

# Inventory and Assessment of Terrestrial Vegetation on the 45 Ranch Allotment

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## ABSTRACT

The Owyhee Plateau region of southwestern Idaho is recognized by many for its ecological significance. In 1996 The Nature Conservancy purchased the 45 Ranch located on the Owyhee Plateau. In 1998 and 1999 an ecological inventory of the conservation site was conducted to prepare a baseline vegetation map of terrestrial plant associations, provide documentation of the composition and structure of major plant associations and condition classes, compile a comprehensive plant species list for the study area, and document the distribution of rare plant species. The report provides an integrated summary of the biological diversity of terrestrial habitats. A vegetation map of the 65,000-acre site was created using Landsat imagery and modeled distribution patterns. The distribution, relative abundance, composition, and structure of 37 plant associations is described. Twelve plant associations were not previously described. The distribution and abundance of 463 common and 19 rare vascular plant species is summarized. Lists of reptiles, amphibians, mammals, and birds observed on the conservation site are provided. The vegetation on 45 Ranch is primarily mid- to late-seral and in good to excellent condition. The ranch encompasses some of the highest quality, representative stands known on the Owyhee Plateau. The effects of resource-based land use practices and chronic disturbances, such as exotic species invasion, and their cumulative effects, however, are apparent. As with many sagebrush steppe ecosystems of the Great Basin, Snake River Plain, and the Upper Columbia Basin, portions of the vegetation are at risk - perched on a threshold of permanent change and loss of ecological values observed today.



## Table of Contents

<b>Introduction</b> .....	1
Study Area .....	1
Climate .....	1
Geology .....	3
Methods .....	4
GIS Methods .....	5
Field and Office Methods .....	5
Inventory of Biotic Components .....	5
Vegetation .....	5
Trend Analysis .....	25
Flora .....	25
Fauna .....	30
Management and Monitoring Recommendations .....	32
Literature Cited .....	34
Figures .....	36
Tables .....	44
Appendix 1. Field Forms and Associated Data Dictionaries .....	56
Appendix 2. Comprehensive Plant Species List .....	60
Appendix 3. Upland Vascular Plant Species List .....	68
Appendix 4. Avian Species List .....	80
Appendix 5. Spatial Data Metafile .....	84
Map Pocket .....	89



## Introduction

The Owyhee Plateau region of southwestern Idaho is recognized by many for its ecological significance (USDA Forest Service 1996; Vander Shaaf 1996). In November 1996 The Nature Conservancy (TNC) purchased the 45 Ranch located on the Owyhee Plateau. The ranch includes 240 acres of deeded land and approximately 65,000 acres of associated Bureau of Land Management (BLM) grazing allotment.

The Nature Conservancy has contracted with Idaho Department of Fish and Game, Conservation Data Center (CDC), to conduct an ecological inventory and assessment of the 45 Ranch deeded and allotment acres. The combined area of deeded private land and the associated allotment on public land is the study area, referred to here as the 45 Ranch. The project occurred in two phases. An inventory and assessment of riparian and wetland communities was completed in 1998 (Moseley 1999). The second phase focused on terrestrial vegetation and, with the exception of preliminary reconnaissance work, was completed during the 1999 field season.

The overall goals of the inventory and assessment project are to: (1) conduct a basic ecological inventory of the biological diversity of the study area, (2) provide recommendations for management and monitoring, and (3) provide information for the TNC/BLM collaborative allotment planning process currently underway. The objectives of this second phase of the inventory and assessment project are to: (1) prepare a vegetation map of terrestrial plant associations at the 1:24,000 scale, (2) provide documentation of the composition and structure of major plant associations and condition classes, (3) compile a comprehensive plant species list for the study area, (4) conduct rare plant inventories, (5) reread six BLM trend plots, and (6) recommend a monitoring strategy for terrestrial vegetation within the study area.

## Study Area

The 45 Ranch is located on the southwestern extent of the YP Desert in southwestern Idaho. The study area is bounded by the Little Owyhee, South Fork Owyhee and Owyhee rivers on the west, east, and north, respectively (Figure 1). The 65,434-acre study encompasses an area of generally moderate relief that is dramatically dissected by major canyon systems. Elevation ranges from 4,080 (at the base of the Owyhee River canyon, on the Idaho-Oregon stateline) to 5,566 feet (at the summit of Spring Creek Butte). The site is accessed via a modestly improved gravel road from Owyhee, Nevada. The site is located on the Riddle BLM Surface Area Management 1:100,000 scale map. The study area is located on the following USGS 1:24,000 scale topographical maps: Bull Camp Butte, Coyote Hole, Star Valley, Grassy Ridge, Spring Creek Basin, Defeat Butte, Bull Basin Camp, and Beaver Charlie Breaks. The most recent aerial photography of the site is from the ID89AC project taken July 1989 at 1:24,000 scale.

Climate—The Owyhee Plateau surrounding the 45 Ranch is both cooler and moister than both the Great Basin (to the south) and the Snake River Plains (to the north). Sometimes termed a cold desert, the climate is characterized by mild and moist springs (late March to mid-June), hot and dry summers (mid-June to mid-September), mild and dry falls (mid-September to mid-November), and cool and moist winters (mid-November to late March). From May to September daytime temperatures can be quite hot but evenings are cool. Based on climate mapping models, the estimated annual average precipitation on the 45 Ranch is between 10 and 12 inches (USDA-NRCS 1998), though locally hotter and drier microclimates exist in sheltered canyons or basins. There is an area of lower precipitation (8 to 10 inches) mapped along the plateau north of Spring Butte and an area of higher precipitation mapped in the Walcot Hills along the Nevada border. Our field observations support the opposite—the Spring Butte plateau, characterized by the abundance of *Festuca idahoensis*, appears relatively moist compared to the Walcot Hills, which are characterized by *Stipa thurberiana* and *Poa secunda*. Unfortunately, there are no weather data stations in southwest Owyhee County to provide more detailed information. The nearest and most similar weather stations within the *Artemisia tridentata wyomingensis* vegetation zone are in southeastern Oregon at Rome (on the Main Owyhee River at 3,380 feet elevation), Burns Junction (3,930

feet elevation), and McDermitt 26N (at Basque on Highway 95). In Nevada, the closest station with similar climate and vegetation is at McDermitt.

Climatic data for Rome, McDermitt 26N, and McDermitt are summarized in Figure 2. McDermitt 26N (4,460 feet elevation) and McDermitt (4,500 feet elevation) are the closest stations to the 45 Ranch in distance, elevation, and vegetation composition, and thus, provide the best estimate of the 45 Ranch's climate. Since the 1950s, both of these stations have annual average precipitation of 9.5 inches. The average annual maximum and minimum temperatures of McDermitt 26N are 64.4 and 32.5 degrees Fahrenheit. McDermitt is only two degrees cooler at 62.4 average maximum and 30.3 minimum. The Rome station may be the best estimate of the lower elevation, hotter, and drier Owyhee River canyonlands of the 45 Ranch. Since the 1950s, the average annual maximum temperature at Rome is 65.5, the minimum 32.7, and average annual precipitation only 8.18 inches. Total average annual snowfall in this area is low and monthly snow accumulations are only about an inch (only in December and January). The average annual snowfall at McDermitt 26N is 15.3 inches while both Rome and McDermitt receive only about 10.1 inches. By comparison, the average annual precipitation at Danner, Oregon (near Jordan Valley, elevation 4,230 feet), which is close to the transition to the *Juniperus occidentalis* vegetation zone, is 11.61 inches and snowfall is 24.8 inches. The only weather station in the Owyhee Plateau at an elevation similar to the higher points on the 45 Ranch is at Owyhee, Nevada (5,400 feet elevation). This station, however, is in a cooler and wetter belt (e.g., vegetation is *Artemisia tridentata vaseyana*), receiving 14.6 inches of precipitation a year, and does not accurately reflect the 45's climate.

The most interesting aspect of the 45 Ranch climate is that the wettest three months of the year are consistently April, May, and June, not November, December, and January as one might assume from observations elsewhere in the lower Snake River Plains (e.g., Payette to Bliss). In addition, there are two precipitation peaks—one in December and a higher one in May. This pattern is observed on the Owyhee Plateau (e.g., Three Creek) and in the middle Snake River Plains (e.g., Gooding to Burley). For example, McDermitt 26N, McDermitt, and Rome all have average monthly precipitation peaks in May and again in December (Figure 2). At all three sites, precipitation averages over 1 inch in both May and June compared to less than an inch in December. The May through June peak is probably the result of thunderstorm formation in the region spawned from low-pressure systems over the Great Basin. This burst of spring moisture may account for the large diversity of forbs, especially desert annuals, on the 45 Ranch and a longer green season for all plants. Precipitation drops dramatically during July and August to 0.45 inches or less at all three sites and remains low until November.

The hottest average monthly maximum and minimum temperatures in the 45 Ranch area are in July and August, while the coolest months are December and January. At McDermitt 26N, McDermitt, and Rome the average July maximum temperature ranges from 88.7 (McDermitt) to 92.1 (Rome) degrees Fahrenheit. The average high temperatures in the winter are actually quite mild, ranging from 38.5 (McDermitt) to 40.8 (McDermitt 26N) degrees in January. The average minimum temperatures in the summer are relatively cool, ranging from 47.9 (McDermitt) to 51.1 (Rome) degrees in July. The average winter minimum temperatures are cold, ranging from 15.5 (McDermitt) to 18.9 (McDermitt 26N) degrees in January. During fall and spring (October through April), the average minimum temperature at each station is at or below freezing. At all three weather stations average maximum temperatures increase most dramatically between June and July (increasing 11 degrees), corresponding with the abrupt drop in precipitation. The most dramatic decrease in maximum temperatures occurs between August and September (dropping around 10 degrees). Minimum temperatures do not change as dramatically from month to month.

