and Sarcobatus vermiculatus were present in some stands. Agropyron smithii/dasystachyum was present in all stands with an mean canopy cover of 27%. Poa sandbergii and Koeleria pyramidata are common in most stands. Forbs diversity is low, but Phlox hoodii and Vicia americana are common in most stands, and Lomatium foeniculaceum is common in some plots.

Soils- ARTTRI/AGRSMI occurs on deep soils developed from alluvium. Gravels and coarse fragments are absent, and carbonates are leached well below the surface. The soil subgroup at our single soil characterization site was a Ustollic Haplargid. Surface texture is silt to clay loam. The single pH measurement was 7.4, and conductivity was 210 uhmos/cm² (1 stand).

Other Studies- Communities dominated by Artemisia tridentata and Agropyron smithii/A. dasystachyum are described for central and eastern Montana by Jorgensen (1979) and Hansen and Hoffman (1988). The type also occurs in North and South Dakota (Hansen and Hoffman 1988), Wyoming and Colorado (Bourgeron and Engelking 1992). Throughout all of eastern Montana this community type has low species richness.

Natural Heritage Program Rank- G5/S5

21. Artemisia tridentata/Agropyron spicatum c.t.
(ARTTRI/AGRSPI, big sagebrush/bluebunch wheatgrass)
(24 Stands)

Environment- ARTTRI/AGRSPI is common on gentle to moderately steep (and occasionally very steep) slopes in the outwash plains and foothills of the Pryor Mountains. Occasional examples may also be found well up into the mountains, and elevations range from 4,200 feet to over 6,700 feet. This type occurs on slopes of

all aspects as well as ridgetops, terraces and alluvial fans. Juniperus osteosperma woodland is common on adjacent sites with more exposed bedrock, and black sagebrush steppe is frequently found on sites with shallower soils. Adjacent sites with deep but less well-drained soils are often dominated by big sagebrush but with Agropyron smithii or Atriplex confertifolia as codominants. Birdfoot sagebrush is often dominant on adjacent communities in the southwest portion of the study area.

Vegetation- Typically this type has a rather sparse shrub layer, 1 to 3 feet tall, and a moderate cover of grasses. Artemisia tridentata was present in all stands with a mean cover of 23%. Gutierrezia sarothrae was present in most stands, but had a mean cover of only 1%. Artemisia nova, Chrysothamnus nauseosus, C. viscidiflorus and Ceratoides lanata are present in some stands. Agropyron spicatum was present in all stands with a mean canopy cover of 23%. Poa sandbergii and Stipa comata were frequent in ca. half the stands. Agropyron dasystachyum, Carex filifolia and Koeleria pyramidata are common in some stands. Arenaria hookeri, Phlox hoodii, Opuntia polyacantha and Vicia americana are common forbs. Allium textile is abundant in some stands, and Penstemon eriantherus, Platyschkurhria integrifolia and Sphaeralcea coccinea are frequent but never common. Soil lichens are present in most stands, and bryophytes are common in some stands.

Soils- ARTTRI/AGRSPI is found on moderately deep to deep soils derived from limestone, shale, sandstone or alluvium. Surface gravel is common in some stands and common textural classes are silt, silt-loam and clay-loam. The soil subgroups at our five soil characterization sites included a Ustollic Calciorthid, a Ustollic Haplargid, Ustic Torriorthents, and a Argic Cryoboroll. pH varied from 6.5 to 7.8, and conductivity ranged from 175 to 230 uhmos/cm² (5 stands).

Other Studies- Knight et al. (1987) describe this type for the adjacent Bighorn Canyon NRA. Jorgensen (1979), Mueggler and Stewart (1980), and Hansen and Hoffman (1988) describe an Artemisia tridentata/Agropyron spicatum for Montana. Similar communities are described for British Columbia, Washington, Oregon, Idaho, Nevada, Utah, Wyoming and Colorado (references in Mueggler and Stewart 1980 and Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G5/S5

22. Artemisia tridentata-Atriplex confertifolia c.t.
(ARTTRI-ATRCON, big sagebrush-shadscale)
(4 stands)

Environment- ARTTRI-ATRCON occurs on terraces and alluvial fans at 4,200 to 4,700 feet in the outwash plains south of the Pryor

Mountains. This type is closely related to and often merges with ARTTRI/AGRSPI and ARTTRI/STICOM, but these communities are generally found on better drained or less saline soils.

Vegetation- This vegetation is characterized by a moderately dense shrub layer ca. 3 feet tall and a sparse ground layer. Both Artemisia tridentata and Atriplex confertifolia occurred in all stands and had mean canopy covers of 28% and 4% respectively. Artemisia spinescens, Atriplex nuttallii, Chrysothamnus nauseosus and Sarcobatus vermiculatus are often present. Graminoid cover is low. Aristida purpurea and Stipa comata are common in many stands, and Sporobolus airoides may be abundant. Phlox hoodii and Opuntia polyacantha are the only common and frequent forbs. Lichens and bryophytes are uncommon.

Soils- ARTTRI-ATRCO occurs on deep soil weathered from sandstone, often of the calcareous Chugwater formation. Surface gravel is absent, and texture is generally silty. We collected no additional soils data for this type.

Other Studies- Knight et al. (1987) describe a sagebrush desert shrubland on the Bighorn Canyon NRA that includes our ARTTRI-ATRCO type. Brown (1971) describes a community dominated by Atriplex confertifolia and Artemisia tridentata for the badlands of eastern Montana; however, common grasses are different. Similar communities also occur in Oregon and Utah (Bourgeron and Engelking 1992) and probably in Wyoming and Idaho.

Natural Heritage Program Rank- G4/S4

23. Sarcobatus vermiculatus-Artemisia tridentata c.t.
(SARVER-ARTTRI, greasewood-big sagebrush)
(3 stands)

Environment- SARVER-ARTTRI occurs along drainages on alluvial terraces. The type occurs from 4,000 to 4,600 feet and is found in the south and southwest portions of the study area. Adjacent upland sites are most often dominated by Artemisia tridentata and Agropyron smithii or A. spicatum.

Vegetation- This community has a relatively dense shrub layer that may be over 6 feet tall. Artemisia tridentata and Sarcobatus vermiculatus occurred in all stands with mean canopy covers of 21% and 30% respectively. Artemisia pedatifida was common in one stand. Agropyron smithii and Poa sandbergii were the common native grasses with 30% and 7% cover respectively. Lepidium perfoliatum and Opuntia polyacantha are common forbs. The introduced Taraxacum officinale and Bromus tectorum are common in some stands. Lichens and bryophytes are uncommon.

Soils- SARVER-ARTTRI is found on deep alluvial soils. Gravel and coarse fragments are absent, and a carbonate layer occurs at depths below 20 inches. The soil subgroup at our single soil characterization site was a Ustic Torrifuvent. Surface texture is silty. pH and conductivity of the one stand measured were 7.7 and 290 $\mu\text{hos}/\text{cm}^2$ (1 stand).

Other Studies- Knight et al. (1987) report a greasewood desert shrubland for the Bighorn Canyon NRA. Mueggler and Stewart (1980) and Hansen et al. (1991) describe a Sarcobatus vermiculatus-Artemisia tridentata habitat type for western Montana; however, they do not include Artemisia tridentata as a common species. Although greasewood communities are reported throughout the Intermountain West, this type is reported only for Montana (Bourgeron and Engelking 1992), but is certainly also present in Wyoming.

Natural Heritage Program Rank- G4/S4

24. Artemisia tridentata/Stipa comata c.t.
(ARTTRI/STICOM; big sagebrush/needle-and-thread)
(18 stands)

Environment- Wide alluvial valleys, fans, toeslopes and terraces are most often occupied by ARTTRI/STICOM. This type is very common between 4,000 and 5,000 feet in the outwash plains and foothills on the south side of the Pryor Mountains. Adjacent community types include ARTTRI/AGRSPI and Utah juniper woodlands on steeper slopes and stonier soils and ARTTRI-ATRCON or ARTTRI/AGRSMI on heavier or more saline soils.

Vegetation- Artemisia tridentata was present in nearly all of the stands with a mean cover of 23%. Ceratoides lanata and Gutierrezia sarothrae have low cover in many stands. Atriplex confertifolia and Grayia spinosa are common in some stands. Stipa comata and Bouteloua gracilis were present in most stands with mean canopy covers of 11% and 25% respectively. Oryzopsis hymenoides and Poa sandbergii were present in approximately half of the stands, but their cover was generally low. Aristida purpurea, Sitanion hystrix and Sporobolus cryptandrus are common in some stands. Forb cover is low, but Opuntia polyacantha and Sphaeralcea coccinea are common, and Ipomopsis pumila is present in many stands. Bryophytes and lichens are present in many stands but are usually not common.

Soils- ARTTRI/STICOM occurs on deep soils derived from sandstone or limestone. Coarse fragments or gravel are absent in most but not all stands, and texture is silty or sandy loam. The soil subgroups at our two soil characterization sites included a Ustollic Calciorthid and a Ustollic Haplargid. pH of the surface

horizon ranged from 7.4 to 7.8, and conductivity varied from 210 to 270 uhmos/cm² (2 stands).

Other Studies- Knight et al. (1987) include this community type in their description of big sagebrush steppe on Bighorn Canyon NRA. This type appears to have northern Great Basin affinities. Similar community types are described for Idaho, Oregon, Nevada, Utah, Washington and Wyoming (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G4/S4

25. Atriplex nuttallii-Artemisia spinescens c.t.
(ATRNUT-ARTSPI; Gardner saltbush-bud sagebrush)
(4 stands)

Environment- ATRNUT-ARTSPI occurs on broad alluvial plains in the area around Gyp Springs near the Wyoming border. Elevations range from 4,600 to 4,800 feet ARTTRI/STICOM or ARTTRI-ATRCON occupy adjacent sites on better drained soils. ARTTRI/AGRSPI may occur on adjacent slopes.

Vegetation- Atriplex nuttallii and Artemisia spinescens occurred in all stands with mean canopy covers of 38% and 20% respectively. Ceratoides lanata is sometimes common. The herb layer is very sparse. Poa sandbergii and Sitanion hystrix have low cover in most stands. Opuntia polyacantha, Lappula echinata and Ipomopsis pumila are present in most stands. Bryophytes and lichens are absent or nearly so.

Soils- ATRNUT-ARTSPI occurs only on fine-textured alluvial soil derived from Chugwater sandstone. Soils are very deep, and distinct horizons are undeveloped. Coarse fragments and gravel are absent, and surface texture is silty clay. The soil subgroup at our single soil characterization site was a Typic Torriorthent. High concentrations of carbonates are present at the surface and increase with depth. pH was 8.0 with conductivity of 230 uhmos/cm².

Other Studies- Kratz (1988) reports this type from the same area, otherwise this community type is previously unreported for North America.

Natural Heritage Program Rank- G1/S1

26. Artemisia tridentata/Atriplex nuttallii c.t.
(ARTTRI/ATRNUT; big sagebrush/Gardner saltbush)
(2 stands)

Environment- This minor type occurs on slopes, terraces and alluvial fans in highly eroded terrain on the south side of the Pryor Mountains. Elevations range from 4,300 to 4,800 feet. Adjacent communities include ARTTRI/AGRSPI and sparse Utah juniper woodlands.

Vegetation- Artemisia tridentata and Atriplex nuttallii occurred in both stands with cover of 15% and 10% respectively. Gutierrezia sarothrae also occurred in both stands but cover was sparse. Grass cover is very sparse; no species is present in all stands or has more than 1% canopy cover. The scarcity of grasses is likely due to livestock grazing. Agropyron spicatum, Oryzopsis hymenoides, and Stipa comata would probably be the dominant grasses in undegraded stands. The exotic Halogeton glomeratus and Opuntia polyacantha are the only common forbs. Lichens are abundant in stands with a gentle slope.

Soils- ARTTRI/ATRNUT occurs on deep to very deep soils derived from shale, sandstone and alluvium. Gravel and cobbles are abundant in some stands but absent in others. The soil subgroup at our single soil characterization site was a Ustic Torriorthent. Texture of the surface horizon is silty. Carbonates were present throughout all horizons in the single stand sampled. pH was 6.8 and 1925 uhmos/cm², one of the highest measurements recorded, suggesting that soils are highly saline (1 stand).

Other Studies- This community type would likely be included in Knight et al.'s (1987) saltbush desert shrubland. ARTTRI/ATRNUT is not reported from outside the northern Bighorn Basin. Fautin (1946) described communities dominated by Atriplex confertifolia, Artemisia spinescens, and Oryzopsis hymenoides from west-central Utah.

Natural Heritage Program Rank- G2/S2

27. Atriplex nuttallii/Monolepis nuttalliana c.t.
(ATRNUT/MONNUT; Gardner saltbush/povertyweed)
(3 stands)

Environment- Low ridges and toeslopes in badlands near the Wyoming border are often occupied by ATRNUT/MONNUT. Elevations range from 4,500 to 4,800 feet, and slopes are usually gentle but show evidence of sheet and gully erosion. Adjacent communities are generally dominated by Atriplex nuttallii or Artemisia pedatifida.

Vegetation- Sites occupied by ATRNUT/MONNUT appear barren in spite of moderate cover by the two dominant species. Atriplex nuttallii was present in two of three stands with a mean cover of 35%. Sarcobatus vermiculatus and Sueda nigra were both present in one stand, but neither were common. Grass cover is sparse; Hordeum jubatum was present in two stands, and Oryzopsis hymenoides was present in one stand. Monolepis occurred in all stands with a mean cover of 34%. Allium textile, Camissonia scapoidea, Platyschkurhia integrifolia and Opuntia polyacantha are found in most stands, but all have low cover. Lichens and bryophytes are absent or nearly so.

Soils- ATRNUT/MONNUT occurs on deep, heavy clay soils with extremely low infiltration rates. Parent materials are shale, clay, or bentonite. Gravel derived from old streambeds or shores is often present on the surface as are salt deposits. We collected no additional soils data for this type.

Other Studies- This community type has not been previously described. It would probably fit into Knight et al.'s (1987) saltbush desert shrubland. These authors do not mention the presence of Monolepis nuttalliana, but this species is an annual and may not always be as prevalent as it was in 1991. This community type is probably similar to the Atriplex nuttallii/Allenrolfea occidentalis type described for Idaho, Wyoming and Utah (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G2?/S2?

28. Potentilla fruticosa/Festuca idahoensis c.t.
(POTFRU/FESIDA; shrubby cinquefoil/Idaho fescue)
(1 stand)

Environment- POTFRU/FESIDA is a minor type found near lower timberline on cool slopes in the Pryor Mountains. The elevation of our one stand was 7,080 feet. Adjacent communities are dominated by Abies lasiocarpa and Pseudotsuga menziesii.