Average monthly precipitation and temperatures can vary widely from year to year. For example, during 1998 (an El Nino year), McDermitt 26N station was 4.21 inches of precipitation above average and McDermitt was 6.05 inches above average. During the 1998 wet period (from December through June), McDermitt 26N received 10.89 inches of precipitation and McDermitt received 11.37 inches. In contrast, during 1999's wet period (December through June of a La Nina year) these stations received below

average amounts of 4.40 and 4.27 inches of precipitation respectively. No rain was recorded during July and August 1999 in this area—a relatively uncommon, but not unheard of, event. These fluctuations in yearly precipitation, especially during the growing season, can have a dramatic effect on vegetation production. In 1999, the cover and density of annuals was significantly less than in 1998. The floral display of perennials responding to 1998's wet spring will be remembered by many as one of the best ever. Temperatures can also fluctuate dramatically with the highest temperature ever recorded in the 45 Ranch area being 111 degrees Fahrenheit (McDermitt 26N) and the lowest temperature being -37 degrees (McDermitt).

**Geology**-The geology of the 45 Ranch is typical of southwest Idaho's Owyhee Uplands and plays an important role in the formation of soils and distribution of vegetation communities. The 45 Ranch is characterized by a gently undulating volcanic plateau incised by steep-walled canyons. The volcanic plateau is composed of rhyolitic ash-flow tuff layers, erupted about 11 to 14 million years ago, capped by basalt flows with interbedded sediments about 8 to 10 million years ago (Ekren et al. 1981 and 1982). Since formation, the volcanic plateau has experienced minor structural faulting and erosion by the South Fork and Little Owyhee rivers. Numerous shallow drainages have formed on the plateau as well as vernal wet plays within closed basins. During the Quaternary Period, several large landslides and deposition of alluvium occurred in the South Fork and Little Owyhee River canyons (Ekren et al. 1981). In addition, wind blown sand and silt were deposited atop the plateau forming the parent material of today's soils.

While there were several eruptive centers throughout the greater Owyhee Uplands, the rhyolite seen on the 45 Ranch (and extending into northern Nevada, much of Malheur County, Oregon, and southwestern Owyhee County, Idaho) originated from the Juniper Mountain volcanic center (Ekren et al. 1981). In contrast, northeast of the 45 Ranch (near Deep Creek and the East Fork Owyhee River, and again near Riddle), is slightly younger rhyolite from the Little Jacks Creek eruptive center (Ekren et al. 1981 and 1982). The oldest multi-layered flow of rhyolitic tuff exposed on the 45 Ranch, the Tuff of Swisher Mountain, was probably deposited about 13.8 million years ago or more (Ekren et al. 1981). Each tuff flow formed as violent volcanic explosions widely spread layers of hot ash and pyroclastic debris over low-lying areas. As a result, the vast mid-section of a tuff flow exhibits flow layering (indicating an ash flow which liquified before final cooling) which is sandwiched between thin glassy or breccia sections (Bonnichsen et al. 1988; Ekren et al. 1982). The tuff flows are usually crystal-poor and vertically jointed upon cooling shrinkage.

The Tuff of Swisher Mountain is the most common rock exposed along the 50 to 200 m deep inner gorges of the South Fork, Main Fork, and Little Owyhee rivers (Ekren et al. 1981). It weathers characteristically into striking reddish-brown colored, vertical canyon walls and picturesque pinnacles, hoodoos, spires, and monoliths (Ekren et al. 1982). The walls drop straight into the rivers or may have a talus toe-slope composed of platy stones. A north-south trending fault block of the Tuff of Swisher Mountain has been uplifted between the Little and South Fork Owyhee rivers. It has since eroded into the low rolling ridges of Grassy Ridge, Colt, the Walcot Ridge, and South Boundary Ridge. The overlying basalts were probably never deposited atop these hills. Minor structural faulting also probably provided weak points for canyon erosion by the ancestral Little and South Fork Owyhee rivers.

On the 45 Ranch, younger rhyolitic tuff flows are seen only along the Main Fork Owyhee River from the mouth of the South Fork down to nearly Long Pull Draw. These flow layers, which overlying the Tuff of Swisher Mountain, known as the Lower Lobes of Juniper Mountain, are about 13.8 million years old or less (Ekren et al. 1981). The Lower Lobes of Juniper Mountain are also ash-flow tuffs but usually have more distinct basal breccia, more crystals, and a redder color than the Tuff of Swisher Mountain (Ekren et al. 1982). The Lower Lobes of Juniper Mountain, up to 200 m thick, form the massive, vertical mid-walls of the Main and East Fork Owyhee River gorges below Red Canyon (Ekren et al. 1981). The tuff also forms dramatic spires, hoodoos, and monoliths. Off the 45 Ranch, upstream from Red Canyon and Crutcher's Crossing, another younger rhyolitic tuff flow is exposed. This is the Tuff of the Badlands, about 12 million years old, characterized by numerous larger crystals (Ekren et al. 1982).

The rhyolitic tuff flows on the 45 Ranch were blanketed 10.5 and 8 million years ago by numerous thin basalt flows (each about 15 m thick or less) and interbedded sediments (Ekren et al. 1981 and 1982). These basalt flows, including interbedded sediments, are collectively known as Banbury Basalt. They are often over 150 m in total thickness and are the only formation exposed in the South Fork Owyhee River canyon from the south boundary downriver to about Bull Camp (Ekren et al. 1981). The interbedded sediments, up to 60 m thick, are a mix of stream deposits (e.g., water-worked chert, tan quartzite and volcanic cobbles, pebbles, gravel, and sand), glassy ash, petrified wood, fossils, and lacustrine diatomite (Ekren et al. 1981). At the north end of Spring Creek Basin, Miocene or Pliocene fossil fragments of equids, camelids, proboscideans, or rhinoceros have been found (at T. 14S, R. 5W, NE ¼ sec. 10; Ekren et al. 1981). Though common throughout the 45 Ranch, these interbedded sediments are highly visible in Spring Creek Basin and vicinity, Juniper Basin, and along the South Fork Owyhee above Coyote Hole, where they create a patchy mosaic of different soil types.

The basalt flows, with their vertical columnar jointing, combined with the poorly consolidated interbedded sediments, are less resistant to erosion than the underlying rhyolitic tuff. As a result, most canyons on the 45 Ranch have an inner gorge through tuff, occasionally topped with a gently sloping bench, knife ridge, or mesa. Above the tuff there is a moderately steep colluvial slope composed of basaltic talus, basaltic colluvium--mostly boulders and stones--embedded in a matrix of sediments, or just gravel and fine sediments. This slope is typically capped by one to three upper basalt flows (usually totalling less than 50 m thick) forming a vertical cliff complex of dark, olivine-rich basalt columns occasionally broken by rock falls and draws (Ekren et al. 1981). This uppermost layer forms the vast flat to gently rolling volcanic plateau seen throughout most of the 45 Ranch. The generally circular, broad, and gently sloping hills seen on the plateau (e.g., Spring Butte, 45 Hill, and Bull Camp Butte and Star Valley Knoll just outside the 45 Ranch) are basalt shield volcanos formed around vents (Ekren et al. 1981). Since the eruption period, water erosion has created numerous shallow drainages and washes, carving the plateau and radiating from buttes, leading into river canyons. In addition, naturally closed drainage basins (e.g., volcanic vents, collapsed lava, or other depressions) have collected water runoff, silt, and clay, forming today's lakebeds, playas, and vernal pools.

During the Quaternary Period (the last 1.6 million years), the 45 Ranch has been further subjected to both erosion and deposition. Below the basalt rimrock and tuff cliffs, patches of unconsolidated angular boulder, stone, and cobble talus are common. Along the Little Owyhee and South Fork rivers, large sandy and silty alluvial terraces have been deposited. Small alluvial fans of rocky and sandy sediment are seen atop terraces at the mouths of side canyon washes. Several large landslides have created benches within the Little Owyhee and South Fork canyons, most notably on the South Fork (at the south boundary and in Spring Creek Basin). Large landslides, up to 100 m thick, are composed of massive basalt boulders embedded in sediments, while smaller slides are slumps of mostly interbedded sediments (Ekren et al. 1981). Eolian deposits of ice-age sand, silt, and ash (e.g., loess) are common throughout the plateau (up to 20 m thick to the east of the 45 Ranch in the Y-P Desert) (Ekren et al. 1981). In other areas, such as drainageways or atop buttes, mesas, canyon rims, and ridges, erosion has removed loess leaving only thin soil. Large areas of mounded topography (also called Biscuit and Swale) exist on the northwest quarter of the 45 Ranch, around the base of Spring Butte. The mounds, which range in height from 1 to 2 m and vary in size from several to tens of square meters, are composed of deep, fine-textured soil. The origin of the mounds, whether they are depositional, erosional, or caused by freeze-thaw, is unclear. The inter-mound swales, in contrast, may have a shallow silt and clay layer over bedrock, which slows water drainage, creating barren pseudo-playas.

## Methods

Vegetative components of terrestrial ecosystems are characterized on the basis of the dominant species cover, seral status, structural condition, and natural potential vegetation. In mapping vegetation, information regarding these four vegetative attributes is mutually supportive. That is, knowledge of one component will assist in the development and refinement of knowledge of the other components.

GIS Methods: We developed a geographical information system (GIS) database for five vegetation attributes: cover type, potential natural vegetation, seral status, structural condition, and ecological condition. In this spatial database cover type and potential natural vegetation are primary database attributes. Seral status, structural condition, and ecological condition are secondary attributes and serve to qualify, or further define, the primary attributes.

We used Landsat Thematic Mapper (TM) imagery to derive a cover type classification of the study area. Limited use of aerial photography and orthophoto quad maps was employed in the interpretation of the Landsat imagery. We modeled potential natural vegetation using values for slope, aspect, elevation, and topographic configuration calculated from the USGS digital elevation model (DEM); soils; and precipitation (Henderson 1998; Daly et al. 1998). We used Bureau of Land Management fire history GIS coverages to identify seral sites. Seral status, structural condition, and ecological condition were determined as well through inspection of cover type and potential natural vegetation. To the extent possible, we modeled seral status and ecological condition using information on disturbance and land-use history.

The vegetation mapping project was conducted at the 1:24,000 scale. We maintained a 30 X 30 meter pixel size throughout the project.

Field and Office Methods: We collected stand level point observation and ecology plot data to describe the distribution, composition, and structure of the vegetation. Stand level point observation data were collected primarily to assist in the accumulation of a large number of geographic reference points where knowledge of the vegetation is linked to base information available to assist with mapping the vegetation (e.g., simple environmental data such as elevation and slope aspect and gradient). Ecological point data were collected using the protocol developed in the 1998 field season (Rust and Moseley 1999). The data card and data dictionary for the stand level observation method are reproduced in Appendix 1 with a brief explanation of the protocol.

We collected composition and structure data on 0.1 acre fixed-area plots using standard plant community ecology methods (Bourgeron et al. 1991; USDA Forest Service 1992). Plots were located to represent the range in composition and structure of major vegetation mapping units. Data on relatively few plots were collected in comparison to the number of stand level point observations. We recorded the location of stand level observation points and ecology plots in the field using navigation grade geographical positioning system (GPS) units (the Garmin 12XL) and by hand on 1:24,000 USGS quadrangles.

Owyhee Resource Area staff re-read nested frequency trend plots during 1999 using standard methods. We summarize these data using the methods described by USDI Bureau of Land Management (1996). The location of study plots and nested frequency trend plots is shown in Figure 3.

## Inventory of Biotic Components

### VEGETATION

We observed 37 plant associations in the upland environments of 45 Ranch. The plant associations are listed in Table 1. The extent of each association within the study area is shown in Figure 4 (reproduced on Map 1) and summarized by seral status and ecological condition in Table 2. The vegetation on 45 Ranch is primarily mid- to late-seral and in good to excellent condition (B- and A-ranked). The ranch encompasses some of the highest quality, representative stands that we have observed on the Owyhee Plateau. The effects of resource-based land use practices and chronic disturbances, such as exotic species invasion, and their cumulative effects, however, have taken a toll. As with many sagebrush steppe ecosystems of the Great Basin, Snake River Plain, and the Upper Columbia Basin, portions of the vegetation are at risk - perched on a threshold of permanent change and loss of ecological values observed today.

Discussion of the vegetation we observed on 45 Ranch is arranged by physiognomic group (Federal Geographic Data Committee-Vegetation Subcommittee 1996), series, and plant association. To the extent possible we have summarized the distribution, composition, and ecological condition of each plant association.

#### Woodland Vegetation

##### *Juniperus occidentalis* Series

Stands of *Juniperus occidentalis* are relatively uncommon on 45 Ranch. They are found only on the upper canyon breaks from the lower South Fork Owyhee River in Juniper Basin downriver along the Main Owyhee River. This area is the southern edge of a much larger region of western juniper woodland and forest in the greater Owyhee Mountains. In contrast to the dry and dusty expanse of gray-green sagebrush, golden grass, and reddish canyon rhyolite, the striking green color, cooling shade, and nice fragrance of junipers are welcome on hot summer days. *Juniperus occidentalis* trees are also valued by a variety of birds and mammals for shade, cover, and nesting habitat. Though *Juniperus occidentalis* is found on all aspects and slopes in this area, well developed stands occur on steeper north to northeast slopes. Dispersed trees are occasionally found along the canyon rim; however, large stands only occur below the basaltic plateau rim on break slopes above the first layer of rhyolitic bedrock. Many of these canyon slopes are inaccessible to cattle and in nearly pristine, reference condition with lush grass and thick microbiotic soil crust (the best we have observed anywhere in the Owyhee uplands). There are several old-growth juniper stands. Large, old juniper trees (easily several hundred years old) are readily recognized by their large diameter trunks (occasionally over 3 feet!), rounded or irregular snag-topped canopies about 5 to 10 m tall, branches covered with chartreuse lichen (probably *Letharia vulpina*), and fire-scarred bases. They are ecologically important elements for wildlife habitat and soil protection and formation (e.g., providing woody debris). Fire plays an important role in determining the extent of *Juniperus occidentalis* invasion in an area. Older stands seem to experience mostly light understory burning which reduce both juniper and *Artemisia tridentata* recruitment, while younger stands appear to be cyclically replaced by fire. Due to the patchiness of small burns and the quick recovery of vegetation from light understory fires, the fire history of the *Juniperus occidentalis* stands on the 45 Ranch Allotment is poorly understood.

##### ***Juniperus occidentalis/Artemisia arbuscula/Festuca idahoensis*** (western juniper/low sagebrush/Idaho fescue)

Distribution: Though limited in overall distribution, *Juniperus occidentalis/Artemisia arbuscula/Festuca idahoensis* was the most commonly sampled juniper association on 45 Ranch (Table 2). It was sampled in the Long Pull Draw, North Canyon, and Juniper Basin areas along the upper break slopes of the Main Owyhee and lower South Fork Owyhee River canyons. It is generally found on NW to N to NE aspects

(mostly between 19 and 78 degrees) of moderate to steep slopes (10 to 55%). However, it is occasionally seen on other aspects (e.g., W, E, and SE) and on flatter rimrock or canyon benches (e.g., 2% slope). The plant association is best formed on well-drained soils characterized by colluvial cobbles, stones, and boulders embedded in gravelly loess (e.g., Xerollic Haplargids and Xerollic Paleargids). Micro-site characteristics (e.g., topographic configuration, insolation) are highly variable. This association is often in mosaic with *Juniperus occidentalis*/*Artemisia tridentata* (both *wyomingensis* and *vaseyana*)/*Festuca idahoensis* (on deeper soil), *Artemisia tridentata* (both *wyomingensis* and *vaseyana*) communities, *Artemisia arbuscula*/*Festuca idahoensis*, and *Juniperus occidentalis*/*Danthonia californica* (in intermittent drainages). However, stands transitional to these four plant associations exist, sometimes making their delineation difficult.

**Composition:** Due to differences in seral status, stands of *Juniperus occidentalis*/*Artemisia arbuscula*/*Festuca idahoensis* vary mainly in the density and size of overstory juniper trees. Juniper cover ranges from less than 5% (in early seral or burnt stands) to 35-45% in mid- to late-seral stands, though typical stands average about 25%. Older mid- to late-seral stands are dominated by medium to large trees (9 to 33 inches diameter at crown height (dch)) but usually have all age classes represented (from seedlings to, occasionally, very large old-growth trees over 33 inches dch). These old stands usually have low numbers of seedlings or saplings, some fire-scarred trunks and downed wood, snag-topped trees, and low stem density. These features probably result from occasional light understory burns. In contrast, early- to mid-seral stands are dominated by shrubs and scattered juniper saplings and pole trees (5 to 9 inches dch) which have invaded since the most recent fire. *Artemisia arbuscula* dominates the understory shrub layer of *Juniperus occidentalis*/*Artemisia arbuscula*/*Festuca idahoensis* with 2 to 30% cover (typically about 20 to 30%), depending on seral state and soil variations. Other shrubs are often present, including *Artemisia tridentata* (both *wyomingensis* and *vaseyana*), *Ribes cereum*, and *Symphoricarpos oreophilus parishii*. These shrubs usually (but not always) have low cover, depending on seral status. *Chrysothamnus viscidiflorus* and *C. nauseosus* can also be common, especially in early- to mid-seral stands. The herbaceous layer is dominated by *Festuca idahoensis* (cover ranging from 20 to 60%) usually mixed with varying amounts of *Poa secunda*, *Agropyron spicatum*, *Bromus tectorum*, and *Stipa thurberiana* depending on aspect, soils, and disturbance. Numerous forbs are often present, including *Antennaria dimorpha*, *Aster scopulorum*, *Astragalus* spp., *Calochortus* spp., *Crepis acuminata*, *Erigeron bloomeri*, *Erigeron pumilus*, *Eriogonum* spp., *Lomatium macrocarpum*, *Machaeranthera canescens*, *Penstemon deustus*, and *Phoenicaulis cheiranthoides*.

**Ecological Condition:** Most *Juniperus occidentalis*/*Artemisia arbuscula*/*Festuca idahoensis* stands sampled were ungrazed due to their inaccessibility below canyon rimrock. These stands have thick microbiotic soil crust (about 10 to 40% ground cover), nearly no *Bromus tectorum*, and are in A-ranked ecological conditions. These stands are among the best we have observed of this community in the Owyhee uplands. In contrast, one SE facing, cattle accessible stand in Juniper Basin had only 1% moss and lichen cover and 7% *Bromus tectorum* cover. Despite having high soil microbiotic crust cover, one heavily burnt early seral stand had high cover of *Bromus japonicus* and is in BC-ranked condition. Occasionally, *Festuca idahoensis* appears pedestalled but this is probably due to natural soil erosion around grass clumps rather than from grazing.

***Juniperus occidentalis*/*Artemisia tridentata tridentata*/*Agropyron spicatum***  
(western juniper/basin big sagebrush/bluebunch wheatgrass)

**Distribution:** *Juniperus occidentalis*/*Artemisia tridentata tridentata*/*Agropyron spicatum* is a tentative undescribed community observed only once on the 45 Ranch and only rarely elsewhere in the Owyhee uplands. It was on a steep SE slope (140 degrees, 47%) in Long Pull Draw above the Main Owyhee River. The site, located below a rhyolitic bench and above the drainage bottom, was very rocky. The site had numerous colluvial boulders, stones, and cobbles embedded in gravelly loess and was probably a stabilized talus slope. Further surveys of canyon slopes may find more stands of this plant association.

**Composition:** The *Juniperus occidentalis*/*Artemisia tridentata tridentata*/*Agropyron spicatum* stand

sampled was moderately burned and had low cover juniper cover (about 3%). Several scattered saplings and a few mature medium-sized trees survived the fire. More common were snags of fire-killed saplings, pole trees, medium trees, and sagebrush. Mature *Artemisia tridentata tridentata* shrubs (3 to 4 feet tall), had about 10% cover and were mixed with occasional *Chrysothamnus nauseosus*, *C. viscidiflorus*, and *Ribes cereum*. *Agropyron spicatum* and *Bromus tectorum* dominated the herb layer with 30 and 15% cover respectively. *Elymus cinereus* was common (3 to 5%) with *Stipa thurberiana* and *Poa secunda* also present. Few forbs were present (e.g., *Calochortus bruneaunis*, *Crepis occidentalis*, *Epilobium brachycarpum*, *Penstemon deustus*, and *Tragopogon dubius*).

**Ecological Condition:** Though inaccessible to cattle, the community sampled was in C-ranked condition. Due to the combination of heavy fire, low microbiotic soil crust cover, the drought prone aspect, and natural erosion, *Bromus tectorum* had thoroughly invaded the plant interspaces.