Vegetation- Potentilla fruticosa is the only common shrub; it had 20% canopy cover in the one stand sampled. Festuca idahoensis is the most abundant grass, but Koeleria pyramidata, Leucopoa kingii and Agropyron caninum are also common. Forbs are common and conspicuous. Solidago missouriensis, Anemone patens, Galium boreale and Astragalus miser are common species. Bryophytes and lichens are uncommon.

Soils- POTFRU/FESIDA occurs on deep soils derived from limestone. Surface texture is silty or loamy and gravel is rare. We collected no additional soils data for this type.

Other Studies- Mueggler and Stewart (1980) describe a Potentilla fruticosa/Festuca idahoensis habitat type for southwestern Montana; however, Danthonia intermedia and Potentilla gracilis are common in their type but were not present in our POTFRU/FESIDA. Similar community types are also reported for Idaho, Nevada and Wyoming (Mueggler and Stewart 19980, Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G4/S3

29. Sarcobatus vermiculatus/Atriplex nuttallii c.t.
(SARVER/ATRNUT, greasewood/Garner saltbush)
(1 stand)

Environment- SARVER/ATRNUT occurs on highly eroded moderate slopes in badlands topography near the Wyoming border at ca. 4,600 feet. Adjacent communities are dominated by Artemisia pedatifida.

Vegetation- Sarcobatus vermiculatus and Atriplex nuttallii each had ca. 10% cover, while Chrysothamnus nauseosus was present with cover of 3%. The herbaceous layer is very sparse. Poa sandbergii is the only common grass, and Lappula echinata and Allium textile are the only common forbs. Lichens and bryophytes are absent.

Soils- SARVER/ATRNUT occurs on deep undifferentiated soil derived from bentonite. Surface gravel and coarse fragments are absent. The soil subgroup at our single soil characterization site was a Ustic Torriorthent. Surface texture is heavy clay. pH was 7.2, and conductivity was 270 uhmos/cm² (1 stand).

Other Studies- Knight et al. (1987) describe a saltbush desert shrubland that probably includes stands similar to ours. Mueggler and Stewart (1980) describe a community dominated by Sarcobatus vermiculatus with significant quantities of Atriplex nuttallii for western Montana, but their type has much greater cover of grasses. A similar community type is also reported for Wyoming (Bourgeron and Engelking 1992). Fautin (1946) described communities dominated by Sarcobatus vermiculatus and Atriplex confertifolia for west-central Utah.

Natural Heritage Program Rank- G4/S3

Grasslands

30. Agropyron spicatum/cushion plant c.t. (AGRSPI/cushion; bluebunch wheatgrass/cushion plant) (17 stands)

Environment- Windswept mesas, ridgetops and upper slopes in the outwash plains and foothills on the south side of the Pryor Mountains are often dominated by cushion plant-grasslands. Elevations range from 4,100 to 5,500 feet. Adjacent plant communities are often Utah juniper or limber pine woodlands in more protected sites. ARTTRI/AGRSPI may also occur nearby where soils are deeper.

Vegetation- Shrubs are rare in this community type. The subshrubs Ceratoides lanata and Gutierrezia sarothrae were present in the majority of stands but their mean cover did not exceed 2%. Agropyron spicatum was present in all stands with a mean canopy cover of 13%. Koeleria pyramidata is common in some stands. The most common forbs are cushion plants, including Arenaria hookeri, Hymenoxys acaulis, Phlox hoodii and P. muscoides. Cryptantha cana and Eriogonum mancum are common in some stands, and Machaeranthera grindelioides, Townsendia spathulata and Astragalus spatulatus are present in the majority of stands but have low mean cover. Lichens are relatively common in this type.

Soils- AGRSPI/cushion generally occurs on moderately deep soils derived from limestone or calcareous sandstone. They are very gravelly or cobbly with a loamy to clay texture. The soil subgroup at both of the soil characterization sites was Ustic Torriorthent. High concentrations of carbonate are present in all horizons. pH varied from 7.2 to 7.6, and conductivity ranged from 200 to 680 uhmos/cm² (2 stands).

Other Studies- Knight et al. (1987) describe this community type from Bighorn Canyon NRA and refer to it as windswept plateau grassland. Similar shallow-soil grasslands dominated by Agropyron spicatum have been described for northwest Montana where the codominant forb is Eriogonum ovalifolium (Lesica 1988) and for Oregon and Idaho in which the codominant is E. heracleoides (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G3/S3

31. Chrysothamnus nauseosus/Eriogonum brevicaule c.t.
(CHRNAU/ERIBRE; rubber rabbitbrush/short-stem buckwheat)
(8 stands)

Environment- CHRNAU/ERIBRE is common on moderate to steep, highly eroded slopes, often in badlands terrain on the south and west sides of the Pryor Mountains. Elevations range from 4,200 to 5,000 feet. Adjacent communities on gentler slopes include ARTPED/AGRSPI and ARTTRI/AGRSPI. Utah juniper woodland may also occur nearby on ridgetops with fractured bedrock.

Vegetation- These stands are characterized by low vegetal cover. Chrysothamnus nauseosus was present in all stands but had a mean cover of only 3%. Gutierrezia sarothrae was present in most stands with mean cover of 2%. Atriplex confertifolia is often present. Agropyron spicatum was the only common grass, occurring in half of the stands with mean canopy cover of 7%. Oryzopsis hymenoides occurs in some stands. Eriogonum brevicaule was present in nearly all stands and had mean cover of 3%. Arenaria hookeri is common in some stands, and Machaeranthera grindelioides is present in many stands. Cryptogamic soil crusts are well-developed in some of the stands on gentler slopes.

Soils- CHRNAU/ERIBRE occurs on deep soils derived from shale, bentonite, clay or sandstone interbedded with clay. Surface gravel and cobbles are common and texture is sandy clay to clay. We collected no additional soils data for this type.

Other Studies- CHRNAU/ERIBRE probably corresponds to Knight et al.'s (1987) mixed desert shrubland. ECON (1975) describes a similar badlands community in southeastern Montana where Eriogonum pauciflorum replaces E. brevicaule as the most common forb.

Natural Heritage Program Rank- G2/S2

32. Festuca idahoensis-Agropyron caninum c.t.
(FESIDA-AGRCAN; Idaho fescue-bearded wheatgrass)
(3 stands)

Environment- Upper slopes and broad ridges near the crest of the Pryor Mountains are often occupied by mesic high-elevation grasslands. Elevations range from 8,000 to 8,800 feet. On gentle, warm slopes these grasslands often grade into mesic limber pine forests at lower elevations, while on cooler slopes or the highest areas, Abies lasiocarpa and Picea engelmannii dominate adjacent communities.

Vegetation- Shrubs are rare in this type although Artemisia frigida may be locally common in protected sites at lower elevations. Festuca idahoensis, Agropyron caninum and Koeleria

pyramidata occurred in all stands with mean canopy covers of 24%, 18% and 29% respectively. Other common graminoids include Carex rupestris, Poa cusickii and P. secunda. Forbs are abundant in this community type. Common species include Achillea millefolium, Antennaria microphylla, Arenaria congesta, Astragalus miser, Cerastium arvense and Oxytropis campestris. Arenaria nuttallii, Hymenoxys acaulis, Lupinus argenteus and Phlox hoodii are common in some plots and may indicate overgrazing. Soil lichens are common in most stands.

Soils- FESIDA-AGRCAN occurs on moderately deep to deep soils derived from Madison limestone. Surface gravel is uncommon or absent but often increases with depth. The soil subgroup at our single soil characterization site was a Calcic Cryoboroll. Carbonates are leached from the surface horizon but also increase with depth. pH of the single stand measured was 6.99, and conductivity was 161 uhmos/cm² (1 stand).

Other Studies- Mueggler and Stewart (1980) describe a Festuca idahoensis-Agropyron caninum habitat type for southwest Montana. Cooper and Lesica (1992) describe a similar community type from lower portions of the alpine zone for the same region, but their alpine type had many different forbs and graminoids. Similar communities also occur in Wyoming and Colorado (Bourgeron and Engelking 1992).

Natural Heritage Program Rank- G4/S4

33. Carex rupestris/Potentilla ovina c.t.
(CARRUP/POTOVI; curly sedge/sheep cinquefoil)
(1 stand)

Environment- This minor type occurs on high windswept ridgetops along the crest of the Pryor Mountains. Our one stand was at 8,750 feet. Adjacent sites with deeper soils support the FESIDA-AGRCAN community type.

Vegetation- Shrubs are absent. Carex rupestris, Koeleria pyramidata and Calamagrostis purpurascens are the dominant grasses. In our single sample they had 30%, 20% and 10% canopy cover respectively. Oxytropis campestris, Zigadenus elegans and Arenaria obtusiloba are common forbs. Both lichens and mosses are common.

Soils- CARRUP/POTOVI occurs on shallow, limestone-derived soils. Surface texture is sandy to silty, and gravel is abundant. We collected no additional soils data for this type.

Other Studies- Cooper and Lesica (1992) describe a similar limestone fellfield type from alpine areas in southwest Montana. This community type also occurs on limestone ridges along the east side of the Beartooth Mountains and at lower elevations in the Ruby Range of Beaverhead County (P. Lesica, observations).

Natural Heritage Program Rank- G3/S3

Incidental Types

In addition to the 33 vegetation types described above, six communities were observed that did not fit our classification. Additional sampling is needed to more fully document these communities and to ascertain their status as unique types.

Within the forest and woodland zone the following three additional communities were sampled:

1) Pseudotsuga menziesii-Juniperus osteosperma

This community was sampled at two mid slope locations on soils derived from limestone parent materials at elevations between 5,200 and 6,200 feet. Vegetation composition suggests that this community is at the ecotone between Pseudotsuga menziesii forest and Juniperus osteosperma woodland and both tree species are well represented to abundant. Characteristic undergrowth species include Artemisia tridentata, Cercocarpus ledifolius, Agropyron spicatum, and Koeleria pyramidata. This community type has not been previously described.

2) Pinus ponderosa-Juniperus scopulorum

This community was sampled at one mid slope location on soils derived from non-calcareous sandstone parent material at an elevation of 4,300 feet. Sandstone outcrops were abundant. Adjacent vegetation was the ARTTRI/STICOM type. Pinus ponderosa and Juniperus scopulorum were both well represented. Undergrowth species that were well represented included Artemisia tridentata, Agropyron spicatum, and Bromus tectorum. This community type has been previously described in north-central Montana (Roberts 1980). Similar communities occur in Wyoming (Bourgeron and Engelking 1992).

3) Picea engelmannii/SCREE

This community was sampled at one upper slope location on steep limestone talus with little soil development at an elevation of 8,600 feet. Adjacent vegetation was of the ABILAS/ARNCOR and ABILAS/RIBMON types. Picea engelmannii dominates the open tree stratum. Undergrowth species that were well represented included Clematis columbiana, Leucopoa

kingii, Carex rupestris, and Poa interior. This community type has been described in Montana in very general terms by Pfister et al. 1977.

Within the shrubland and grassland zone the following three additional communities were sampled:

4) Atriplex confertifolia

This community was sampled at one steep mid slope location at an elevation of 4,600 feet. Atriplex confertifolia and Halogeton glomeratus were the only species that were well represented. This community type has not been previously described in Montana. Similar communities occur in Nevada (Bourgeron and Engelking 1992).

5) Sporobolus cryptandrus

This community was sampled at one valley bottom location on at an elevation of 4,800 feet. Sporobolus cryptandrus, Opuntia polyacantha, and Halogeton glomeratus were all well represented. This community type has not been previously described.

6) UNCLASSIFIED

One steep mid slope sample at an elevation of 4,500 feet was not characterized by any single species or group of species. The only species present with canopy cover values up to 5% were Suaeda nigra, Atriplex confertifolia, and Atriplex nuttallii.

DISCUSSION

Rarity and Biogeography

Using a combination of two-way indicator species analysis (TWINSPAN) and detrended correspondence analysis (DCA) 33 vegetation types were identified among the 197 study plots. Comparisons with a "comprehensive" listing of vegetation types of the western United States revealed that 9 of the types from the Pryor Mountains region had not been reported from elsewhere and 14 are rare globally. This concentration of rare vegetation types, in combination with previously documented occurrences of rare plant species, highlight the significant biodiversity values of the Pryor Mountains.

Specifically, the globally rare types identified in the study area were:

Abies lasiocarpa/Clematis columbiana (G3/S3)

Pseudotsuga menziesii/Cercocarpus ledifolius (G3/S3)

Juniperus osteosperma/Agropyron spicatum (G3/S3)
Juniperus osteosperma/Cercocarpus ledifolius (G3/S3)
Juniperus scopulorum/Artemisia nova (G2/S2)
Pinus flexilis-Juniperus osteosperma (G3/S3)
Artemisia pedatifida/Agropyron spicatum (G3/S3)
Artemisia pedatifida-Atriplex nuttallii (G2/S2)
Atriplex nuttallii-Artemisia spinescens (G1/S1)
Artemisia tridentata/Atriplex nuttallii (G2/S2)
Atriplex nuttallii/Monolepis nuttalliana (G2?/S2?)
Agropyron spicatum/cushion plant (G3/S3)
Chrysothamnus nauseosus/Eriogonum brevicaule (G2/S2)
Carex rupestris/Potentilla ovina (G3/S3)

Among the above types, those that appear to be possibly endemic to the Pryor Mountain and northern Bighorn River Basin area are:

Juniperus osteosperma/Cercocarpus ledifolius (G3/S3)
Juniperus scopulorum/Artemisia nova (G2/S2)
Pinus flexilis-Juniperus osteosperma (G3/S3)
Artemisia pedatifida-Atriplex nuttallii (G2/S2)
Atriplex nuttallii-Artemisia spinescens (G1/S1)
Artemisia tridentata/Atriplex nuttallii (G2/S2)
Atriplex nuttallii/Monolepis nuttalliana (G2?/S2?)
Agropyron spicatum/cushion plant (G3/S3)
Chrysothamnus nauseosus/Eriogonum brevicaule (G2/S2)

Management Considerations

Plant community diversity should be conserved on the ecosystem and landscape levels. Maximizing diversity of one group of species, such as birds or plants, may not optimize overall biological diversity. On the other hand, plant communities are one of the most efficient surrogates for overall species diversity because vegetation consists of the principle autotrophs upon which most other organisms depend, and it integrates many important environmental gradients (Whittaker 1975). Maintaining community diversity is the best insurance that small, difficult-to-inventory organisms that contribute the most to ecosystem function and biological diversity are not lost. For these reasons it is important to protect rare and threatened vegetation types in any ecosystem- or landscape-level management plan.