***Juniperus occidentalis/Artemisia tridentata vaseyana/Festuca idahoensis***  
(western juniper/mountain big sagebrush/Idaho fescue)

**Distribution:** *Juniperus occidentalis/Artemisia tridentata vaseyana/Festuca idahoensis* is an occasionally encountered juniper community. It was sampled only three times on the 45 Ranch Allotment, all in the North Canyon area along the canyon breaks of the Main Owyhee River (Figure 4). It is generally restricted to NE aspects (22 to 58 degrees) and steep slopes (42 to 55%) with undulating micro-topography at 5,075 to 5,170 feet elevation. Stands are relatively sheltered and might even accumulate winter snow. Sites have fairly deep loess soil with varying amounts of colluvial basalt boulders embedded (e.g., Xerollic Haplargids). *Juniperus occidentalis/Artemisia tridentata wyomingensis/Festuca idahoensis* is adjacent on more exposed NW aspects and *Juniperus occidentalis/Artemisia arbuscula/Festuca idahoensis* adjacent on steeper, E facing slopes.

**Composition:** All three *Juniperus occidentalis/Artemisia tridentata vaseyana/Festuca idahoensis* stands were mid- to late-seral, dominated by large old trees (over 21 inches dch) and mature, medium-sized trees (9 to 21 inches dch). Pole trees were less common while saplings and seedlings were even more rare. In general, juniper cover ranges from about 25 to 40% and its distribution is patchy. Interspersed between big junipers are patches of *Artemisia tridentata vaseyana* (found only in these stands on the 45 Ranch Allotment). Cover of *Artemisia tridentata vaseyana* ranges from 4 to 25%. Other shrubs, such as *Artemisia arbuscula*, *Chrysothamnus viscidiflorus*, *Ribes cereum*, *R. velutinum*, and *Symphoricarpos oreophilus parishii*, occur with less than 1% cover. Shrub heights are generally 2 to 4 feet. *Festuca idahoensis* is abundant with 50 to 70% cover and *Poa secunda* is the only other important grass (<10% cover). Common forbs, all with low cover, are *Antennaria dimorpha*, *A. microphylla*, *Erigeron* spp., *Eriogonum heracleoides*, *Crepis acuminata*, and *Senecio integerrimus*.

**Ecological Condition:** All stands observed are un-grazed by cattle (due to their inaccessibility below the canyon rim) and, therefore, in superb A-ranked condition. Exotic species were nearly non-existent (very rare *Bromus tectorum*) and a thick microbiotic soil crust covered over 30% of the ground. These are the best reference stands of *Juniperus occidentalis/Artemisia tridentata vaseyana/Festuca idahoensis* we have observed in the Owyhee uplands.

***Juniperus occidentalis/Artemisia tridentata wyomingensis/Festuca idahoensis***  
(western juniper/Wyoming big sagebrush/Idaho fescue)

**Distribution:** Like other western juniper plant associations, *Juniperus occidentalis/Artemisia tridentata wyomingensis/Festuca idahoensis* is rare on the 45 Ranch. It is occasionally found on the canyon break slopes of the Main Owyhee River and was sampled at Long Pull Draw and North Canyon. This association occurs on moderately exposed, convex or undulating, steep (20 to 48%), NW to E (302 to 94 degrees) facing slopes. Sites are very rocky, resembling consolidated talus, with basaltic boulders and stones embedded in moderately thick loess soil (e.g., Xerollic Haplargids). *Juniperus occidentalis/Artemisia tridentata wyomingensis/Festuca idahoensis* grades into *Juniperus*

*occidentalis/Artemisia arbuscula/Festuca idahoensis* on toeslopes and shallower soil but seems distinctly separate from *Juniperus occidentalis/Artemisia tridentata vaseyana/Festuca idahoensis*.

**Composition:** All three *Juniperus occidentalis/Artemisia tridentata wyomingensis/Festuca idahoensis* stands sampled were early- to mid-seral and had only 10 to 15% cover of juniper trees. The junipers were predominantly young saplings and pole trees with some mature medium-sized trees (up to 21 inches dch and 6 m tall). However, occasional seedlings and large trees were also observed. *Artemisia tridentata wyomingensis* is the dominant understory shrub, found between trees with 6 to 25% cover, depending on the stand's seral condition. *Chrysothamnus viscidiflorus* and *C. nauseosus* are common and locally abundant in early seral stands while *Artemisia arbuscula*, *Artemisia tridentata tridentata*, *Leptodactylon pungens*, and *Ribes cereum* are less commonly observed. Shrub heights are mostly less than 2.5 feet. The dominant understory grass is *Festuca idahoensis* with cover ranging from 30 to 50%. However, *Poa secunda* (25% cover) and *Agropyron spicatum* (5 to 30%) are also common and locally abundant. Forbs are usually low cover, the most noticeable being *Crepis acuminata*, *Erigeron bloomeri*, *Erigeron linearis*, *Erigeron pumilus*, *Eriogonum ovalifolium*, *Machaeranthera canescens*, and *Penstemon speciosus*.

**Ecological Condition:** All three stands sampled were un-grazed and in good to excellent condition (AB- to A-ranked). They were all inaccessible to cattle due to their locations below vertical canyon rimrock. The three communities all had high microbiotic soil crust cover (up to 50%), with carpets of moss (mainly *Tortula ruralis*) under trees. One stand had burned recently and had trace amounts of *Bromus tectorum* while another stand had minor natural erosion. As with other juniper stands on the 45 Ranch, these are the best reference quality examples of this plant association we have observed in the Owyhee uplands.

***Juniperus occidentalis/Danthonia californica***  
(western juniper/California oatgrass)

The *Juniperus occidentalis/Danthonia californica* plant association was observed only below the plateau rimrock in several intermittent drainages leading into the Main and South Fork Owyhee rivers. It is an uncommon community on the 45 Ranch Allotment sampled only in 1998 with 2 plots. See Moseley (1999) for a description of its distribution and composition.

***Juniperus occidentalis/Festuca idahoensis***  
(western juniper/Idaho fescue)

**Distribution:** *Juniperus occidentalis/Festuca idahoensis* is a relatively common juniper plant association found on the 45 Ranch Allotment. It was sampled below the plateau rim at Long Pull Draw and North Canyon, along the canyon breaks of the Main Owyhee River. Stands are on NW to N to E aspects (305 to 94 degrees) of mostly steep slopes (31 to 55%). One stand, however, was found in a low gradient intermittent drainage similar to *Juniperus occidentalis/Danthonia californica*. Two stands were found in concave bowls and one on convex topography. Soils usually have large numbers of colluvial boulders and stones embedded in loess (e.g., Xerollic Haplargids).

**Composition:** *Juniperus occidentalis/Festuca idahoensis* stands were mostly late-seral, dominated by medium-sized (9 to 21 inches dch) and large junipers (21 to 33 inches dch) with scattered very large trees (over 33 inches dch). These older stands are composed of mature trees with healthy, rounded crowns and also old, snag-topped, and irregularly crowned trees. Older stands have downed snags and signs of repeated light burning, but few seedlings or saplings. In contrast, one stand sampled was mid-seral, dominated by vigorous pole-sized trees (5 to 9 inches dch) with scattered seedlings, saplings, and medium-sized trees. In general, tree heights average about 5 to 6 m and total juniper cover 40 to 50%. Stands sometimes have dead *Artemisia tridentata* in the understory, indicating that *Juniperus occidentalis/Festuca idahoensis* might be a late-seral replacement of neighboring *Juniperus occidentalis/Artemisia tridentata wyomingensis* (or *vaseyana*)/*Festuca idahoensis*. Overall shrub cover is less than about 3%, with only occasional *Artemisia arbuscula*, *Artemisia tridentata tridentata* (or

*wyomingensis*), *Ribes cereum*, *Ribes velutinum*, and *Symphoricarpos oreophilus parishii*. The herbaceous understory is the most diverse of any juniper community on the 45 Ranch. *Festuca idahoensis* dominates with 25 to 70% cover but *Poa secunda*, *Agropyron spicatum*, and *Poa cusickii* may also be locally important. Numerous forbs are notable with low cover (e.g., *Arabis holboellii*, *Arnica sororia*, *Collinsia parviflora*, *Crepis acuminata*, *Cystopteris fragilis*, *Geum triflorum*), but only *Antennaria microphylla* and *Eriogonum heracleoides* are locally common and abundant (up to 20% and 2% cover respectively).

**Ecological Condition:** All stands sampled were in A ecological condition and had no evidence of cattle grazing. They were nearly pristine, with no *Bromus tectorum* and thick microbiotic crust (23 to 36% cover). Like prior juniper stands, these are also reference quality and the finest we have seen in the Owyhee uplands.

## Evergreen Shrubland Vegetation

### *Artemisia tridentata tridentata* Series

On the 45 Ranch Allotment, *Artemisia tridentata tridentata* plant associations are found on alluvial terraces along the forks of the Owyhee rivers (Moseley 1999) and also at cliff bases, in steep and rocky slot canyon washes, and on talus slopes. On these sites, *Artemisia tridentata tridentata* can grow impressively tall (sometimes over 6 feet tall!). Due to topography and minimal fuel on talus slopes, fire is relatively rare in these stands and shrubs often grow old. These communities are an important and threatened component of ecological diversity and watershed stability. On both canyon slopes and alluvial river terraces, *Artemisia tridentata tridentata* provides valuable nesting and cover habitat for birds (e.g., loggerhead shrike and songbirds) and mammals (e.g., mule deer, bighorn sheep). It also helps stabilize steep canyon talus and reduces soil erosion. Unfortunately, *Artemisia tridentata tridentata* communities are preferred loafing and grazing areas for cattle, especially flatter stands on alluvial terraces with understories dominated by highly palatable *Elymus cinereus* (Moseley 1999). In many areas these alluvial terrace communities have been cleared for agricultural development. In addition, the steep and unstable canyon slopes are susceptible to natural erosion, exposing soil for *Bromus tectorum* invasion. As a result, many *Artemisia tridentata tridentata* communities have been lost or severely degraded by invasions of exotic species, mainly *Bromus tectorum*.

#### ***Artemisia tridentata tridentata/Agropyron spicatum***

(basin big sagebrush/bluebunch wheatgrass)

**Distribution:** The *Artemisia tridentata tridentata/Agropyron spicatum* plant association is uncommon on the 45 Ranch Allotment (Table 2). It was documented only once on a steep (45%), SW slope (224 degrees) in the South Fork Owyhee River canyon above Bull Camp. Small patches were observed elsewhere on semi-consolidated boulder talus. This association is found where basaltic talus boulders, stones, and cobbles have become semi-consolidated in pockets of gravelly soil derived from interbedded sediments (e.g., Xerollic Haplargids). Loose rocks and soil are also exposed. The association is not always clearly defined, having inclusions of *Atriplex confertifolia/Agropyron spicatum* and grading into *Artemisia tridentata tridentata/Elymus cinereus* and *Artemisia tridentata wyomingensis/Agropyron spicatum*.

**Composition:** The *Artemisia tridentata tridentata/Agropyron spicatum* stand sampled was mid-seral with a well-developed layer of *Agropyron spicatum* (30% cover) but only scattered shrubs. *Artemisia tridentata tridentata* shrubs, 3 to 4 feet tall, were patchy and scattered in rocky areas (only 3% cover in sampled stand, more observed elsewhere) while *Atriplex confertifolia* was on gravelly soil pockets (up to 8% cover). *Bromus tectorum*, *Sitanion hystrix*, and *Poa secunda* were common grasses. Understory forbs were sparse and included *Sphaeralcea munroana*, *Calochortus bruneaunis*, and *Crepis acuminata*.

**Ecological Condition:** Though there were no signs of cattle grazing (the site was too steep and rocky) or

other recent disturbance, the sampled stand was in C-rank ecological condition due to extensive *Bromus tectorum* cover (10% or more). *Bromus tectorum* tends to readily invade hot and exposed slopes with loose soil throughout the canyonlands.

***Artemisia tridentata tridentata/Elymus cinereus***  
(basin big sagebrush/basin wildrye)

*Artemisia tridentata tridentata/Elymus cinereus* stands are found on alluvial terraces of the Main, East Fork, South Fork, and lower Little Owyhee rivers (Moseley 1999). The plant association is also common, though limited in area, on canyon slopes as garlands on the edges of talus, at cliff bases, and in steep and rocky slot canyon washes. Canyon slope stands often have high cover of tall (over 5 feet) *Artemisia tridentata tridentata*, locally dense *Elymus cinereus*, and *Bromus tectorum* common on disturbed ground. Forbs are low in cover and diversity. Sometimes the understory is predominantly loose boulder and stone talus. The alluvial terrace sites, in contrast, are on mostly flat ground with silty clay or sand loam (e.g., Goose Creek Loam). No stands of *Artemisia tridentata tridentata/Elymus cinereus* were sampled in 1999. See Moseley (1999) for descriptions of the distribution and composition of the alluvial terrace communities.

***Artemisia tridentata tridentata/Stipa comata***  
(basin big sagebrush/needle-and-thread)

Distribution: This plant association is uncommon on the 45 Ranch Allotment. It occurs on sandy upper alluvial terraces of the South Fork Owyhee River and possibly elsewhere (Table 2). The association was only sampled in 1998, once downstream from Spring Creek and once above the ranch (Moseley 1999). The association is found on terraces with various aspects and gentle slopes (less than 1%). Soil is sandy loam, with trace amounts of silt and gravel but no rocks. One stand sampled was on an alluvial fan atop a terrace at the mouth of a small side canyon. It was below a canyon slope dominated by *Artemisia tridentata wyomingensis* plant associations and above a *Artemisia tridentata tridentata/Elymus cinereus* terrace.

Composition: Tall *Artemisia tridentata tridentata* is dominant in these stands (20 to 40% cover), with variable amounts of other shrubs species (10% or less total cover). Other common shrubs include *Chrysothamnus viscidiflorus*, *C. nauseosus*, *Grayia spinosa*, and *Sarcobatus vermiculatus*. *Stipa comata* dominates the understory with 30 to 40% cover. *Bromus tectorum* may occur with up to 30% cover. *Agropyron smithii*, *Elymus cinereus*, *Poa secunda*, and *Oryzopsis hymenoides* were also present with low cover. Forb cover was low with only trace amounts of *Artemisia dracuncululus*, *Astragalus lentiginosus*, *Crepis acuminata*, *Eriastrum sparsiflorum*, *Iva axillaris*, *Phacelia linearis*, *Rumex venosus*, and a few other species.

Ecological Condition: The stands sampled were not recently grazed and had lush *Stipa comata* cover. Historic grazing, however, has disturbed the soft sandy soil, reducing the microbiotic soil crust, and facilitating extensive *Bromus tectorum* invasion. The stands were ecological condition 'B/C.'

*Artemisia tridentata wyomingensis* Series

*Artemisia tridentata wyomingensis* is the definitive shrub on the 45 Ranch, forming a vast gray-green "sea" covering both the majority of the plateau and canyon slopes. Superficially, *Artemisia tridentata wyomingensis* communities seem monotonous, but in reality, their understory species composition is very diverse. These stands provide valuable nesting, foraging, and cover habitat for numerous sagebrush obligate birds (e.g., Brewer's sparrow, sage sparrow, sage thrasher, etc.) and mammals (e.g., rabbits, ground squirrels, antelope, etc.). *Artemisia tridentata wyomingensis* plant associations are found on all aspects and slopes, and nearly all soil types, ranging from moderately thick silty loess to gravelly and rocky canyon rims. They are often in mosaic with *Artemisia arbuscula* plant associations on thinner soils and are rare on harsh, droughty sand or cinder gravel outcrops. Despite extended summer drought and

occasional lightning, evidence of fire in the 45 Ranch's *Artemisia tridentata wyomingensis* stands is uncommon. Occasional grassy patches (e.g., Grassy Ridge), thin shrub cover, or patches of distinctly different aged shrubs are the most common signs of fire. High quality stands of *Artemisia tridentata wyomingensis* are increasingly rare in southwest Idaho. However, those on the 45 Ranch are predominantly in good to excellent ecological condition and are valuable reference stands worthy of continued conservation.

***Artemisia tridentata wyomingensis/Agropyron spicatum***  
(Wyoming sagebrush/bluebunch wheatgrass)

Distribution: On the 45 Ranch Allotment, *Artemisia tridentata wyomingensis/Agropyron spicatum* is the most commonly encountered upland plant association (Table 2). It covers most slopes in the South Fork and Little Owyhee River canyons and many of their associated rims and breaks. It is also common on higher ridges such as Grassy Ridge, Colt, Walcot Ridge, and 45 Hill (outside the allotment). It can also be found on in-canyon benches and basins, such as Juniper Basin, Spring Creek Basin, Triple Draw Basin, and Walcot Basin. Though found on a variety of aspects, slopes, and topographical positions, the plant association is rare on due N slopes and most common on convex slopes. Canyon slope soils are usually moderately thick, non-calcareous, well-drained silt loams classified as Xerollic Haplargids. These soils have moderate organic matter but minimal clay and sand. On the plateau, canyon rims, ridges, hillslopes, and in basins, this plant association is also found on silt loam soils with distinct duripans at depth (e.g., Xerollic Duragids of the Bedstead-Arbidge Association and Troughs-Sugarcreek Association, occasionally Snowmore-Willhill Association). Most soils are derived from loess or interbedded sediments, and may have large amounts of colluvial boulders, stones, cobble, and gravel embedded. This association occupies habitats intermediate in soil moisture and depth between more arid *Artemisia tridentata wyomingensis/Poa secunda* and/or *Sitanion hystrix* and more mesic *Artemisia tridentata wyomingensis/Festuca idahoensis*. Thus, *Artemisia tridentata wyomingensis/Agropyron spicatum* is notably rare on the plateau north of Spring Butte and on aspects from NW to N to NE where *Agropyron spicatum* is replaced by *Festuca idahoensis*. Similarly, *Artemisia tridentata wyomingensis/Agropyron spicatum* is rare on the dry, flat plateau (e.g., Halogeton Flat, the area between the Walcot Ridge and the South Fork, the Y-P Desert, and the greater Star Valley Knoll area (the latter two are off the allotment)). In these areas *Artemisia tridentata wyomingensis/Poa secunda* or *Artemisia tridentata wyomingensis/Sitanion hystrix* dominate. On thin soils of intermittent drainages or ridgetops, *Artemisia arbuscula* or *Artemisia longiloba* plant associations replace *Artemisia tridentata wyomingensis/Agropyron spicatum*.

Composition: The majority of *Artemisia tridentata wyomingensis/Agropyron spicatum* stands sampled on the allotment were open and savannah-like with widely spaced, 2 to 4 foot tall shrubs. Nearly all stands sampled were mid- to late-seral, though some were kept open by historic light burns. *Artemisia tridentata wyomingensis* is the dominant shrub but usually has only 15 to 25% cover (dense stands with over 30% cover are occasionally documented). Other shrubs, such as *Chrysothamnus humilis*, *C. nauseosus*, *C. viscidiflorus*, and *Grayia spinosa*, are sometimes present with total cover less than 5%. Tall and lush *Agropyron spicatum*, with an average cover of 40%, characterizes the plant association. *Poa secunda* is always common and locally abundant with up to 20% cover. Other common grasses are *Bromus tectorum* (up to 8% cover in lightly grazed stands), *Stipa thurberiana* (up to 5% cover), *Oryzopsis hymenoides*, and *Sitanion hystrix*. Forb diversity is moderate but total cover low. The most common forbs are *Antennaria dimorpha*, *Arabis holboellii*, *Aster scopulorum*, *Astragalus obscurus*, *Castilleja* spp., *Crepis acuminata*, *Crepis occidentalis*, *Epilobium brachycarpum*, *Erigeron aphanactis*, *Erigeron chrysopsidis*, *Eriogonum ovalifolium*, *Lomatium* spp., *Lupinus lepidus*, *Phlox longifolia*, and *Sphaeralcea munroana*.