We identified six community types in the Pryor Mountain study area that are considered globally rare: Artemisia pedatifida-Atriplex nuttallii (G2/S2), Atriplex nuttallii-Artemisia spinescens (G1/S1), Artemisia tridentata/Atriplex nuttallii (G2/S2), Atriplex nuttallii/Monolepis nuttalliana (G2?/S2?), Chrysothamnus nauseosus/Eriogonum brevicaule (G2/S2), and Juniperus scopulorum/Artemisia nova (G2/S2). All of these community types are thought to be endemic to the Pryor Mountain Desert region at the north end of the Bighorn Basin.

These rare plant communities in the Pryor Mountain Desert are threatened by (1) encroachment of exotic species, (2) livestock and feral horse grazing, (3) off-road vehicle (ORV) use, and (4) oil and gas development (Lesica and Achuff 1992).

Exotic Species

Halogeton glomeratus is an Asian species that was introduced into arid western North America in 1934. It has since spread throughout much of the arid and semi-arid lands in the western U.S. It is poisonous to livestock, and it outcompetes many native species by increasing the salinity of the soil (Sauer 1988). This plant is present in the Bighorn Basin (Fisser and Joyce 1984) and has become locally common in the Pryor Mountain Desert region and may be able to displace native plants, especially annuals. Halogeton glomeratus was found in three of the rare community types, Artemisia tridentata/Atriplex nuttallii, Atriplex nuttallii/Monolepis nuttalliana and Chrysothamnus nauseosus/Eriogonum brevicaulis, and it is expected to be able to invade the Artemisia pedatifida-Atriplex nuttallii community type. Halogeton glomeratus is a threat to individual rare plant species (Lesica and Achuff 1992) as well as the integrity of rare communities.

Grazing

Recent livestock grazing appeared to be light to moderate throughout most of the lower portions of the study area. However, severe effects of overgrazing were apparent in areas near water, such as Gyp Springs and Bear Canyon. Overgrazing in the Gyp Springs area is a particularly serious problem because this area supports the only stands of the rare Atriplex nuttallii-Artemisia spinescens community type. Four or five species of grass occur in this type, but total grass cover was always less than 5%. Low grass cover may be due to the harsh edaphic environment, but grazing is likely an exacerbating factor. Most stands of Artemisia pedatifida-Atriplex nuttallii, another rare community type, had very low grass cover, but one or two stands had much more grass. Stands on steep slopes often had more grass cover than stands on adjacent terraces. These differences in grass cover are likely caused by livestock grazing. ATRNUT-ARTSPI and ARTPED-ATRNUT are particularly vulnerable to livestock grazing because they occur on nearly level terrain where use is heaviest.

Damage due to feral horses was observed in the desert west of the mouth of Big Coulee. Steep slopes and banks had been severely terraced and destabilized. Fragile vegetation in this arid environment is slow to recover, particularly when the effects of trampling and terracing are compounded by erosion. Subalpine grasslands appear to have been degraded by feral horse grazing. We sampled inside a horse enclosure (T3S R28E S18

SE1/4) and compared the vegetation to that outside the fence. Cover of unpalatable forbs, Balsamorhiza sagittata, Phlox hoodii, Oxytropis campestris, Taraxacum officinale and Zigadenus venenosus, was higher outside the enclosure. Height of native grasses inside the enclosure was approximately twice that on the outside. Both livestock and feral horse grazing increase the likelihood of exotic weed encroachment. Degradation of subalpine grasslands can be ameliorated by lowering stocking rates. Damage done to the desert ecosystem at lower elevations suggests that these fragile systems are not compatible with feral horse grazing.

ORV Use

At the present time there is relatively little off-road vehicle use in the Pryor Mountain Desert area. However, the topography and sparseness of the vegetation is appropriate for this sort of recreation. ARTPED-ATRNUT, ATRNUT-ARTSPI, ATRNUT/MONNUT and CHRNAU/ERIBRE are dominated by low shrubs and have sparse vegetation. These habitats will be especially vulnerable to disturbance caused by ORV use, particularly destruction of vegetation, soil compaction and increased erosion. The arid climate prohibits rapid recovery of vegetal cover and soil stability.

Mining

Bentonite claims have been made on public lands in the Pryor Mountain Desert area, and some strip mining has occurred on both sides of the Wyoming border. The Atriplex nuttallii/Monolepis nuttalliana and Artemisia pedatifida-Atriplex nuttallii community types are often associated with bentonite deposits and strip mining has the potential for disturbing or destroying large areas occupied by these rare plant communities. Oil and gas development has occurred south and west of Warren. Drilling and the associated road-building and development could degrade or destroy portions of rare plant communities. Introduction of exotics is a potential problem associated with development in these areas.

Protecting Biological Diversity

Plant communities that are at risk due to their rarity or other aspects of their biology should be given high priority for protection (Jenkins 1981). Based on the results of our study, vegetation types occurring in the study area can be classified into one of three groups based on global and state rarity and degree of threats: (1) globally rare - G1, G2 or G2, (2) globally uncommon - G3, and (3) relatively common. Knowledge of the distribution of plant communities in groups (1) and (2) in the Pryor Mountain Desert can be used to identify areas that are

critical for protecting the biological diversity of this northern outlier of intermountain desert vegetation. Protection should be given to many of the areas supporting extensive, good-condition examples of the six community types in group (1). Protection of the Gyp Springs area that supports the Atriplex nuttallii-Artemisia spinescens community type is particularly critical. The eight community types in group (2), Abies lasiocarpa/Clematis columbiana, Pseudotsuga menziesii-Cercocarpus ledifolius, Juniperus osteosperma/Agropyron spicatum, Juniperus osteosperma/Cercocarpus ledifolius, Pinus flexilis-Juniperus osteosperma, Artemisia pedatifida/Agropyron spicatum, Agropyron spicatum/Cushion plant, and Carex rupestris/Potentilla ovina are more common in the study area. Good-condition extensive examples of these communities should be managed to maintain their condition, and examples should be protected when possible during designation of special management areas designed to protect more critical elements of diversity.

Mapping of plant communities should be completed in order to take community diversity into account. Using GIS, maps locating rare plant communities could be overlaid on the existing rare plant maps (Lesica and Achuff 1992) to better delineate the boundaries of special management areas. This integrated approach will provide an information base that allows managers to protect biological diversity on multiple-use lands.

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APPENDIX A. Vascular Plant Species List

The importance values (IV) presented equal the species percentage presence (number of plots of occurrence as percentage of all plots) time the species cover index (% cover of species summed over all plots of occurrence).

#OCCUR = number of plots of occurrence

Summary statistics:

Total number of species = 365
 Total number of plots = 197
 Total number of species occurrences = 3565

SPECIES	CODE	#OCCUR	IV
TREES			
ABIES LASIOCARPA	ABILAS	6.	582.
JUNIPERUS OSTEOSPERMA	JUNOST	62.	32385.
JUNIPERUS SCOPULORUM	JUNSCO	22.	1742.
PICEA ENGELMANNII	PICENG	6.	701.
PINUS CONTORTA	PINCON	2.	20.
PINUS FLEXILIS	PINFLE	31.	5665.
PINUS PONDEROSA	PINPON	4.	71.
PSEUDOTSUGA MENZIESII	PSEMEN	17.	6118.
SHRUBS			
ACER GLABRUM	ACEGLA	1.	2.
ARTEMISIA CANA	ARTCAN	2.	2.
ARTEMISIA FRIGIDA	ARTFRI	31.	834.
ARTEMISIA LONGIFOLIA	ARTLON	3.	8.
ARTEMISIA NOVA	ARTNOV	43.	10979.
ARTEMISIA PEDATIFIDA	ARTPED	23.	4308.
ARTEMISIA SPINESCENS	ARTSPI	12.	573.
ARTEMISIA TRIDENTATA	ARTTRI	95.	78315.
ATRIPLEX CANESCENS	ATRCAN	5.	23.
ATRIPLEX CONFERTIFOLIA	ATRCON	30.	1112.
ATRIPLEX NUTTALLII	ATRNU	28.	4889.
BERBERIS REPENS	BERREP	4.	12.
CERATOIDES LANATA	CERLAN	57.	3414.
CERCOCARPUS LEDIFOLIUS	CERLED	10.	909.
CHRYSOTHAMNUS NAUSEOSUS	CHRNAU	30.	822.
CHRYSOTHAMNUS VISCIDIFLORUS	CHRVIS	8.	134.
CLEMATIS COLUMBIANA	CLECOL	4.	35.
GRAYIA SPINOSA	GRASPI	5.	71.
GUTIERREZIA SAROTHRAE	GUTSAR	99.	6784.

SPECIES	CODE	#OCCUR	IV
JUNIPERUS COMMUNIS	JUNCOM	7.	302.
KELSEYA UNIFLORA	KELUNI	1.	1.
PETROPHYTUM CAESPITOSUM	PETCAE	10.	137.
POTENTILLA FRUTICOSA	POTFRU	1.	10.
PHYSOCARPUS MONOGYNUS	PHYMON	4.	8.
RHUS TRILOBATA	RHUTRI	16.	146.
RIBES CEREUM	RIBCER	13.	112.
RIBES MONTIGENUM	RIBMON	5.	58.
ROSA WOODSII	ROSWOO	1.	1.
RUBUS IDAEUS	RUBIDA	1.	1.
SALIX GLAUCA	SALGLA	1.	1.
SARCOBATUS VERMICULATUS	SARVER	12.	737.
SHEPHERDIA CANADENSIS	SHECAN	2.	2.
SPIRAEA BETULIFOLIA	SPIBET	1.	10.
SUAEDA NIGRA	SUANIG	5.	18.
SYMPHORICARPOS ALBUS	SYMALB	1.	2.
SYMPHORICARPOS OREOPHILUS	SYMORE	13.	224.
TETRADYMIA CANESCENS	TETCAN	1.	1.
VACCINIUM SCOPARIUM	VACSCO	1.	20.
YUCCA GLAUCA	YUCGLA	14.	163.

GRAMINOIDS

AGROPYRON CANINUM	AGRCAN	4.	128.
AGROPYRON CRISTATUM	AGRCRI	2.	2.
AGROPYRON DASYSTACHYUM	AGRDAS	6.	457.
AGROPYRON SMITHII	AGRSMI	6.	408.
AGROPYRON SPICATUM	AGRSPI	120.	87533.
ARISTIDA PURPUREA	ARIPUR	30.	1188.
BOUPELLOUA GRACILIS	BOUGRA	32.	6741.
BROMUS INERMIS	BROINE	1.	1.
BROMUS JAPONICUS	BROJAP	1.	1.
BROMUS TECTORUM	BROTEC	18.	1215.
CALAMAGROSTIS PURPURASCENS	CALPUR	1.	5.
CALAMAGROSTIS RUBESCENS	CALRUB	4.	8.
CAREX FILIFOLIA	CARFIL	29.	3592.
CAREX PENNSYLVANICA	CARPEN	2.	2.
CAREX PETASATA	CARPET	1.	1.
CAREX ROSSII	CARROS	17.	276.
CAREX RUPESTRIS	CARRUP	4.	89.
CAREX VALLICOLA	CARVAL	1.	1.
DANTHONIA UNISPICATA	DANUNI	1.	1.
ELYMUS CINEREUS	ELYCIN	1.	1.
FESTUCA IDAHOENSIS	FESIDA	9.	923.
HORDEUM JUBATUM	HORJUB	7.	25.
KOELERIA PYRAMIDATA	KOEPYR	38.	6115.
LEUCOPOA KINGII	LEUKIN	10.	244.

SPECIES	CODE	#OCCUR	IV
MUNROA SQUARROSA	MUNSQU	1.	1.
ORYZOPSIS HYMENOIDES	ORYHYM	48.	1413.
POA SPP.	POA	1.	5.
POA ALPINA	POAALP	1.	1.
POA CUSICKII	POACUS	6.	30.
POA INTERIOR	POAINT	5.	36.
POA JUNCIFOLIA	POAJUN	2.	21.
POA NERVOSA	POANER	4.	26.
POA SANDBERGII	POASAN	76.	14930.
POA SCABRELLA	POASCA	1.	1.
SITANION HYSTRIX	SITHYS	22.	313.
SPOROBOLUS AIROIDES	SPOAIR	3.	94.
SPOROBOLUS CRYPTANDRUS	SPOCRY	7.	107.
STIPA COMATA	STICOM	58.	9127.
STIPA OCCIDENTALIS	STIOCC	4.	8.
TRisetum SPICATUM	TRISPI	1.	1.
FORBS			
ABRONIA FRAGRANS	ABRFRA	2.	2.
ACHILLEA MILLEFOLIUM	ACHMIL	14.	405.
AGOSERIS GLAUCA	AGOGLA	6.	79.
ALLIUM BREVIStYLUM	ALLBRE	2.	11.
ALLIUM CERNUUM	ALLCER	11.	61.
ALLIUM TEXTILE	ALLTEX	61.	1889.
ALYSSUM ALYSSOIDES	ALYALY	1.	1.
ALYSSUM DESERTORUM	ALYDES	2.	4.
ANEMONE MULTIFIDA	ANEMUL	4.	12.
ANEMONE PATENS	ANEPAT	4.	47.
ANTENNARIA MICROPHYLLA	ANTMIC	18.	457.
ANTENNARIA RACEMOSA	ANTRAC	2.	2.
ANTENNARIA UMBRINELLA	ANTUMB	3.	5.
ARABIS DRUMMONDII	ARADRU	3.	5.
ARABIS HOLBOELLII	ARAHOL	5.	13.
ARABIS NUTTALLII	ARANUT	6.	18.
ARABIS SPARSIFLORA	ARASPA	2.	2.
ARENARIA CONGESTA	ARECON	9.	164.
ARENARIA HOOKERI	AREHOO	83.	9775.
ARENARIA NUTTALLII	ARENUT	1.	10.
ARENARIA OBTUSILOBA	AREOBT	3.	18.
ARNICA CORDIFOLIA	ARNCOR	10.	690.
ARNICA FULGENS	ARNFUL	1.	1.
ARNICA RYDBERGII	ARNRYD	1.	1.
ARNICA SORORIA	ARNSOR	1.	1.
ARTEMISIA BIENNIS	ARTBIE	1.	1.
ARTEMISIA CAMPESTRIS	ARTCAM	2.	2.
ARTEMISIA DRACUNCULUS	ARTDRA	1.	1.