Ecological Condition: Stands of *Artemisia tridentata wyomingensis/Agropyron spicatum* range from excellent A-ranked condition stands to degraded D stands with extensive *Bromus tectorum* (up to 25% cover) and *Sisymbrium altissimum*. The majority of stands on the 45 Ranch allotment are in B-ranked condition due to minor *Bromus tectorum* invasion (usually less than 5% cover). Many of these stands are

on steep or erosive SW to S to SE facing slopes and have naturally lower cover of native vegetation and soil crust. These stands, even when ungrazed, are highly susceptible to *Bromus tectorum* invasion. At numerous C-ranked condition sites, locally excessive cattle grazing has caused soil disturbances, such as broken microbiotic soil crust, erosion, and hoof pugging (deep imprints in soft, wet ground), allowing *Bromus tectorum* cover to increase more significantly (up to 20%). There are a few D-ranked condition stands with very high exotic species cover and clearly excessive grazing (due to their proximity to cattle trails, flat ground, or water reservoirs) or other disturbances, such as fire. Areas of C- and D-ranked conditions are mainly the gentler slopes of basins and in-canyon benches (where cattle loaf) and near the 45 Landing Strip (heavy horse and cow traffic). In contrast, occasional A-ranked condition stands have much higher cover of microbiotic soil crust (up to 12%+) and only trace amounts of *Bromus tectorum*.

***Artemisia tridentata wyomingensis/Festuca idahoensis***  
(Wyoming big sagebrush/Idaho fescue)

Distribution: Though *Artemisia tridentata wyomingensis/Festuca idahoensis* is the second most commonly encountered plant association on 45 Ranch, its distribution is much less continuous than other adjacent *Artemisia tridentata wyomingensis* associations (Table 2). For example, *Artemisia tridentata wyomingensis/Festuca idahoensis* is found throughout the canyons of the South Fork, Main, East Fork, and Little Owyhee rivers but is restricted to steep (to over 60%!), sheltered slopes with usually NW to N to NE aspects (rarely E or W). It is seen on similar slopes of canyon basins such as Juniper Basin, Spring Creek Basin, and Triple Draw Basin but is notably rare on exposed in-canyon benches. It is found on a variety of topographical configurations. *Artemisia tridentata wyomingensis/Stipa thurberiana* may be present on adjacent more gentle terrain. *Artemisia tridentata wyomingensis/Festuca idahoensis* is also common on the plateau (above about 5,000 feet elevation) around Spring Creek Butte, north of Spring Creek drainage. Here, it is found in areas of mounded topography (also called Biscuit and Swale) on various aspects and gentle slopes (less than 10%). South of Spring Creek, the association is on northerly facing slopes of Grassy Ridge and Colt but not on the plateau. *Artemisia tridentata wyomingensis/Festuca idahoensis* is typically found on deep silt loam soils similar to those described for *Artemisia tridentata wyomingensis/Agropyron spicatum*. Soils vary from fine silt and clay to rocky, with numerous colluvial boulders, stones, and cobbles embedded. On the plateau around the base of Spring Butte, the plant association occurs on deep loess soil mounds (Bedstead-Arbidge Association) which range in height from 1 to 2 m and vary in size from several to tens of square meters. Due to this unusual microtopography, *Artemisia tridentata wyomingensis/Festuca idahoensis* forms a complex landscape mosaic with *Artemisia arbuscula* (which occupies the inter-mound, thin soil swales).

Composition: In the majority of *Artemisia tridentata wyomingensis/Festuca idahoensis* stands, the cover of *Artemisia tridentata wyomingensis* averages about 25% (usually falling in the 15 to 30% range). Shrub heights range from 2 to 4 feet. Stands are open and savannah-like but sometimes include patchy *Artemisia arbuscula* (up to about 20% cover). Other shrubs present may include *Artemisia tridentata tridentata*, *Chrysothamnus humilis* (up to about 10% cover in mid-seral stands), *C. nauseosus*, *C. viscidiflorus*, and *Grayia spinosa*. All stands sampled were either mid- or late-seral; evidence of fire was rare. The plateau mound occurrences of the plant association have noticeably higher understory species diversity than those on canyon slopes. A lush carpet of *Festuca idahoensis* dominates the understory, usually with 40 to 50% cover. *Poa secunda* and *Agropyron spicatum* are common and locally abundant, but their covers are usually less than 5% each. On canyon slopes the most common forbs are *Antennaria dimorpha*, *Aster scopulorum*, *Crepis acuminata*, *Erigeron bloomeri*, and *Phlox longifolia*. In addition to the aforementioned forbs, common forbs on plateau mounds are *Astragalus eremiticus*, *Astragalus obscurus*, *Blepharipappus scaber*, *Cordylanthus ramosus*, *Crepis occidentalis*, *Lomatium cous*, and *Lupinus lepidus*.

Ecological Condition: The *Artemisia tridentata wyomingensis/Festuca idahoensis* plant association is usually resilient to moderate grazing and resistant to *Bromus tectorum* invasion. Canyon slope stands, only occasionally grazed due to their inaccessibility and steepness, were nearly all A-ranked condition (only a few moderately grazed B-ranked stands were found). These A-ranked stands had only trace

amounts of *Bromus tectorum*, minor natural erosion, and microbiotic soil crust was common in the plant interspaces (up to 15% cover). In contrast, the gentler basin slopes and plateau mound areas were moderately to heavily grazed. Most stands were in B-ranked condition, though several C- and D-ranked condition sites were documented in Juniper Basin and near the 45 Landing Strip. In B-ranked condition stands, trampling by cattle had churned the soft loess soil and reduced the soil microbiotic crust. As a result, soil had eroded around plants creating pedestalled grass clumps. In addition, some *Festuca idahoensis* clumps in B-ranked stands had dead centers indicating incomplete recovery from grazing. However, unlike *Artemisia tridentata wyomingensis/Agropyron spicatum* occurrences, grazing damage did not always equate to *Bromus tectorum* increases. The majority of B-ranked stands had less than 5% *Bromus tectorum*. In contrast, C- and D-ranked stands were heavily grazed and had high *Bromus tectorum* cover.

***Artemisia tridentata wyomingensis/Poa secunda* and  
*Artemisia tridentata wyomingensis/Sitanion hystrix***

(Wyoming big sagebrush/Sandberg's bluegrass and Wyoming big sagebrush/squirreltail)

Distribution: On the 45 Ranch Allotment, *Artemisia tridentata wyomingensis/Poa secunda* and *Artemisia tridentata wyomingensis/Sitanion hystrix* are the most common plant associations on the relatively flat, hot, and dry plateaus south of Spring Creek Basin (Figure 4). These two associations form a mosaic but often blend imperceptibly into a seemingly endless sagebrush desert "sea." Combined, these associations are the third most frequently sampled plant associations, but possibly cover the largest area of any vegetation on the allotment. They form the dominant vegetation on the vast basaltic plateaus of Halogeton Flat, the area between the Walcot Ridge and the South Fork (e.g., above Triple Draw Basin), the Y-P Desert, and the area south of Spring Creek to Star Valley Knoll (the latter areas are off the allotment). The mosaic of *Artemisia tridentata wyomingensis/Poa secunda* and *Artemisia tridentata wyomingensis/Sitanion hystrix* is rare on canyon slopes, but is occasionally found on rims, in basins (e.g., Spring Creek Basin and Walcot Basin), on benches, or on ridges (e.g., Grassy Ridge). Illustrating an affinity to flat or gently undulating terrain, 84% of the *Artemisia tridentata wyomingensis/Poa secunda* and *Artemisia tridentata wyomingensis/Sitanion hystrix* stands sampled were on slopes less than 5%. Three stands were on slopes 5 to 10% and only 4 stands were on canyon or ridge slopes over 10%. The associations do not show an affinity to a particular slope aspect or topographical configuration.

*Artemisia tridentata wyomingensis/Poa secunda* and *Artemisia tridentata wyomingensis/Sitanion hystrix* are nearly always found on soils belonging to Bruncan-Arbidge Complex or Arbidge-Hunnton Silt Loams. These soils are moderately thick, often calcareous, silt loams with duripans at depth. Soils are derived from loess, or sometimes interbedded sediments, and have varying amounts of rock, gravel, and clay. In many places on the plateau, there are barren slickspots, or playa-like areas (sometimes over 50 square meters), where silt, clay, and minerals (e.g., sodium) have accumulated, creating minimally productive heavy soil with little vegetation. Soils in Spring Creek and Juniper Basin are loamy skeletal Xerollic Durargids of the Troughs-Sugarcreek Association.

Composition: The composition of *Artemisia tridentata wyomingensis/Poa secunda* and *Artemisia tridentata wyomingensis/Sitanion hystrix* are very similar. These *Artemisia tridentata wyomingensis*-dominated stands are open, with the shrub canopy cover averaging 20 to 30% (occasionally up to 35%). Multiple *Artemisia tridentata wyomingensis* age and size classes are present in many occurrences observed on 45 Ranch (indicated passed disturbance history). Other shrubs species typically occur with low cover. *Atriplex confertifolia*, *Chrysothamnus humilis*, *C. viscidiflorus*, *Eurotia lanata*, and *Grayia spinosa* may be present. The majority of stands sampled were mid- and late-seral. Understory plant cover is sparse and stands typically have low species diversity. In *Artemisia tridentata wyomingensis/Poa secunda*, the cover of *Poa secunda* is usually about 15 to 25% with *Sitanion hystrix* having about 5 to 10% cover. *Artemisia tridentata wyomingensis/Sitanion hystrix* stands, in contrast, are dominated by *Sitanion hystrix* (with up to 15% cover), though *Poa secunda* is nearly co-dominant (up to 10% cover). At times, the distinction between the two associations seems arbitrary. Other common grasses with low cover include *Agropyron spicatum*, *Bromus tectorum*, *Oryzopsis hymenoides*, *Stipa*

*thurberiana*, and *Stipa webberi*. Both associations share similar forbs, though none occur with more than a few percent cover. The most commonly encountered forbs are *Arabis* spp., *Aster scopulorum*, *Astragalus* spp., *Chaenactis douglasii*, *Crepis acuminata*, *Crepis occidentalis*, *Erigeron chrysopsidis*, *Eriogonum ovalifolium*, *Lepidium perfoliatum*, *Lomatium* spp., *Phlox hoodii*, and *Phlox longifolia*.

**Ecological Condition:** The majority of both *Artemisia tridentata wyomingensis*/*Poa secunda* and *Artemisia tridentata wyomingensis*/*Sitanion hystrix* stands are in A- or AB-ranked condition, with several BC-ranked stands. In general, A- or AB-ranked stands have zero to 1% cover of *Bromus tectorum* while BC-ranked stands have up to 5% *Bromus tectorum* cover. *Lepidium perfoliatum* is another common exotic species in B- through D-ranked stands, though its cover is usually low. Undisturbed A- and less disturbed B-ranked stands are characterized by extensive patches of microbiotic soil crust (about 20 to 40%+ cover) interspersed with smooth and barren slickspot areas. In contrast, areas disturbed by chronic moderate to heavy cattle grazing (e.g., B- through D-ranked stands) have extensive trailing, hoof printing (pugging), broken crust, churned soil, and exotic species cover. The soft loess soil on which these associations occur is susceptible to churning by cattle, especially when it is moist in winter and spring.

In many stands of these associations two distinct *Artemisia tridentata wyomingensis* cohorts (differentiated by size, growth form, and age) are present. This multiple cohort structure may be subtle or more well defined, where young *Artemisia tridentata wyomingensis* individuals are replacing severely broken, standing dead large, old individuals. This structural condition is purportedly the result of historic intense horse grazing on the allotment. We did not collect *Artemisia tridentata wyomingensis* stand age data. The current ecological condition of multiple cohort stands was not noticeably different from that of single cohort stands.

#### ***Artemisia tridentata wyomingensis*/*Stipa comata* (Wyoming big sagebrush/needle-and-thread)**

**Distribution:** *Artemisia tridentata wyomingensis*/*Stipa comata* is a relatively rare plant association both globally and on 45 Ranch (Table 2). It was documented only in Walcot Basin at the south boundary of the allotment and also sampled once on a high alluvial terrace of the lower South Fork Owyhee River. In Walcot Basin, it is found on sandy toeslopes with varied microtopography, W-SW to S aspects, and gentle to moderate (10 to 21%) slopes. The association is restricted to pockets of gravelly sandy loam soil, often with colluvial boulders, stones, and cobble embedded. On the South Fork, the association is located on a high, sandy terrace above an *Artemisia tridentata tridentata*/*Elymus cinereus* bar and at the toe of an *Artemisia tridentata wyomingensis*/*Festuca idahoensis* slope.

**Composition:** *Artemisia tridentata wyomingensis*/*Stipa comata* is characterized by open stands of mature *Artemisia tridentata wyomingensis* with about 10 to 20% cover (occasionally up to 30% cover). Other shrubs are usually present and sometimes abundant, including *Artemisia tridentata tridentata*, *Chrysothamnus humilis*, *C. nauseosus* and *C. viscidiflorus* (both up to 15% cover), *Grayia spinosa*, and *Leptodactylon pungens*. *Stipa comata*, of varying aged plants, dominates the understory with 10 to 35% cover. Other commonly recorded and occasionally abundant grasses are *Agropyron spicatum*, *Bromus tectorum*, *Elymus cinereus*, *Oryzopsis hymenoides*, *Poa secunda*, and *Stipa thurberiana*. Forbs are all low cover and include many annuals, such as *Camissonia claviformis*, *Cryptantha circumscissa*, *Eriastrum sparsiflorum*, and *Eriogonum vimineum*. Sand tolerant perennials, such as *Crepis* spp., *Erigeron* spp., *Eriogonum ovalifolium*, *Oenothera caespitosa*, *Orobanche corymbosa*, *Phlox* spp., *Rumex venosus*, and *Sphaeralcea munroana*, are also common.

**Ecological Condition:** In Walcot Basin, stands of *Artemisia tridentata wyomingensis*/*Stipa comata* are mid- to late-seral and degraded, ranging from BC- to CD-ranked condition. *Bromus tectorum* is common and locally abundant with up to 30% cover. The loose sand, palatable grasses, and gentle slopes in this area make these stands highly susceptible to cattle-caused soil displacement, erosion, and subsequent *Bromus tectorum* invasion. The Walcot Basin appears to have moderate grazing and there is evidence of historic fire. The alluvial terrace stand located on the South Fork is not grazed and in A-ranked condition,

having less than 3% *Bromus tectorum* cover and 10% microbial soil crust cover.

***Artemisia tridentata wyomingensis/Stipa thurberiana***  
(Wyoming big sagebrush/Thurber's needlegrass)

Distribution: Throughout southwest Idaho and on the 45 Ranch, *Artemisia tridentata wyomingensis/Stipa thurberiana* is widely, but irregularly, distributed. This plant association is fourth most commonly encountered on the allotment (Table 2). It is relatively common in the tributary basins of the South Fork Owyhee River, from Juniper Basin south through Spring Creek Basin to Triple Draw Basin, on rocky soils derived from interbedded sediments. On the plateau, however, *Artemisia tridentata wyomingensis/Stipa thurberiana* is only common on hills and ridges south of the confluence of the Little Owyhee and South Fork Owyhee rivers. It is also found on Grassy Ridge, in Tent Creek and Star Valley areas, and in the Y-P Desert. Unlike the frequently neighboring *Artemisia tridentata wyomingensis/Festuca idahoensis* and *Artemisia tridentata wyomingensis/Agropyron spicatum*, this community is restricted to gentle or moderate slopes. For example, it is common on the canyon rim breaks, rolling ridges, and toeslopes of the Walcot Ridge, Colt, the hills between the Little and South Fork confluence, and Walcot Basin. All but one of the stands sampled were on slopes of 20% or less, with the average slope about 7%. In addition, 80% of the stands sampled were on aspects from W to E-SE (274 to 113 degrees). It is also occasionally seen on rocky alluvial fans atop river terraces and in intermittent drainages. Soils are well drained, thin to moderately thick, and typically loamy skeletal or silt loam in texture, and always have varying amounts of sand, gravel, and embedded boulders, stones, and cobble. Soils of the Walcot Ridge region are usually Durixerollic Haplargids of the Snowmore-Willhill Association, derived from rhyolite weathering with discontinuous duripans. Soils in Juniper and Spring Creek basins are Xerollic Durargids of the Troughs-Sugarcreek Association, derived from interbedded sediments with shallow duripans. The plant association is occasionally also found on Arbridge-Hunnton Silt Loams derived from loess.

Composition: Like other *Artemisia tridentata wyomingensis* associations, stands of *Artemisia tridentata wyomingensis/Stipa thurberiana* are open and savannah-like. The cover of *Artemisia tridentata wyomingensis* ranges from 15 to over 30% but averages around 20 to 25%. Other shrubs, especially *Chrysothamnus humilis* (occasionally over 5% cover) and *Grayia spinosa*, are commonly associated, while *Atriplex confertifolia*, *C. nauseosus*, *Eurotia lanata*, *Leptodactylon pungens*, and *Tetradymia glabrata* are less common. *Stipa thurberiana* is the dominant understory grass species usually with 10 to 30% cover (more cover in late-seral stands). However, in mid-seral stands *Agropyron spicatum* (up to 10% cover), *Bromus tectorum*, *Poa secunda* (up to 30% cover), or *Sitanion hystrix* (up to 15%) are locally abundant, or even co-dominant, making community definition ambiguous. *Festuca idahoensis*, *Oryzopsis hymenoides*, and *Stipa webberi* are also occasionally documented. The most commonly sampled forbs, usually with less than 3% cover, are *Astragalus purshii*, *Aster scopulorum* (up to 5% cover), *Castilleja chromosa*, *Chaenactis douglasii*, *Crepis acuminata*, *Crepis occidentalis*, *Erigeron chrysopsidis* (occasionally over 5% cover), *Eriogonum ovalifolium*, *Penstemon humilis*, *Phlox hoodii*, and *Phlox longifolia*.

Ecological Condition: *Artemisia tridentata wyomingensis/Stipa thurberiana* stands on the 45 Ranch are evenly distributed among the ecological condition classes. High quality, A- and B-ranked stands occur within Spring Creek Basin and upslope of Stud Pile Reservoir. Lower quality stands are generally distributed throughout the range of the association on the Ranch. Since *Stipa thurberiana* is highly palatable, especially in the spring, cattle selectively graze it more heavily. Thus, C condition stands often have reduced *Stipa thurberiana* cover relative to other grass species. *Stipa thurberiana* clumps in both B and C condition stands often have dead centers, the result of incomplete recovery after grazing. In addition, *Artemisia tridentata wyomingensis/Stipa thurberiana* occurrences are typically on gentle slopes, which are easily accessible by livestock. In B- and C-ranked stands, cattle churn and pug the soil surface, breaking the soil microbial crust, and causing increased soil erosion. *Bromus tectorum* commonly invades such damaged sites, sometimes with cover over 25% (e.g., D-rank condition stands).

## Mixed Evergreen-deciduous Shrubland

### *Atriplex confertifolia* Series

Thorny *Atriplex confertifolia* communities occupy the hottest and driest sites on the 45 Ranch. These sites come close to the definition of desertic, having low understory vegetative cover and much bare soil (often with varnished surface gravel similar to desert pavement). These communities have an affinity for fine-textured calcareous loams derived from interbedded (lacustrine?) sediments or ash, often with duripans at depth. These soils are exposed on steep canyon and basin slopes on the allotment south of Spring Creek Basin and found on the southern plateau (around Star Valley). *Atriplex confertifolia* associations are very common in the Great Basin but much more restricted in distribution in southern Idaho and Oregon. They are especially rare on the 45 Ranch, found only as small patches on southerly aspects within the greater matrix of *Artemisia tridentata wyomingensis*. They are not large enough to provide significant habitat, though they add both structural and species diversity to the vegetation. Fire is probably more frequent on these droughty slopes, however, the low amount of fuel in these stands prevents large or intense burns.

#### ***Atriplex confertifolia*/Agropyron spicatum** (shadscale/bluebunch wheatgrass)

Distribution: *Atriplex confertifolia*/Agropyron spicatum is a rare plant association on the 45 Ranch (Table 2). Two occurrences were observed -- one is located in Spring Creek Basin and the other on a bench slope in the South Fork Owyhee River canyon south of Bull Camp. Both sites are droughty, erosive, steep (28 and 55% slopes), and south-facing (131 and 233 degrees). Both stands occur on gravelly soil derived from interbedded sediments, with numerous embedded colluvial boulders, stones, and cobbles. In Spring Creek Basin the soil is composed of greenish volcanic ash and probably belonged to the Troughs-Sugarcreek Association. South of Bull Camp the soil is silty, with a desert pavement appearance, and possibly classified as a Xerollic Haplargids. *Artemisia tridentata wyomingensis*/Agropyron spicatum was adjacent.