SPECIES	CODE	#OCCUR	IV
ARTEMISIA MICHAUXIANA	ARTMIC	1.	1.
ASTER SPP.	ASTER	1.	2.
ASTER ALPIGENUS	ASTALP	1.	1.
ASTER CONSPICUUS	ASTCON	8.	219.
ASTER FOLIACEUS	ASTFOL	1.	2.
ASTER OCCIDENTALIS	ASTOCC	1.	10.
ASTRAGALUS ADSURGENS	ASTADS	19.	222.
ASTRAGALUS AGRESTIS	ASTAGR	2.	2.
ASTRAGALUS BISULCATUS	ASTBIS	1.	1.
ASTRAGALUS CHAMAELEUCE	ASTCHA	12.	73.
ASTRAGALUS CIBARIUS	ASTCIB	1.	1.
ASTRAGALUS DRUMMONDII	ASTDRU	3.	8.
ASTRAGALUS GEYERI	ASTGEY	3.	5.
ASTRAGALUS GILVIFLORUS	ASTGIL	2.	2.
ASTRAGALUS GRACILIS	ASTGRA	8.	49.
ASTRAGALUS HYALINUS	ASTHYA	17.	147.
ASTRAGALUS LOTIFLORUS	ASTLOT	3.	5.
ASTRAGALUS MISER	ASTMSR	12.	548.
ASTRAGALUS MISSOURIENSIS	ASTMIS	4.	8.
ASTRAGALUS OREGANUS	ASTORE	1.	1.
ASTRAGALUS PURSHII	ASTPUR	8.	41.
ASTRAGALUS SPATULATUS	ASTSPA	26.	515.
ASTRAGALUS VEXILIFLEXUS	ASTVEX	2.	2.
ATRIPLEX DIOICA	ATRDIO	2.	42.
BALSAMORHIZA INCANA	BALINC	1.	1.
BALSAMORHIZA SAGITTATA	BALSAG	3.	18.
BESSEYA WYOMINGENSIS	BESWYO	6.	24.
BUPLEURUM AMERICANUM	BUPAME	5.	18.
CALOCHORTUS GUNNISONII	CALGUN	1.	1.
CALOCHORTUS NUTTALLII	CALNUT	8.	32.
CAMELINA MICROCARPA	CAMMIC	3.	5.
CAMISSONIA ANDINA	CAMAND	2.	2.
CAMISSONIA MINOR	CAMMIN	6.	18.
CAMISSONIA PARVULA	CAMPAR	1.	1.
CAMISSONIA SCAPOIDEA	CAMSCA	20.	203.
CAMPANULA ROTUNDIFOLIA	CAMROT	7.	25.
CASTILLEJA SPP.	CAS	1.	1.
CASTILLEJA ANGUSTIFOLIA	CASANG	21.	224.
CASTILLEJA LINARIIFOLIA	CASLIN	4.	8.
CASTILLEJA PULCHELLA	CASPUL	3.	5.
CASTILLEJA SESSILIFLORA	CASSES	1.	1.
CERASTIUM ARVENSE	CERARV	9.	224.
CHAENACTIS DOUGLASII	CHADOU	13.	86.
CHENOPODIUM SPP.	CHE	1.	1.
CHENOPODIUM ALBUM	CHEALB	10.	51.
CHENOPODIUM DESICCATUM	CHEDES	1.	1.
CHENOPODIUM FREMONTII	CHEFRE	8.	57.

SPECIES	CODE	#OCCUR	IV
CHRYSOPSIS VILLOSA	CHRVIL	7.	25.
CIRSIIUM HOOKERIANUM	CIRHOO	1.	1.
CIRSIIUM UNDULATUM	CIRUND	1.	1.
CLAYTONIA LANCEOLATA	CLALAN	2.	2.
COLLINSIA PARVIFLORA	COLPAR	5.	36.
COMANDRA UMBELLATA	COMUMB	22.	290.
CORALLORHIZA STRIATA	CORSTR	1.	1.
CREPIS SPP.	CRE	4.	8.
CREPIS ACUMINATA	CREACU	8.	32.
CREPIS INTERMEDIA	CREINT	1.	1.
CRYPTANTHA CANA	CRYCAN	14.	270.
CRYPTANTHA CELOSIODES	CRYCEL	23.	292.
CRYPTANTHA FLAVOCULATA	CRYFLA	22.	503.
CRYPTANTHA KELSEYANA	CRYKEL	3.	8.
CRYPTANTHA SCOPYARIA	CRYSKO	2.	2.
CRYPTANTHA SPICULIFERA	CRYSPI	14.	99.
CRYPTANTHA TORREYANA	CRYTOR	8.	41.
CYMOPTERUS ACAULIS	CYMACA	15.	114.
CYMOPTERUS TEREBINTHINUS	CYMTER	7.	25.
DALEA CANDIDA	DALCAN	1.	1.
DELPHINIUM ANDERSONII	DELAND	1.	1.
DELPHINIUM BICOLOR	DELBIC	5.	13.
DESCURAINIA SPP.	DES	17.	380.
DESCURAINIA PINNATA	DESPIN	13.	86.
DESCURAINIA RICHARDSONII	DESRIC	1.	1.
DISPORUM TRACHYCARPUM	DISTRA	2.	2.
DODECATHEON CONJUGENS	DODCON	4.	8.
DRABA NEMOROSA	DRANEM	2.	2.
DRABA OLIGOSPERMA	DRAOLI	7.	25.
EPILOBIUM ANGUSTIFOLIUM	EPIANG	6.	30.
ERIGERON ACRIS	ERIACR	1.	1.
ERIGERON ALLOCOTUS	ERIALL	7.	25.
ERIGERON CAESPITOSUS	ERICAER	22.	290.
ERIGERON COMPOSITUS	ERICOM	1.	1.
ERIGERON DIVERGENS	ERIDIV	2.	2.
ERIGERON OCHROLEUCUS	ERIOCH	27.	521.
ERIGERON SUBTRINERVIS	ERISUB	1.	1.
ERIOGONUM ANNUM	ERIANN	1.	1.
ERIOGONUM BREVICAULE?	ERIBRE	28.	1109.
ERIOGONUM CERNUUM	ERICER	1.	1.
ERIOGONUM FLAVUM	ERIFLA	10.	51.
ERIOGONUM MANCUM	ERIMAN	10.	223.
ERIOGONUM OVALIFOLIUM	ERIOVA	16.	130.
ERIOGONUM PAUCIFLORUM	ERIPAU	9.	50.
ERIOGONUM UMBELLATUM	ERIUMB	1.	2.
ERITRICHIIUM HOWARDII	ERIHOW	2.	2.
ERYSIMUM ASPERUM	ERYASP	2.	2.

SPECIES	CODE	#OCCUR	IV
EUPHORBIA GLYPTOSPERMA	EUPGLY	6.	24.
EUPHORBIA ROBUSTA	EUPROB	4.	8.
FRAGARIA VESCA	FRAVES	3.	5.
FRAGARIA VIRGINIANA	FRAVIR	4.	12.
FRASERA SPECIOSA	FRASPE	3.	5.
GAILLARDIA ARISTATA	GAIARI	1.	5.
GALIUM BOREALE	GALBOR	8.	231.
GAURA COCCINEA	GAUCOC	16.	130.
GEUM TRIFLORUM	GEUTRI	6.	18.
GILIA LEPTOMERIA	GILLEP	6.	18.
GILIA TWEEDYI	GILTWE	10.	51.
GOODYERA OBLONGIFOLIA	GOOUBL	2.	2.
GRINDELIA SQUARROSA	GRISQU	1.	1.
HALOGETON GLOMERATUS	HALGLO	10.	503.
HAPLOPAPPUS ACAULIS	HAPACA	13.	330.
HAPLOPAPPUS ARMERIOIDES	HAPARM	14.	306.
HEDEOMA DRUMMONDII	HEDDRU	4.	8.
HEDEOMA HISPIDUM	HEDHIS	1.	1.
HEDYSARUM BOREALE	HEDBOR	12.	140.
HEDYSARUM SULPHURESCENS	HEDSUL	4.	8.
HELIANTHUS ANNUUS	HELANN	1.	1.
HEUCHERA GROSSULARIIFOLIA	HEUGRO	1.	1.
HEUCHERA PARVIFOLIA	HEUPAR	7.	25.
HYMENOPAPPUS FILIFOLIUS	HYMFIL	23.	269.
HYMENOXYIS ACAULIS	HYMACA	51.	2951.
HYMENOXYIS TORREYANA	HYMTOR	11.	73.
IPOMOPSIS CONGESTA	IPOCON	1.	1.
IPOMOPSIS PUMILA	IPOPUM	18.	201.
IPOMOPSIS SPICATA	IPOSPI	24.	292.
IVA AXILLARIS	IVAAXI	1.	1.
KOCHIA SCOPARIA	KOCSCO	1.	1.
LACTUCA SERRIOLA	LACSER	2.	2.
LAPPULA ECHINATA	LAPECH	10.	127.
LAPPULA REDOWSKII	LAPRED	17.	164.
LEPIDIDIUM SPP.	LEP	1.	1.
LEPIDIDIUM DENSIFLORUM	LEPDEN	4.	8.
LEPIDIDIUM PERFOLIATUM	LEPPER	2.	54.
LEPTODACTYLON CAESPITOSUM	LEPCAE	1.	2.
LEPTODACTYLON PUNGENS	LEPPUN	1.	2.
LESQUERELLA ALPINA	LESALP	26.	343.
LESQUERELLA LESICII	LESLES	1.	2.
LEWISIA REDIVIVA	LEWRER	2.	2.
LIATRIS PUNCTATA	LIAPUN	1.	1.
LINUM PERENNE	LINPER	15.	114.
LITHOPHRAGMA BULBIFERA	LITBUL	1.	1.
LITHOSPERMUM INCISUM	LITINC	10.	51.
LOMATIUM COUS	LOMCOU	5.	58.

SPECIES	CODE	#OCCUR	IV
LOMATIUM FOENICULACEUM	LOMFOE	8.	41.
LOMATIUM ORIENTALE	LOMORI	3.	5.
LUPINUS ARGENTEUS	LUPARG	3.	49.
LUPINUS PUSILLUS	LUPPUS	1.	1.
LUPINUS SERICEUS	LUPSER	3.	62.
LYGODESMIA JUNCEA	LYGJUN	1.	1.
MACHAERANTHERA CANESCENS	MACCAN	3.	8.
MACHAERANTHERA GRINDELIOIDES	MACGRI	44.	1117.
MACHAERANTHERA TANACETIFOLIA	MACTAN	5.	18.
MALACOTHRIX TORREYI	MALTOR	1.	1.
MELILOTUS OFFICINALIS	MELOFF	1.	1.
MENTZELIA ALBICAULIS	MENALB	7.	32.
MENTZELIA PUMILA	MENPUM	5.	13.
MERTENSIA OBLONGIFOLIA	MEROBL	6.	18.
MICROSERIS CUSPIDATA	MICCUS	1.	1.
MICROSTERIS GRACILIS	MICGRA	1.	2.
MIRABILIS LINEARIS	MIRLIN	4.	8.
MITELLA STAUROPETALA	MITSTA	2.	2.
MITELLA TRIFIDA	MITTRI	1.	1.
MONOLEPIS NUTTALLIANA	MONNUT	5.	266.
MUSINEON DIVARICATUM	MUSDIV	30.	579.
MUSINEON VAGINATUM	MUSVAG	7.	46.
MYOSOTIS ALPESTRIS	MYOALP	1.	1.
OENOTHERA ALBICAULIS	OENALB	4.	8.
OENOTHERA CAESPITOSA	OENCAE	10.	51.
OENOTHERA PALLIDA	OENPAL	1.	1.
OROBANCHE FASCICULATA	OROFAS	6.	18.
OSMORHIZA CHILENSIS	OSMCHI	3.	5.
OSMORHIZA DEPAUPERATA	OSMDEP	1.	1.
OXYTROPIS BESSEYI	OXYBES	11.	84.
OXYTROPIS CAMPESTRIS	OXYCAM	10.	365.
OXYTROPIS LAGOPUS	OXYLAG	1.	1.
OXYTROPIS LAMBERTII	OXYLAM	1.	1.
OXYTROPIS SERICEA	OXYSER	11.	61.
PARONYCHIA SESSILIFLORA	PARSES	22.	290.
PEDICULARIS CYSTOPTERIDIFOLIA	PEDCYS	3.	5.
PENSTEMOM ARIDUS	PENARI	1.	1.
PENSTEMOM ATTENUATUS	PENATT	1.	1.
PENSTEMON ERIANTHERUS	PENERI	30.	457.
PENSTEMON LARICIFOLIUS	PENLAR	19.	309.
PENSTEMON NITIDUS	PENNIT	12.	73.
PENSTEMOM PROCERUS	PENPRO	2.	2.
PHACELIA HASTATA	PHAHAS	3.	5.
PHACELIA IVESIANA	PHAIVE	16.	130.
PHACELIA LINEARIS	PHALIN	7.	25.
PHLOX CAESPITOSA	PHLCAE	1.	1.

SPECIES	CODE	#OCCUR	IV
PHLOX HOODII	PHLHOO	80.	14416.
PHLOX MULTIFLORA	PHLMUL	5.	58.
PHLOX MUSCOIDES	PHLMUS	19.	926.
PHYSARIA ACUTIFOLIA	PHYACU	18.	164.
PLANTAGO PATAGONICA	PLAPAT	4.	8.
PLATYSCHKURHIA INTEGRIFOLIA	PLAINT	38.	1080.
POLYGONUM AVICULARE	POLAVI	1.	1.
POLYGONUM BISTORTOIDES	POLBIS	3.	5.
POLYGONUM DOUGLASII	POLDOU	1.	1.
POTENTILLA SPP.	POT	3.	5.
POTENTILLA DIVERSIFOLIA	POTDIV	5.	23.
POTENTILLA GRACILIS	POTGRA	1.	1.
POTENTILLA HIPPIANA	POTHIP	1.	1.
POTENTILLA OVINA	POTOVI	1.	1.
PSORALEA TENUIFLORA	PSOTEN	3.	14.
PYROLA CHLORANTHA	PYRCHL	1.	1.
PYROLA SECUNDA	PYRSEC	3.	32.
SALSOLA IBERICA	SALIBE	3.	21.
SAXIFRAGA RHOMBOIDEA	SAXRHO	1.	1.
SCHOENOCRAMBE LINIFOLIA	SCHLIN	17.	147.
SEDUM LANCEOLATUM	SEDLAN	16.	130.
SENECIO CANUS	SENCAN	42.	938.
SENECIO CRASSULUS	SENCRA	2.	11.
SENECIO STREPTANTHIFOLIUS	SENSTR	6.	18.
SILENE ANTIRRHINA	SILANT	1.	1.
SILENE MENZIESII	SILMEN	2.	2.
SISYMBRIUM SPP.	SIS	1.	1.
SISYMBRIUM ALTISSIMUM	SISALT	3.	8.
SISYMBRIUM LOESELII	SISLOE	1.	1.
SMILACINA RACEMOSA	SMIRAC	1.	1.
SOLIDAGO MISSOURIENSIS	SOLMIS	1.	10.
SOLIDAGO MULTIRADIATA	SOLMUL	7.	210.
SOLIDAGO SPARSIFLORA	SOLSPA	2.	21.
SPHAERALCEA COCCINEA	SPHCOC	39.	1049.
SPHAEROMERIA CAPITATA	SPHCAP	7.	32.
STANLEYA PINNATA	STAPIN	8.	32.
STANLEYA TOMENTOSA	STATOM	22.	246.
STEPHANOMERIA RUNCINATA	STERUN	11.	61.
STREPTANTHELLA LONGIROSTRIS	STRLON	9.	41.
TARAXACUM OFFICINALE	TAROFF	11.	346.
THALICTRUM OCCIDENTALE	THAOCC	1.	1.
THLASPI ARVENSE	THLARV	2.	4.
TOWNSENDIA HOOKERI	TOWHOO	11.	61.
TOWNSENDIA INCANA	TOWINC	24.	317.
TOWNSENDIA PARRYI	TOWPAR	1.	2.
TOWNSENDIA SPATHULATA	TOWSPA	11.	61.
TRAGOPOGON DUBIUS	TRADUB	3.	5.

SPECIES	CODE	#OCCUR	IV
VALERIANA DIOICA	VALDIO	1.	1.
VALERIANA EDULIS	VALEDU	2.	2.
VICIA AMERICANA	VICAME	19.	704.
VIOLA ADUNCA	VIOADU	1.	1.
VIOLA CANADENSIS	VIOCAN	1.	5.
VIOLA NUTTALLII	VIONUT	4.	8.
VIOLA ORBICULATA	VIOORB	1.	1.
VIOLA PURPUREA	VIOPUR	1.	1.
WYETHIA SCABRA	WYESCA	12.	97.
XYLORHIZA GLABRIUSCULA	XYLGLA	11.	73.
ZIGADENUS ELEGANS	ZIGELE	1.	1.
ZIGADENUS VENENOSUS	ZIGVEN	15.	305.
FERNS/ALLIES & CACTI			
CYSTOPTERIS FRAGILIS	CYSFRA	2.	2.
SELAGINELLA DENSA	SELDEN	1.	2.
CORYPHANTHA SPP.	COR	1.	1.
OPUNTIA POLYACANTHA	OPUPOL	126.	20467.

APPENDIX B. Vascular Plant Constancy and Coverage

VEGETATION CHARACTERISTICS* SUMMARY TABLE
FOR PRYOR MOUNTAINS FOREST AND WOODLAND COMMUNITIES

TYPE NO	PHASE NO	COMMUNITY TYPE NAME
1	1	Abies lasiocarpa/Arnica cordifolia
2	1	Abies lasiocarpa/Clematis columbiana
3	1	Abies lasiocarpa/Ribes montigenum
4	1	Abies lasiocarpa/Vaccinium scoparium
5	1	Pinus flexilis/Festuca idahoensis
6	1	Pinus flexilis/Juniperus communis
7	1	Pseudotsuga menziesii/Agropyron spicatum
8	1	Pseudotsuga menziesii/Festuca idahoensis
9	1	Pseudotsuga menziesii/Cercocarpus ledifolius
10	1	Pseudotsuga menziesii/Symphoricarpos oreophilus
11	1	Juniperus osteosperma/Agro. spic., Arte. nova
11	2	Juniperus osteosperma/Agro. spic., Guti. saro.
12	1	Juniperus osteosperma/Artemisia tridentata
13	1	Juniperus osteosperma/Cercocarpus ledifolius
14	1	Juniperus scopulorum/Artemisia nova
15	1	Pinus flexilis-Juniperus osteosperma
16	1	Pinus flexilis-Juni. scop., Arte. nova
16	2	Pinus flexilis-Juni. scop., Arte. trid.

* average cover (COV) and constancy (CON). Those species with importance values less than 10 (APPENDIX A) are excluded.

COMMUNITY TYPE/PHASE NO:	1- 1		2- 1		3- 1		4- 1		5- 1		6- 1		7- 1		8- 1		9- 1		10- 1		
	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	
TREES																					
ABIES LASIOCARPA	30	100	20	100	55	100	30	100													
JUNIPERUS OSTEOSPERMA																					
JUNIPERUS SCOPULORUM										5	75	10	100	10	100	1	100	1	100	9	100
PICLA ENGLMANNII	20	100	30	100	55	100	50	100													
PINUS CONTORTA	10	100					10	100	50	100	28	100	3	100	3	100			3	33	
PINUS FLEXILIS																					
PINUS PONDEROSA									10	100	58	100	60	100	60	100	1	100	80	100	
PSEUDOTSUGA MENZIESII	3	100	60	100																	
SHRUBS																					
ARTEMISIA FRIGIDA																					
ARTEMISIA NOVA																					
ARTEMISIA PEDATIFIDA																					
ARTEMISIA SPINESCENS																					
ARTEMISIA TRIDENTATA									1	100			1	100	10	100					
AIRIPEX CANESCENS																					
ATRIPEX CONFERTIFOLIA																					
ATRIPEX NUTTALLII																					
BERBERIS REPENS			1	100							2	75									
CERATOIDES LANATA																				40	100
CERCOCARPUS LEDIFOLIUS																					
CHRYSOTHAMNUS NAUSEOSUS																					
CHRYSOTHAMNUS VISCIDIFLORUS																					
CLEMATIS COLUMBIANA			3	100	10	50					1	25									
GRAYIA SPINOSA																					
GUTIERREZIA SAROTHRAE																					
JUNIPERUS COMMUNIS									3	100	20	100									
PLTRIPIHYTUM CAESPITOSUM																					
POTENTILLA FRUTICOSA																					
RIBUS TRILOBATA																					
RIBES CEREUM																					
RIBES MONTIGENUM			1	100	10	100	1	100													
SARCOCATUS VERMICULATUS																					
SPIRAEA BETULIFOLIA			20	100																	
SUAEDA NIGRA																					
SYMPHORICARPOS OREOPHILUS																					
VACCINIUM SCOPARIUM									1	100	1	100	1	100	20	100				2	100
YUCCA GLAUCA							40	100													

COMMUNITY TYPE/PHASE NO: 1-1 2-1 3-1 4-1 5-1 6-1 7-1 8-1 9-1 10-1
COV CON COV CON COV CON COV CON COV CON COV CON COV CON COV CON

GRASSLANDS

AGROPYRON CARINUM																				
AGROPYRON DASYSTACHYUM																				
AGROPYRON SMITHII																				
AGROPYRON SPICATUM																				
ARISTIDA PURPUREA																				
BABINGTONIA GRACILIS																				
BRUCHUS PECTORUM																				
CAREX FULFOLIA																				
CAREX RUPESTRIS																				
CAREX RUPESTRIS	10	100		1	100		1	100		3	100		1	100		3	100		1	67
ELSHUCA IDAHOENSIS	10	100			30	100														
HOEDEUM JURATUM																				
KOeleria PYRAMIDATA																				
LEUCOPOGON KINGII																				
ORYZOPSIS HYMENOIDES																				
POA CUSICKII																				
POA INTERIOR	1	100																		
POA JUNCIFOLIA																				
POA MLRVOVA																				
POA SANDBERGII																				
SITANION HYSTRIX																				
SPOROBOLUS AIROIDES																				
SPOROBOLUS CRYPTANDRUS																				
STIPA COMATA																				

TURBS

ACHILLEA MILLEFOLIUM	3	100		1	100		1	100		20	100		1	25		1	100		3	100
AGOSERIS GLAUCA	3	100								10	100		1	25						
ALLIUM BREVI-STYLUM										1	100									
ALLIUM CERNUUM										1	100		1	50		1	100		1	100
ALLIUM TEXTILE										1	100		1	100		1	100		1	100
ANEMONE MULTIFIDA																				
ANEMONE PATENS	1	100								1	100		1	25						
ARTENNARIA MICROPHYLLA	3	100								1	100		1	25						
ARABIS HOLBOELLII																				
ARABIS NUTTALLII	1	100																		
ARENARIA CONGESTA	1	100																		
ARENARIA HOOKERI	1	100																		
ARENARIA OBSTUSIFLOSA																				
ARENARIA CORDIFOLIA	40	100		3	100		20	100		20	100		1	100		8	100			

COMMUNITY TYPE/PHASE NO: 1-1 2-1 3-1 4-1 5-1 6-1 7-1 8-1 9-1 10-1
 COV CON COV CON COV CON COV CON COV CON COV CON COV CON COV CON

ASTER CONSPICUUS	1	100	1	100	10	100	10	100													
ASTRAGALUS ADSURGENS																					
ASTRAGALUS CHAMAELEUCE																					
ASTRAGALUS GRACILIS																					
ASTRAGALUS HYALINUS																					
ASTRAGALUS MISER	3	100			10	100	1	50													
ASTRAGALUS PURSHII							1	100													
ASTRAGALUS SPATULATUS																				1	100
ATRIPLEX DIOICA																					
BALSAMORHIZA SAGITTATA																					
BESSEYA WYOMINGENSIS																					
BUPLEURUM AMERICANUM					1	100															
CALOCHORTUS NUTTALLII																					
CAMELINA MICROCARPA																					
CAMISSONIA SCAPOIDEA																					
CAMPANULA ROTUNDIFOLIA																					
CASTILLEJA ANGUSTIFOLIA																					
CERASTIUM ARVENSE									1	50											
CHAENACTIS DOUGLASSII																					
CHENOPODIUM ALBUM																					
CHENOPODIUM FREMONTII																					
CHRYSOPSIS VILLOSA																					
COLLINSIA PARVIFLORA									1	25	1	100									
COMANDRA UMBELLATA																					
CREPIS ACUMINATA									1	25	1	100	1	100							
CRYPTANTHA CANA																					
CRYPTANTHA CELOSIOIDES																					
CRYPTANTHA FLAVOCULATA																					
CRYPTANTHA SPICULIFERA																					
CRYPTANTHA TORREYANA																					
CYOPTERUS ACAULIS																					
CYOPTERUS TEREBINTHINUS																					
DELPHINIUM BICOLOR	1	100																			
OLIGURAINIA SPP.																					
OLIGURAINIA PINNATA																					
ORABA OLIGOSPERMA																					
EPILLOBIUM ANGUSTIFOLIUM	3	100																			
ERIGERON ALLOCOTUS																					
ERIGERON CAESPITOSUS																					
ERIGERON OCHROLEUGUS																					
ERIOGONUM BREVICHAULE?																					
ERIOGONUM FLAVUM																					
ERIOGONUM MANCUM																					

COMMUNITY TYPE/PHASE NO:	1- 1	2- 1	3- 1	4- 1	5- 1	6- 1	7- 1	8- 1	9- 1	10- 1
	COV CON	COV CON	COV CON	COV CON	COV CON	COV CON	COV CON	COV CON	COV CON	COV CON
ERIOGONUM OVALIFOLIUM									1	100
ERIOGONUM PAUCIFLORUM										
EUPHORBIA GLYPTOSPERMA										
FRAGARIA VIRGINIANA	3	100	1	50	1	25				
GALLUM BOREALE		1	100	10	50	2	75			
GAJRA COCCINEA										
GELUM TRIFLORUM	1	100	1	50				1	100	1
GILIA LEPTOMERIA										
GILIA TREEDY										
HALOGETON GLOMERATUS										
HAPLOPAPPUS ACAULIS										
HAPLOPAPPUS ARMERIOIDES										
HEDYSAURUM BOREALE	3	100						1	100	1
HEUCHERA PARVIFOLIA										
HYCLOPAPPUS FILIFOLIUS										
HYPERICUS ACAULIS										
HYPERICUS TORREYANA									10	100
IPOMOPSIS PUMILA								1	100	3
IPOMOPSIS SPICATA										
LAPPULA LCHINATA							1	100		
LAPPULA REDGWSKI										
LEPIDOTUM PERFOLIATUM										
LESQUELLELLA ALPINA										
LITHUM PERENNE									1	100
LITHOSPERRUM INCISUM										
LOPATIUM COUS					1	100				
LOPATIUM FOENICULACEUM										
LUPINUS ARGENTEUS						1	25			
LUPINUS SERICEUS										
MACRALANTHERA GRINDELIOIDES	30	100								
MACRALANTHERA TANACETIFOLIA				1	100					
MENTZELIA ALTRICHAULIS										
MENTZELIA PUMILA										
MERTENSIA OBLONGIFOLIA										
MOROLEPIS NOTTALLIANA										
MUSINEON DIVARICATUM										
MUSINEON VAGINATUM										
OLNOTHERA CAESPITOSA										
ORUBANCHE FASCICULATA										
OXYTROPIS BESSEYI										
OXYTROPIS CAMPESTRIS										
OXYTROPIS SERICEA										
PARONYCHIA SESSILIFLORA										

COMMUNITY TYPE/PHASE NO: 1-1 COV CON 2-1 COV CON 3-1 COV CON 4-1 COV CON 5-1 COV CON 6-1 COV CON 7-1 COV CON 8-1 COV CON 9-1 COV CON 10-1 COV CON

PENSTEMON ERIANTHERUS																				
PENSTEMON LARICIFOLIUS																				
PENSTEMON NITIDUS																				
PHACELIA IVESIANA																				
PHACELIA LINEARIS																				
PHILOX HOODII																				
PHILOX MULTIFLORA										10	100									
PHILOX MUSCOIDES																				
PHYSARIA ACUTIFOLIA																				
PLATYSCHKURHIA INTEGRIFOLIA																				
POTENTILLA DIVERSIFOLIA	3	100		1	100	1	100	1	100	3	100									
PSORALEA TENUIFLORA																				
PYROLA SECUNDA			1	100	10	100														
SALSOLA IBERICA																				
SCHOENOCRAMBE LINIFOLIA																				
SEDUM LANCEOLATUM	1	100		1	50															
SENECIO CANUS																				
SENECIO CRASSULUS																				
SENECIO STREPTANTHIFOLIUS			1	100	1	50														
SENECIO STREPTANTHIFOLIUS																				
SOLIDAGO MISSOURIENSIS																				
SOLIDAGO MULTIRADIATA	40	100																		
SOLIDAGO SPARSIFLORA																				
SOLIDAGO SPARSIFLORA				3	100	10	100	1	25	3	100									
SPHAERALCEA COCCINEA																				
SPHAEROMERIA CAPITATA																				
STANLEYA PINNATA																				
STANLEYA TOMENTOSA																				
STEPHANOMERIA RUNCINATA																				
STREPTANTHELLA LONGIROSTRIS																				
TARAXACUM OFFICINALE																				
TOWNSENDIA HOOKERI																				
TOWNSENDIA INCANA																				
TOWNSENDIA SPATHULATA																				
VICIA AMERICANA																				
WYETHIA SCABRA																				
XYLORHIZA GLABRIUSCULA																				
ZIGADENUS VENENOSUS																				

FERNS/ALLIES & CACTI

OPUNTIA POLYACANTHA

COMMUNITY TYPE/PHASE NO: 11- 1 (n= 16) COV CON 11- 2 (n= 10) COV CON 12- 1 (n= 6) COV CON 13- 1 (n= 8) COV CON 14- 1 (n= 1) COV CON 15- 1 (n= 10) COV CON 16- 1 (n= 3) COV CON 16- 2 (n= 5) COV CON

TREES

ABIES LASTIOCARPA																			
JUNIPERUS OSTEOSPERMA	26	100	23	100	9	100	11	100	14	100	1	10	5	100	11	100			
JUNIPERUS SCOPULORUM																			
PICEA ENGELMANNII																			
PINUS CONTORTA																			
PINUS FLEXILIS	1	6			3	13			8	100	8	100	8	100	16	100			
PINUS PONDEROSA									1	20	1	20			3	20			
PSALIDOPSISUGA MENZIESII									1	100			1	33					
SIBIRIUS																			
ARTEMISIA FRIGIDA	1	31			1	33			1	10	1	33			2	80			
ARTEMISIA NOVA	9	100			3	17			10	100	2	50	27	100	25	40			
ARTEMISIA PEDATIFIDA																			
ARTEMISIA SPINESCENS																			
ARTEMISIA TRIDENTATA	2	13	2	20	12	100	3	13	2	40					16	100			
ATRIPLEX CANESCENS	3	6	1	10															
ATRIPLEX CONFERTIFOLIA			1	30															
ATRIPLEX NUTTALLII			1	10															
BERBERIS REPENS																			
CERATOIDES LANATA	2	38	1	20	3	38													
CERCOCARPUS LEDIFOLIUS					14	100													
CHRYSOTHAMNUS NAUSEOSUS	1	6			1	17			3	10	1	33							
CHRYSOTHAMNUS VISCIDIFLORUS																			
CLEMATIS COLUMBIANA																			
GRAYIA SPINOSA																			
GUTTIEREZIA SAROTHRAE	1	81	2	70	1	67	2	88	1	100	1	90	2	67	2	60			
JUNIPERUS COMMUNIS																			
PT TROPHYUM CAESPITOSUM	2	13			1	13	3	100	3	50									
POTENTILLA FRUTICOSA																			
RIBUS TRILOBATA	1	6			1	17	1	13	1	50	1	67	2	60					
RIBES CERULUM																			
RIBES MONTIGENUM																			
SARCOMATUS VERNICULATUS																			
SPIRALA BELUI FOLIA																			
SUALDA RIGRA																			
SYMPHORICARPUS OREOPHILUS																			
VALCERIUM SCOPARIUM	1	6	1	10	1	25			1	30									
YULCA GLAUCA																			

COMMUNITY TYPE/PHASE NO: 11- 1 11- 2 12- 1 13- 1 14- 1 15- 1 16- 1 16- 2
 COV CON COV CON COV CON COV CON COV CON COV CON COV CON

GRAMINOIDS

AGROPYRON CANINUM																	
AGROPYRON DASYSTACHYUM																	
AGROPYRON SMITHII																	
AGROPYRON SPICATUM	11	88	11	80	1	50	4	88	3	100	1	70	28	100	4	100	
ARISTIDA PURPUREA	2	25	2	30	6	67	1	38			2	40			3	20	
BOUTELOUA GRACILIS			1	10	3	17									12	40	
BROMUS TECTORUM	1	6			1	17					2	20	1	33	2	60	
CAREX FILIFOLIA	11	31	1	20			3	25			1	20	11	100	15	100	
CAREX ROSSII	1	6					1	13			1	20	1	33			
CAREX RUPESTRIS																	
LESTUCA IDAHOENSIS													20	33			
HORDEUM JUBATUM																	
KOELLERIA PYRAMIDATA	5	19	3	10			3	100					12	67	2	80	
LEUCOPOA KINGII													3	33			
ORYZOPSIS HYMENOIDES	1	25	1	30			1	38			1	30					
POA CUSICKII																	
POA INTERIOR																	
POA JUNCIFOLIA																	
POA NERVOSA																	
POA SANDBERGII	2	56	1	20	2	50	1	13	10	100	1	20	3	33	3	100	
SITARION HYSTRIX	1	6			3	17											
SPODOCHLOUS AIROIDES																	
SPODOBOLUS CRYPTANDRUS																	
STIPA COMATA	1	50	2	20			1	25			1	25	1	33	6	40	
FORDS																	
ACHILLEA MILLEFOLIUM																	
AGOSERIS GLAUCA														1	33		
ALLIUM BREVI-STYLUM																	
ALLIUM CERNUUM										1	100		1	33			
ALLIUM TEXTILE										1	100		1	33	1	40	
ANEMONE MULTIFIDA																	
ANEMONE PATENS																	
ANTENNARIA MICROPHYLLA																	
ARABIS HOLBOELLII	1	6	1	10						1	100		1	33	1	40	
ARABIS NUTTALLII																	
ARENARIA CONGESTA																	
ARENARIA HOOKERI																	
ARENARIA OBTUSILOBA	3	69	1	70	1	17	2	63			2	30	1	33	2	40	
ARNICA CORDIFOLIA																	

COMMUNITY TYPE/PHASE NO: 11- 1 11- 2 12- 1 13- 1 14- 1 15- 1 16- 1 16- 2
 COV CON COV CON COV CON COV CON COV CON COV CON COV CON

ASTER CONSPICUUS																	
ASTRAGALUS ADSURGENS		1	30	1	17					1	10						
ASTRAGALUS CHAMAELEUCE				1	17												
ASTRAGALUS GRACILIS	3	6															
ASTRAGALUS HYALINUS	1	13	1	20	1	17								1	33		
ASTRAGALUS MISLR														1	33		
ASTRAGALUS PURSHII	1	6	2	20													
ASTRAGALUS SPATULATUS			1	10						1	10	1	33				
ATRIplex DIOICA																	
BALSAMORHIZA SAGITTATA																	
BESSEYA WYOMINGENSIS														1	33		
BUPLURUM AMERICANUM																	
CALOCHORTUS NUTTALLII																	
CAMELINA MICROCARPA	1	6								1	13	1	100			1	20
CAMELINA SCAPOIDEA	1	6	1	10	1	33											
CAMPANULA ROTUNDIFOLIA																	
CASTILLEJA ANGUSTIFOLIA	1	19								1	100					1	20
CERASTIUM ARVENSE																	
CHAENACTIS DOUGLASSII	1	13	1	20						1	20						
CHEMPODIUM ALBUM	1	19	1	10	1	17				1	20						
CHEMPODIUM FREMONTII	1	13	3	10													
CHRYSOPSIS VILLOSA																	
COLLINSIA PARVIFLOKA										1	10	1	67	1	60		
COMANDRA UMBELLATA	1	19								1	10	1	67	1	20		
CREPIS ACUMINATA														1	33	1	20
CRYPTANTHA CANA																	
CRYPTANTHA CELOSIOIDES	1	13	1	10	1	17	1	13		1	30					1	20
CRYPTANTHA FLAVOCULATA	3	31	1	40						2	40						
CRYPTANTHA SPICULIFERA	1	19	1	10													
CRYPTANTHA TORREYANA	1	6	1	10	1	17				1	20						
CYOPTERUS ACAULIS										1	13						
CYOPTERUS TEREBINTHINUS										1	25						
DELPHINIUM BICOLOR																	
DESCURAINIA SPP.	1	19	1	20	1	33				1	100						
DESCURAINIA PINNATA	1	19								2	30						
DRABA OLIGOSPERMA	1	6								1	100	1	20				
EPILOBIUM ANGUSTIFOLIUM																	
ERIGERON ALLOCOTUS	1	6															
ERIGERON CAESPITOSUS	1	25								1	13	1	100	1	20	2	67
ERIGERON OCHROLEUCUS	1	25	1	10						1	100	1	100	1	33	1	40
ERIOGONUM BREVICAULE?	1	13	1	30	1	17				1	38	1	13				
ERIOGONUM FLAVUM	1	6															
ERIOGONUM MANCLUM	1	19								1	13						
										1	40	1	33	1	67	1	20

COMMUNITY TYPE/PHASE NO: 11- 1 11- 2 12- 1 13- 1 14- 1 15- 1 16- 1 16- 2
COV CON COV CON COV CON COV CON COV CON COV CON COV CON

ERIOGONUM OVALIFOLIUM	1	25	1	20	1	13	1	100	1	10	1	33						
ERIOGONUM PAUCIFLORUM			1	17														
EUPHORBIA GLYPTOSPERMA																		
FRAGARIA VIRGINIANA																		
GALLIUM BOREALE	1	13	1	20	1	33	1	13	1	40	1	33						
GAURA COCCINEA																		
GLUM TRIFLORUM	1	6							1	30	1	33						
GILIA LEPTOMERIA	1	6							1	10	1	33						
GILIA TWEEDYI																		
HALOGLION GLOMERATUS	2	13	1	10					2	20								
HAPLOPAPPUS ACAULIS	1	19	3	20					1	30								
HAPLOPAPPUS ARMERIODES			4	30	1	33												
HEDYSARUM BOREALE																		
HEUCHERA PARVIFOLIA									1	100	1	33	1	20				
HYMENOPAPPUS FILIFOLIUS	1	25	1	30					1	38	1	33						
HYMENOXYS ACAULIS	2	56	2	40					1	13	1	67	1	20				
HYMENOXYS TORREYANA	1	13							1	13	1	100						
IPOMOPSIS PUMILA									1	33								
IPOMOPSIS SPICATA	1	25	1	40	1	50	1	38			1	40	1	40				
LAPPULA ECHINATA																		
LAPPULA REDOWSKII	1	19	1	10	1	33					1	20						
LEPIDIUM PERFOLIATUM																		
LESQURELLA ALPINA	1	38	1	10					1	13	1	10	1	33	1	20		
LIRUM PERENNE	1	13	1	20					1	100	1	10	1	33				
LITHOSPERMUM INCISUM	1	13							1	17	1	13	1	40	1	33		
LUMATIUM COUS									1	100								
LOMATIUM FOENICULACEUM																		
LUPINUS ARGENTEUS																		
LUPINUS SERICEUS																		
MACHAeranthera grindeloides	1	13	1	30	1	17	1	25			1	20						
MACHAeranthera tanacetifolia																		
Mentzelia albicaulis	1	6	1	10														
Mentzelia pumila	1	6	1	10							1	10						
Mertensia oblongifolia																		
MOROLEPIS NUTTALLIANA																		
MUSTINEON DIVARTICATUM	1	6							1	13			1	33	1	20		
MUSTILON VAGINATUM																		
Oenothera caespitosa	1	6	1	20	1	17												
ORIBARGHE FASCICULATA																		
OXYTROPIS BESSLEYI																		
OXYTROPIS CAMPESTRIS	1	6							1	17			1	10	3	33	1	20
OXYTROPIS SERICEA	1	6							1	17			1	10	1	67	1	40
PARNASSIA SESSILIFLORA	1	56							1	17	1	13						

COMMUNITY TYPE/PHASE NO: 11- 1 11- 2 12- 1 13- 1 14- 1 15- 1 16- 1 16- 2

COV CON COV CON COV CON COV CON COV CON COV CON COV CON

PENSTEMON ERIANATHERUS	1	38	1	10			1	13					1	20				
PENSTEMON LARICIFOLIUS	1	31					1	25					1	40				
PENSTEMON NITIDUS	1	19	1	10	1	17						1	20	1	20			
PHACELIA IVESIANA	1	13	1	20	1	17	1	13				1	50	1	33			
PHACELIA-LINEARIS	1	6										1	10	1	60			
PHLOX HUDDII	3	63	1	50	1	17	1	25	1	100	2	20	7	67	3	80		
PHLOX MULTIFLORA																		
PHLOX RUSCOIDES	4	19			1	17	1	25					1	10				
PHYSARIA ACUTIFOLIA	1	13	1	20	1	17	1	38					1	30				
PLATYGKURHIA INTEGRIFOLIA					1	10	1	50										
POTENTILLA DIVERSIFOLIA																		
PSORALEA TENUIFLORA															3	20		
PYROLA SLCUNDA																		
SALSOLA IBERICA																		
SCHROBOPRAMBE LINIFOLIA	1	19	1	10	1	17	1	25										
SEDUM LANCEOLATUM	1	6	1	10					1	100			1	33				
SENECIO CANUS	1	63	1	20	1	17	1	38	1	100	1	50	1	67	1	40		
SENECIO CRASSULUS																		
SENECIO STREPTANTHIFOLIUS																		
SOLIDAGO MISSOURIENSIS																		
SOLIDAGO MULTIRADIATA																		
SOLIDAGO SPARSIFLORA																		
SPHALRALCEA COCCINEA	1	6	2	30	1	33												
SPHAEROMERIA CAPITATA	3	6																
STANLEYA PINNATA	1	6	1	20					1	25						1	20	
STANLEYA TOMENTOSA	1	56	1	20									1	40				
STEPHANOMERIA RUNCINATA	1	6	1	20	1	17							1	33	1	20		
STREPTANTHELLA LONGIROSTRIS	1	6	1	10									1	50				
TARAXACUM OFFICINALE									1	100						1	20	
TOWRENDIA HOOKERI	1	25											1	10				
TOWSENDIA INCANA	1	13	1	40									1	30				
TOWSENDIA SPATHULATA	1	6											1	13				
VICIA AMERICANA																		
WYETHIA SCABRA	1	6	2	40	1	17	1	13										
XYLORHIZA GLABRIUSCULA																		
ZIGADENUS VENENOSUS	1	13											1	20			1	20

FERNS/ALLIES & CACTI

OPUNTIA POLYACANTHA	1	88	2	70	1	83	1	63	1	100	2	80	2	67	2	80
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VEGETATION CHARACTERISTICS* SUMMARY TABLE
FOR PRYOR MOUNTAINS SHRUBLAND AND GRASSLAND COMMUNITIES

TYPE NO	PHASE NO	COMMUNITY TYPE NAME
17	1	Artemisia nova/Agropyron spicatum
18	1	Artemisia pedatifida/Agropyron spicatum
19	1	Artemisia pedatifida-Atriplex nuttallii
20	1	Artemisia tridentata/Agropyron smithii
21	1	Artemisia tridentata/Agropyron spicatum
22	1	Artemisia tridentata-Atriplex confertifolia
23	1	Sarcobatus vermiculatus-Artemisia tridentata
24	1	Artemisia tridentata/Stipa comata
25	1	Atriplex nuttallii-Artemisia spinescens
26	1	Artemisia tridentata/Atriplex nuttallii
27	1	Atriplex nuttallii/Monolepis nuttalliana
28	1	Potentilla fruticosa/Festuca idahoensis
29	1	Sarcobatus vermiculatus/Atriplex nuttallii
30	1	Agropyron spicatum/cushion plant
31	1	Chrysothamnus nauseosus/Eriogonum brevicaule
32	1	Festuca idahoensis-Agropyron caninum
33	1	Carex rupestris/Potentilla ovina

* average cover (COV) and constancy (CON). Those species with importance values less than 10 (APPENDIX A) are excluded.

COMMUNITY TYPE/PHASE NO: 17- 1 18- 1 19- 1 20- 1 21- 1 22- 1 23- 1 24- 1 25- 1 26- 1
 (n= 8) (n= 3) (n= 9) (n= 6) (n= 24) (n= 4) (n= 3) (n= 18) (n= 4) (n= 2)
 COV CON COV CON COV CON COV CON COV CON COV CON COV CON COV CON

TREES

ABIES LASIOCARPA																					
JUNIPERUS OSTEOSPERMA	1	13			1	4															
JUNIPERUS SCOPULORUM																					
PICEA ENGELMANNII																					
PINUS CONTORTA																					
PINUS FLEXILIS																					
PINUS PONDEROSA																					
PSUEDOTSUGA MENZIESII																					
SHRUBS																					
ARTEMISIA FRIGIDA	7	25			1	13															
ARTEMISIA NOVA	24	100			5	17															
ARTEMISIA PEDATIFIDA																					
ARTEMISIA SPINESCENS					1	4															
ARTEMISIA TRIDENTATA	4	50	2	67	7	33	48	83	23	100	28	100	21	100	23	94	1	50	15	100	
ATRIPLEX CANESCENS																					
ATRIPLEX CONFERTIFOLIA					1	33					2	33	4	100	3	28				1	
ATRIPLEX NUTTALLII					1	33	9	100			1	8	2	50	1	33	1	6	38	100	
BERBERIS REPENS																					
CERATOIDES LANATA	2	50	1	67							3	17	2	38	1	50				2	
CERCOCARPUS LEDIFOLIUS																					
CHRYSOTHAMNUS NAUSEOSUS	1	13	1	33	1	11	2	33	2	29	2	50									
CHRYSOETHAMNUS VISCIDIFLORUS																					
CLEMATIS COLUMBIANA																					
GRAYIA SPINOSA																					
GUTIERREZIA SAROTHRAE	1	75	1	33	1	22					3	25									
JUNIPERUS COMMUNIS											1	58	1	25							
PETROPHYTUM CAESPITOSUM																					
POTENTILLA FRUTICOSA																					
RIBES TRILOBATA																					
RIBES CEREUM																					
RIBES MORTIGENUM																					
SARGOLATUS VERMICULATUS																					
SEPIRAIA BETULIFOLIA																					
SUAEDA HIGRA																					
CAMPYLOCARPUS OREOPHILLUS																					
VALLENIUM SCOPARIUM																					
YUCCA GLAUCA																					

COMMUNITY TYPE/PHASE NO: 17- 1 18- 1 19- 1 20- 1 21- 1 22- 1 23- 1 24- 1 25- 1 26- 1
COV CON COV CON COV CON COV CON COV CON COV CON COV CON COV CON

GRAMINOIDS

AGROPYRON CANTHUM																				
AGROPYRON DASYSTACHYUM																				
AGROPYRON SMITHII				14	50															
AGROPYRON SPICATUM	17	100	21	100	3	44	1	17	23	100		30	100							
ARISTIDA PURPUREA																				
BOUTELOUA GRACILIS			1	33				3	17	3	25	3	25	2	50		4	28		
DROZUS TECTORUM								7	33	1	4			25	78	1	50	1		
CAREX FILIFOLIA	1	13						3	17	13	13			50	67	1	6	1	25	
CAREX ROSSII																				
CAREX RUPESTRIS																				
FESTUCA IDAHOENSIS																				
HORDEUM JUBATUM																				
KOeleria pyramidata	18	38			1	11		2	67	11	21			1	33		1	11		
LLUCOPOA KINGII																				
ORYZOPSIS HYMENOIDES	1	25			1	22	1	17	2	25	3	50	1	33	1	56	1	75	1	50
POA CUSICKII	3	13																		
POA INTERIOR																				
POA JUNCIFOLIA					20	11								1	33					
POA NERVOSA																				
POA SANDBERGII	5	100			20	44	16	83	5	50	1	25	7	67	2	39	1	75	1	50
SITANION HYSTRIX					1	33	3	17	1	4	1	25	1	33	2	22	1	75	1	50
SPOROBOLUS AIROIDES												60	25			1	6			
SPOROBOLUS CRYPTANDRUS										1	4					2	17	2	50	
STIPA COMATA	2	63	1	33						6	46	7	50	1	33	11	89	1	25	1

FORBS

ACHILLEA MILLEFOLIUM																				
AGOSERIS GLAUCA								3	17											
ALLIUM BREVI-STYLUM								1	17											
ALLIUM CERNUUM																				
ALLIUM TEXTILE	1	13																		
ANEMONE MULTIFIDA	1	38	1	100	1	89	1	67	1	67	1	25	1	67	1	28	1	25		
ANEMONE PATENS																				
ANTENNARIA MICROPHYLLA								1	17	1	4									
ARABIS HOLBOELLII										1	4									
ARABIS NUTTALLII										1	4									
ARENARIA CONGESTA										1	4									
ARENARIA HOOKERI										1	4									
ARNICA OBSTUSILOBA	6	88	2	100				1	17	4	67					1	28			
ARNICA CORDIFOLIA																				

COMMUNITY TYPE/PHASE NO:	17- 1	18- 1	19- 1	20- 1	21- 1	22- 1	23- 1	24- 1	25- 1	26- 1
	COV	COV	COV	COV	COV	COV	COV	COV	COV	COV
ERIOGONUM OVALIFOLIUM	1	25			1	8				
ERIOGONUM PAUCIFLORUM					1	17				
EUPHORBIA GLYPTOSPERMA								1	6	
FRAGARIA VIRGINIANA								1	11	1
GALLIUM BOREALE	1	13						1	6	
GAURA COCCINEA										
GEUM TRIFLORUM										
GILIA LEPTOMERIA			1	11	1	4	1	25	1	28
GILIA TWEEDYI								6	11	
HALOGETON GLOMERATUS										1
HAPLOPAPPUS ACAULIS					11	13				
HAPLOPAPPUS ARMERIOIDES	3	13								
HEDYSARUM BOREALE					1	17		1	6	
HEUCHERA PARVIFOLIA										
HYMENOPAPPUS FILIFOLIUS	1	13			1	13				
HYMENOXYS ACAULIS	3	75			1	25		1	6	
HYMENOXYS TORREYANA	1	13								
IPOMOPSIS PUMILA					1	4	1	50	2	44
IPOMOPSIS SPICATA									1	75
LAPPULA ECHINATA			1	22	1	17				
LAPPULA REDOWSKII									1	67
LEPIDIUM PERFOLIATUM									27	67
LESQUERELLA ALPINA	1	50	1	33	1	4				
LINUM PERENNE	1	13			1	4				
LITHOSPERMUM INCISUM	1	13								
LONATIUM COUS					1	17				
LONATIUM FOENICULACEUM	1	13			2	33	1	13	1	33
LUPINUS ARGENTEUS										
LUPIRUS SERICEUS										
MACHAERANTHERA GRINDELIOIDES	1	13	1	33	1	33			1	17
MACHAERANTHERA TANACETIFOLIA			1	11			1	25	1	33
MLNIZELIA ALBICAULIS			1	11	1	4			1	6
NEOTZELIA PUMILA					1	4			2	11
NERTERIA OBLONGIFOLIA					1	8				
NOROLEPIS NUTTALLIANA			1	11						
MUSINEON DIVARICATUM	2	25	2	56	1	50	1	21	1	33
MUSTHEON VAGINATUM										
OLIOOTHERA CAESPITOSA	1	25	1	11			1	25	1	6
OROBARCHE FASCICULATA			1	22					1	6
OXYTROPIS BESSEYI					2	8				
OXYTROPIS CAMPESTRIS	3	13								
OXYTROPIS SERICEA					1	4				
PARONYCHIA SESSILIFLORA	1	25			1	8				

COMMUNITY TYPE/PHASE NO:	17- 1		18- 1		19- 1		20- 1		21- 1		22- 1		23- 1		24- 1		25- 1		26- 1	
	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON
PENSTEMON ERIANTHERUS	1	63	1	33			1	46												
PENSTEMON LARICIFOLIUS	5	38													1	6				
PENSTEMON NITIDUS	1	13					1	4							1	6				
PHACELIA IVESIANA															1	17	1	25		
PHACELIA LINEARIS	8	100	2	100	2	22	4	83	6	58	3	25			1	22				
PHLOX MULTIFLORA									3	4										
PHLOX MUSCOIDES									1	17										
PHYLSARIA ACUTIFOLIA									1	42	1	25	1	33	2	17				
PLATYSCHEURRIA INTEGRIFOLIA			2	67	2	67	3	17	1	42	1	25	1	33	2	17			1	50
POFFINILLA DIVERSIFOLIA									3	8										
PSORALLA TENUIFLORA																				
PYROLA SECUNDA																				
PYROLA IBERICA																				
SCHROENOCRAMBE LINIFOLIA									1	17	1	25	1	33	1	22				
SEDUM LANCEOLATUM									1	4										
SENECIO CANUS	1	50							1	4										
SENECIO CRASSULUS							10	17												
SENECIO STREPTANTHIFOLIUS																				
SOLIDAGO MISSOURIENSIS																				
SOLIDAGO MULTIRADIATA																				
SOLIDAGO SPARSIFLORA																				
SPHAERALCEA COCCINEA	1	25	1	33			1	17	1	42	2	50								
SPHAEROMERIA CAPITATA	1	13																		
STANLEYA PINNATA									1	4										
STANLEYA TOMENTOSA	1	13																		
STEPHANOMERIA RUNCINATA									1	8										
STREPTANTHELLA LONGIROSTRIS																				
TARAXACUM OFFICINALE					1	11	1	17	1	4				20	67					
TOWNSENDIA HOOKERI	1	13							1	8										
TOWNSENDIA INCANA	1	25							1	21	1	25								
TOWNSENDIA SPATHULATA																				
VICIA AMERICANA	1	13	1	33	2	22	9	67	3	42			1	33	1	6				
WYETHIA SCABRA																				
XYLORHIZA GLABRUSCULA			1	67	1	44			2	17										
ZIGADENUS VENENOSUS	1	13					1	17	3	4										
FERNS/ALLIES & CACTI																				
OPUNTIA POLYACANTHA	1	88	1	33	1	78	1	67	2	88	5	75	2	67	7	100	4	75	2	100

COMMUNITY TYPE/PHASE NO: 27- 1 (n= 3) COV CON 28- 1 (n= 1) COV CON 29- 1 (n= 1) COV CON 30- 1 (n= 17) COV CON 31- 1 (n= 8) COV CON 32- 1 (n= 3) COV CON 33- 1 (n= 1) COV CON

TREES

ABIES LASIOCARPA
 JUNIPERUS OSTEOSPERMA 1 12 1 13
 JUNIPERUS SCOPULORUM
 PICEA ENGELMANNII
 PINUS CONTORTA
 PINUS FLEXILIS
 PINUS PONDEROSA
 PSEUDOTSUGA MENZIESII

SHRUBS

ARTEMISIA FRIGIDA 1 100
 ARTEMISIA NOVA 1 24 1 13 10 33
 ARTEMISIA PEDATIFIDA 1 12
 ARTEMISIA SPINESCENS 2 38 1 33
 ARTEMISIA TRIDENTATA
 ATRIPLEX CANESCENS 3 6 1 63
 ATRIPLEX CONFERTIFOLIA 1 13
 ATRIPLEX NUTTALLII 35 67 10 100
 BERBERIS REPENS 2 82
 CERATOIDES LANATA
 CERCOCARPUS LEDIFOLIUS 3 100
 CHRYSOTHAMNUS NAUSEOSUS
 CHRYSOTHAMNUS VISCIDIFLORUS
 CLEMATIS COLUMBIANA
 GRAYIA SPINOSA
 GUTIERREZIA SAROTHRAE 1 53 2 88
 JUNIPERUS COMMUNIS 1 33
 PETROPHYTUM CAESPITOSUM 20 100
 POTENTILLA FRUTICOSA 1 25
 RHUS TRILOBATA 1 33
 RIBES CEREUM 3 13
 RIBES MONTIGENUM 1 13
 SARCURATUS VERMICULATUS 1 6 1 25
 SPIRALA BETULIFOLIA 1 33
 SUAEDA BIGRA
 SYMPHORICARPOS OREOPHILUS
 VACCINIUM SCOPARIUM
 YUCCA GLAUCA

COMMUNITY TYPE/PHASE NO: 27- 1 28- 1 29- 1 30- 1 31- 1 32- 1 33- 1
 COV CON COV CON COV CON COV CON COV CON COV CON

GRAMIHOIDS

AGOPYRON CANINUM	10	100				18	100
AGOPYRON DASYSTACHYUM							
AGOPYRON SMITHII							
AGOPYRON SPICATUM			13	100	7	50	
ARISTIDA PURPUREA			3	6	1	13	
BOUPELOUA GRACILIS							
BROMUS TECTORUM			1	100			
CAREX FILIFOLIA	1	100	7	24		3	33
CAREX ROSSII						3	33
CAREX RUPESTRIS						6	67
FECLIUCA IDAHOENSIS		50	100			24	100
HORDEUM JUBATUM					1	13	
KOLLERIA PYRAMIDATA	1	67	20	100	12	12	20
LEUCOPOA KINGII		20	100			3	33
ORYZOPSIS HYMENOIDES	1	33			1	38	
POA CUSICKII						2	67
POA INTERIOR							1
POA JUNCIFOLIA							100
POA NERVOSA							
POA SANDBERGII			1	100	2	12	3
SITANION HYSTRIX			1	100			
SPOROBOLUS AIROIDES					1	13	
SPOROBOLUS CRYPTANDRUS							
STIPA COMATA			2	18	1	13	

FORBS

ACHILLEA MILLEFOLIUM						6	67
AGOSERIS GLAUCA	10	100				10	33
ALLIUM BREVI-STYLUM	1	100				10	33
ALLIUM GERNIUM							
ALLIUM FLXITILE	1	100					
ANEMONE MULTIFIDA			1	100			
ANEMONE PATENS						3	33
ANTENNARIA MICROPHYLLA	20	100				10	100
ARABIS HOLBOELLII						1	33
ARABIS NUTTALLII						1	67
ARENARIA CONGESTA	3	100				8	100
ARENARIA HOOKERI							
ARENARIA OBTUSILOBA			4	94	2	50	
ARNICA CORDIFOLIA						1	33
						10	100

COMMUNITY TYPE/PHASE NO: 27- 1 28- 1 29- 1 30- 1 31- 1 32- 1 33- 1
 COV CON COV CON COV CON COV CON COV CON COV CON

ASTER CONSPICUUS												
ASTRAGALUS ADSURGENS			1	6	1	38						
ASTRAGALUS CHAMAELEUCE			1	6								
ASTRAGALUS GRACILIS			1	6								
ASTRAGALUS HYALINUS			1	35	1	38						
ASTRAGALUS MISER	10	100				17	100					
ASTRAGALUS PURSHII			1	71		40	13					
ASTRAGALUS SPATULATUS			1	100								
ATRIPLEX DIOICA			1	100								
BALSAMORHIZA SAGITTATA												
BESSEYA WYOMINGENSIS	1	100				2	100	1	100			
BUPLEURUM AMERICANUM						1	33	3	100			
CALOCHORTUS NUTTALLII												
CAMELINA MICROCARPA												
CAMISSONIA SCAPOIDEA						1	25					
CAMPANULA ROTUNDIFOLIA			1	6								
CAMPANULA ROTUNDIFOLIA	1	100	1	100				1	33	1	100	
CASTILLEJA ANGSTIFOLIA												
CERASTIUM ARVENSE			1	12	1	25						
CHAENACTIS DOUGLASSII												
CHENOPODIUM ALBUM												
CHENOPODIUM FREMONTII												
CHRYSOPSIS VILLOSA												
COLLINSIA PARVIFLORA						2	25					
COMANDRA UMBELLATA												
CREPIS ACUMINATA												
CRYPTANTHA CANA			4	35	1	25						
CRYPTANTHA CELOSIODES			1	12	1	50						
CRYPTANTHA FLAVOCULATA			1	6								
CRYPTANTHA SPICULIFERA			1	12	1	13						
CRYPTANTHA TORREYANA												
CYOPTERUS ACAULIS			1	18								
CYOPTERUS TEREBINTHINUS			1	100								
DELPHINIUM BICOLOR									1	33		
DESCURAINIA SPP.												
DESCURAINIA PINNATA									1	33	1	100
DRABA OLIGOSPERMA									1	33		
EPILOBIUM ANGSTIFOLIUM												
ERIGERON ALLOCOTUS			1	12								
ERIGERON CAESPITOSUS			1	6								
ERIGERON OCHROLEUCUS			1	35					4	100		
ERIOGONUM BREVICAULE?			2	24	8	88						
ERIOGONUM FLAVUM			1	12								
ERIOGONUM MANCUM			7	35								

COMMUNITY TYPE/PIASE NO: 27- 1 28- 1 29- 1 30- 1 31- 1 32- 1 33- 1
 COV CON COV CON COV CON COV CON COV CON COV CON

ERIOGONUM OVALIFOLIUM							
ERIOGONUM PAUCIFLORUM			2	12	1	13	
EUPHORBIA GLYPTOSPERMA							
FRAGARIA VIRGINIANA							
GALIUM BOREALE	20	100					
GAURA COCCINEA			1	6	1	13	
GEUM TRIFLORUM						1	33
GILIA LEPTOMERIA							
GILIA TWEEDYI							
HALOGETON GLOMERATUS	20	33			1	25	
HAPLOAPPUS ACAULIS			1	6			33
HAPLOAPPUS ARMERIOIDES			8	18	1	13	
HEDYSARUM BOREALE			1	6			
HEUCHERA PARVIFOLIA							
HYMENOPAPPUS FILIFOLIUS			1	35	1	13	
HYMENOXYS ACAULIS			3	76	3	13	10 33
HYMENOXYS TORREYANA			1	18			
IPOMOPSIS PUMILA	1	33					
IPOMOPSIS SPICATA							
LAPPULA ECHINATA			1	6			1 67 1 100
LAPPULA REDOWSKII							
LEPIDIUM PERFORIATUM							
LESQUERELLA ALPINA			1	41			1 100
LINUM PERENNE			1	6			1 67 1 100
LITHOSPERMUM INCISUM						10	67
LOMATIUM COUS							
LOMATIUM FOENICULACEUM							
LUPINUS ARGENTEUS							
LUPINUS SERICEUS							
MACHAERANTHERA GRINDELLOIDES			1	82	1	75	
MACHAERANTHERA TANACETIFOLIA							
MERTZELIA ALBICAULIS	10	100					
MERTZELIA PUMILA							
MERTENSIA OBLONGIFOLIA			1	6	1	13	
MOROLEPSIS NUTTALLIANA			1	6			1 33
MUSTINEON DIVARICATUM	34	100					
MUSTINEON VAGINATUM	1	33			1	100	
OLENANTHERA CAESPITOSA					1	25	
OROBANCHIE FASCICULATA							
OXYTROPIS BESSEYI			1	24	1	38	
OXYTROPIS CAMPESTRIS			1	6	1	25	
OXYTROPIS SERICEA			1	24			
PARONYCHIA SESSILIFLORA						11	100 30 100

COMMUNITY TYPE/PHASE NO: 27- 1 28- 1 29- 1 30- 1 31- 1 32- 1 33- 1
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PERSTEMON ERIANTHERUS				1	24							
PERSTEMON LARICIFOLIUS				1	18							
PERSTEMON NITIDUS				1	6							
PHACELIA IVESIANA												
PHACELIA LINEARIS												
PHLOX HOODII				5	71			15	67			
PHLOX MULTIFLORA		10	100					1	67			
PHLOX MUSCOIDES				8	59			1	13			
PHYSARIA ACUTIFOLIA								1	25			
PLATYSCHURHIA INTEGRIFOLIA								2	38			
POTENTILLA DIVERSIFOLIA	1	100				1	100					
PSORALEA TENUIFLORA												
PYROLA SECUNDA												
SALICOLA IBERICA												
SCHEUCHZERIA LINIFOLIA												
SIDDIH LANCEOLATUM				1	6					1	67	1
SENECIO CANUS				1	12			1	38		1	100
SENECIO CRASSULUS										1	33	
SENECIO STREPTANTHIFOLIUS												
SOLIDAGO MISSOURIENSIS												
SOLIDAGO MULTIRADIATA		20	100							1	33	1
SOLIDAGO SPARSIFLORA												
SPHAERALCEA COCCINEA				1	12							
SPHAEROMERIA CAPITATA				1	12							
STANLEYA PINNATA				1	6			1	25			
STANLEYA TOMENTOSA				1	18							
STEPHANOMERIA RUNCINATA								1	25			
STREPTANTHILLA LONGIROSTRIS												
TARAXACUM OFFICINALE	3	100								1	33	
TOWNSENDIA HOOKERI				1	18							
TOWNSENDIA INCANA				1	6							
TOWNSENDIA SPATHULATA				1	53							
VICIA AMERICANA												
WYETHIA SCABRA				1	6			2	25			
XYLOHIZA GLABRIUSCULA								1	13			
ZIGADENUS VENENOSUS	1	100								3	67	

FERNS/ALLIES & CACTI

OPUNTIA POLYACANTHA 2 67 1 24 1 25

APPENDIX C. Key to the Community Types

Use the following definitions for canopy coverage terms in the key:

present	=	greater than 0% cover
common	=	greater than 1% cover
scarce	=	less than 1% cover
well represented	=	greater than 5% cover
poorly represented	=	less than 5% cover

KEY TO PHYSIOGNOMIC TYPES

1. Trees present and reproducing successfully (i.e., Abies lasiocarpa, Juniperus osteosperma, J. scopulorum, Picea engelmannii, Pinus contorta, P. flexilis, P. ponderosa, and/or Pseudotsuga menziesii)
..... FORESTS and WOODLANDS (Key A)
1. Not as above 2
2. Artemisia nova, A. pedatifida, A. spinescens, A. tridentata, Atriplex nuttallii, A. confertifolia, Potentilla fruticosa, and/or Sarcobatus vermiculatus well represented
..... SHRUBLANDS (Key B)
2. Graminoids, forbs, and/or Chrysothamnus nauseosus common
..... GRASSLANDS (Key C)

A. KEY TO FOREST AND WOODLAND TYPES

1. Abies lasiocarpa present and reproducing successfully 2
1. Not as above 5
2. Sites at or above the cold limits of Pseudotsuga menziesii and having Ribes montigenum well represented
..... Abies lasiocarpa/Ribes montigenum
2. Not as above 3
3. Vaccinium scoparium well represented
..... Abies lasiocarpa/Vaccinium scoparium
3. Vaccinium scoparium poorly represented or absent 4
4. Clematis columbiana present
..... Abies lasiocarpa/Clematis columbiana
4. Clematis columbiana absent
..... Abies lasiocarpa/Arnica cordifolia
5. Pinus flexilis a successfully reproducing dominant; often sharing that status with Pseudotsuga menziesii 6
5. Pinus flexilis absent or clearly seral 9

6. Festuca idahoensis well represented
 Pinus flexilis/Festuca idahoensis
6. Festuca idahoensis poorly represented or absent 7
7. Juniperus communis well represented
 Pinus flexilis/Juniperus communis
7. Juniperus communis poorly represented or absent 8
8. Juniperus osteosperma well represented
 Pinus flexilis-Juniperus osteosperma
8. Juniperus osteosperma poorly represented or absent; J. scopulorum well represented
 Pinus flexilis-Juniperus scopulorum
9. Pseudotsuga menziesii present and reproducing successfully
 10
9. Not as above 13
10. Festuca idahoensis well represented
 Pseudotsuga menziesii/Festuca idahoensis
10. Festuca idahoensis poorly represented or absent 11
11. Symphoricarpos oreophilus common
 Pseudotsuga menziesii/Symphoricarpos oreophilus
11. Symphoricarpos oreophilus scarce or absent 12
12. Cercocarpus ledifolius well represented
 Pseudotsuga menziesii/Cercocarpus ledifolius
12. Cercocarpus ledifolius poorly represented or absent;
Agropyron spicatum well represented
 Pseudotsuga menziesii/Agropyron spicatum
13. Juniperus osteosperma well represented 14
13. Juniperus osteosperma poorly represented or absent; J. scopulorum and Artemisia nova well represented
 Juniperus scopulorum/Artemisia nova
14. Cercocarpus ledifolius well represented
 Juniperus osteosperma/Cercocarpus ledifolius
14. Cercocarpus ledifolius poorly represented or absent 15
15. Artemisia tridentata well represented
 Juniperus osteosperma/Artemisia tridentata
15. Artemisia tridentata poorly represented or absent
 Juniperus osteosperma/Agropyron spicatum

B. KEY TO SHRUBLAND TYPES

1. Potentilla fruticosa and Festuca idahoensis both well represented Potentilla fruticosa/Festuca idahoensis
1. Not as above 2

- 2. Agropyron spicatum well represented 3
- 2. Agropyron spicatum poorly represented or absent 5

- 3. Artemisia pedatifida well represented
 Artemisia pedatifida/Agropyron spicatum
- 3. Artemisia pedatifida poorly represented or absent 4

- 4. Artemisia nova well represented
 Artemisia nova/Agropyron spicatum
- 4. Artemisia nova poorly represented or absent; A. tridentata
 well represented ... Artemisia tridentata/Agropyron spicatum

- 5. Sarcobatus vermiculatus or Atriplex confertifolia well
 represented 6
- 5. Sarcobatus vermiculatus and Atriplex confertifolia both
 poorly represented or absent..... 8

- 6. Atriplex confertifolia well represented
 Artemisia tridentata-Atriplex confertifolia
- 6. Atriplex confertifolia poorly represented or absent 7

- 7. Atriplex nuttallii well represented
 Sarcobatus vermiculatus/Atriplex nuttallii
- 7. Atriplex nuttallii poorly represented or absent
 Sarcobatus vermiculatus-Artemisia tridentata

- 8. Atriplex nuttallii well represented..... 9
- 8. Atriplex nuttallii poorly represented or absent..... 12

- 9. Artemisia pedatifida well represented
 Artemisia pedatifida-Atriplex nuttallii
- 9. Artemisia pedatifida poorly represented or absent 10

- 10. Monolepis nuttalliana well represented
 Atriplex nuttallii/Monolepis nuttalliana
- 10. Monolepis nuttalliana poorly represented or absent 11

- 11. Artemisia spinescens well represented
 Atriplex nuttallii-Artemisia spinescens
- 11. Artemisia spinescens poorly represented or absent
 Artemisia tridentata/Atriplex nuttallii
- 12. Agropyron smithii and/or A. dasystachyum well represented
 Artemisia tridentata/Agropyron smithii
- 12. Agropyron smithii and/or A. dasystachyum poorly represented
 or absent..... Artemisia tridentata/Stipa comata

C. KEY TO GRASSLAND TYPES

- 1. Festuca idahoensis well represented
 Festuca idahoensis-Agropyron caninum
- 1. Festuca idahoensis poorly represented or absent 2

- 2. Chrysothamnus nauseosus common
 - Chrysothamnus nauseosus/Eriogonum brevicaule
- 2. Chrysothamnus nauseosus scarce or absent
- 3. Carex rupestris well represented
 - Carex rupestris/Potentilla ovina
- 3. Carex rupestris poorly represented or absent
 - Agropyron spicatum/cushion plant