Composition: The *Atriplex confertifolia*/Agropyron spicatum occurrences on 45 Ranch are degraded and mid- to late-seral. The cover of *Atriplex confertifolia* is low (8 to 12%) and exotic species are common. *Artemisia spinosa*, *Artemisia tridentata wyomingensis*, *Chrysothamnus humilis* (up to 8% cover), *C. nauseosus*, *C. viscidiflorus*, and *Grayia spinosa* were all recorded with low cover. *Agropyron spicatum* is the dominant grass species with 25 to 50% cover. *Poa secunda* (up to 5% cover), *Sitanion hystrix*, *Stipa thurberiana*, and *Vulpia bromoides* were also present with low cover. The most conspicuous forbs were *Crepis occidentalis*, *Erigeron* spp., and *Sphaeralcea munroana*. Exotic forb species were common but had only low cover (e.g., *Erodium cicutarium*, *Lactuca serriola*, *Lepidium perfoliatum*, and *Sisymbrium altissimum*). Numerous desert annuals were also observed in this community including *Eriastrum sparsiflorum*, *Layia glandulosa*, *Lupinus uncialis*, and *Pectocarya setosa*.

Ecological Condition: The *Atriplex confertifolia*/Agropyron spicatum stands observed are in degraded C-ranked ecological condition. Though neither stand showed signs of recent grazing, both had significant *Bromus tectorum* invasion (8 to 20 % cover) on the naturally bare and eroded soil, other exotic species, and a few dead grass clumps. Historic grazing, fire, and drought are the likely disturbances.

#### ***Atriplex confertifolia*/Oryzopsis hymenoides** (shadscale/Indian ricegrass)

Distribution: The *Atriplex confertifolia*/Oryzopsis hymenoides plant association is very rare on the 45 Ranch (Table 2). The association was documented only once in Spring Creek Basin as a small inclusion within a stand of *Artemisia tridentata wyomingensis*/Agropyron spicatum. The association occurs on a S-SE facing (144 degrees), moderately steep (42%) slopes on white, silty-sandy loam soil derived from gravelly interbedded sediments. The soil type is unknown. It may also occupy some small slickspots

and rodent churned mounds within *Artemisia tridentata wyomingensis*/*Poa secunda* and/or *Sitanion hystrix* communities (Bruncan-Arbidge Complex soils) and patches of steep, white colored clay-silt (ash?) outcrops in the South Fork canyon.

Composition: *Atriplex confertifolia* and *Grayia spinosa* were the most common shrubs in the *Atriplex confertifolia*/*Oryzopsis hymenoides* stand sampled. *Artemisia spinosa*, *Artemisia tridentata wyomingensis*, and *Chrysothamnus nauseosus* were also present. Total shrub cover was 15 to 25%. *Oryzopsis hymenoides* was the dominant grass with *Stipa comata* also observed.

Ecological Condition: The *Atriplex confertifolia*/*Oryzopsis hymenoides* sampled was in BC-ranked ecological condition with abundant *Bromus tectorum*.

***Atriplex confertifolia*/*Sitanion hystrix***  
(shadscale/squirreltail)

Distribution: *Atriplex confertifolia*/*Sitanion hystrix* is also rare on the 45 Ranch (Table 2). The plant association was sampled once in Spring Creek Basin, though it was also observed off the allotment on Tent Creek Point and near Star Valley Knoll. In Spring Creek Basin it was sampled on a convex shaped W facing (269 degrees), 37% slope of interbedded sediments, but was also observed on SW to S slopes. The association occurs on gravelly greenish ash soil with loamy skeletal texture and many cobbles embedded. The soil probably belongs to the Troughs-Sugarcreek Association. In the Star Valley area it was observed both as large discreet blocks and as inclusions on slickspots and rodent churned mounds within stands of *Artemisia tridentata wyomingensis*/*Poa secunda* and *Artemisia tridentata wyomingensis*/*Sitanion hystrix*. Soils were probably silt loams of the Bruncan-Arbidge Complex.

Composition: The *Atriplex confertifolia*/*Sitanion hystrix* stand sampled is early- to mid-seral and weakly formed. It is dominated by *Chrysothamnus humilis* (25% cover) with *Atriplex confertifolia* common to well represented (10% cover). *Artemisia spinosa* and *Artemisia tridentata wyomingensis* are also present. In this stand *Poa secunda* dominated with 40% cover followed by *Sitanion hystrix* (5% cover). *Agropyron spicatum* and *Stipa thurberiana* are also present with 1% cover each. The most noticeable forbs are *Aster scopulorum*, *Astragalus purshii*, *Erigeron chysopsidis*, *Microseris troximoides*, *Phlox hoodii*, and *Phlox longifolia*. In contrast, the Star Valley stands were late-seral with 20 to 30% *Atriplex confertifolia* cover and *Sitanion hystrix*, the most dominant grass (up to 10% cover). Other species observed in the Star Valley stands included *Eurotia lanata*, *Oryzopsis hymenoides*, *Astragalus newberryi*, *Chaenactis douglasii*, *Crepis acuminata*, *Eriogonum ovalifolium*, *Lappula redowskii*, and *Sphaeralcea munroana*.

Ecological Condition: The *Atriplex confertifolia*/*Sitanion hystrix* stand in Spring Creek Basin is in B-ranked condition with some light cattle grazing present. The soil was naturally erosive and exposed with moderate *Bromus tectorum* invasion.

## Deciduous Shrubland Vegetation

### *Artemisia cana* Series

We observed several *Artemisia cana* associations in intermittent drainages and lakes (e.g., vernal pools/playas) on the northwestern plateau of the 45 Ranch and in the Little Owyhee River. They generally occur on poorly drained Babbington-Piline silt loam soils characterized by some clay and sodium accumulation. They are also on the margins of playas with Duric Natrargic soils. These plant associations, including *Artemisia cana*/dry graminoid and *Artemisia cana*/*Muhlenbergia richardsonis*, were sampled in 1998. No new sites were sampled in 1999. See Moseley (1999) for descriptions of their distribution and composition.

### Miscellaneous Series

***Acer glabrum-Holodiscus dumosus-Ribes* spp.**  
(Rocky Mountain maple-rockspirea-currant)

Though limited in extent, a previously un-described mixed deciduous shrub community type is occasionally present in the Main, East Fork, South Fork, and lower Little Owyhee River canyons on the 45 Ranch (Table 2). The community occurs on steep, sheltered, northerly facing slopes which could accumulate snow drifts. The community often forms garlands on the edges of talus, patches at the base of cliffs, and thickets in steep and rocky slot canyon washes. On these sites it was in mosaic with, or blended with, *Artemisia tridentata tridentata/Elymus cinereus*. The stands were typically composed of dense, 2 to 4 foot tall, thickets of *Holodiscus dumosus*, *Ribes cereum*, *R. inerme*, *R. velutinum*, and *Symphoricarpos oreophilus parishii*. Occasional clumps of tall *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia tridentata tridentata*, and *Sambucus cerulea* were also seen, either isolated or mixed with shrub thickets. *Rosa woodsii* and *Ribes aureum* are expected on moister sites. The understory was sparse with only patchy *Agropyron spicatum*, *Elymus cinereus*, and *Bromus tectorum* noticeable. Sometimes the understory was predominantly loose boulder and stone talus. The stands are inaccessible to cattle, disturbed only by natural rock movement, and probably in good ecological condition.

***Sarcobatus vermiculatus/Poa secunda* and other *Sarcobatus vermiculatus* stands**  
(greasewood/Sandberg's bluegrass)

*Sarcobatus vermiculatus/Poa secunda* is a previously un-described plant association sampled only in 1998 on alluvial terraces of the South Fork Owyhee River at Bull Camp and Coyote Hole. It may also be present around the ranch's hayfields. See Moseley (1999) for a description of its distribution and composition. In addition, small and variable stands of *Sarcobatus vermiculatus* were observed but not sampled in the uplands. These stands have tall *Sarcobatus vermiculatus* intermixed with *Artemisia tridentata tridentata* (and/or *wyomingensis*), *Atriplex confertifolia*, *Grayia spinosa*, and *Tetradymia glabrata*. They have sparse but variable understories (e.g., mixed *Agropyron spicatum*, *Bromus tectorum*, *Elymus cinereus*, *Poa secunda*, and *Sitanion hystrix*). These stands were observed on whitish colored, silty interbedded sediment outcrops in Spring Creek Basin and on the canyon slopes of the South Fork Owyhee River south of Spring Creek Basin. *Sarcobatus vermiculatus* stands form horizontal bands where the water table is forced near the surface by underlying impenetrable rhyolite. Where springs emerge at such sites, *Sarcobatus vermiculatus* sometimes forms a narrow band of transitional vegetation between wetland and upland communities. Due to their proximity to springs, many stands are moderately grazed and have high cover of *Bromus tectorum*.

Evergreen Dwarf Shrubland Vegetation

*Artemisia arbuscula* and *Artemisia longiloba* Series

*Artemisia arbuscula* and *Artemisia longiloba* are both low sagebrush species found on shallow, rocky soils of buttes, ridges, hills, swales, and intermittent drainages on the 45 Ranch. Though not as widespread as *Artemisia tridentata wyomingensis* plant associations, *Artemisia arbuscula* associations occasionally cover large areas. *Artemisia arbuscula* plant associations often appear as grassy islands in the sagebrush "sea" because associated perennial grass species (*Agropyron spicatum* and *Festuca idahoensis*) often overtop the low shrub canopy. *Artemisia longiloba* (considered by some to be a form of *Artemisia arbuscula*) is less common on the 45 Ranch. Both species are found on sites with shallow clay hardpans. *Artemisia longiloba*, however, is restricted to sites with claypan soils while *Artemisia arbuscula* is not (Hironaka et al. 1983). *Artemisia arbuscula* and *Artemisia longiloba* do not provide much cover or nesting habitat for birds and mammals. Antelope commonly graze these stands. *Artemisia arbuscula* foliage is important winter forage for sage grouse. The associations are relatively diverse in understory plant species composition. Since there is no tall shrub canopy to carry fire, burns are rare and probably light. In addition, stands are relatively open, with more rocks and gravel than ground fuels.

***Artemisia arbuscula/Agropyron spicatum* and  
*Artemisia longiloba/Agropyron spicatum***

(low sagebrush/bluebunch wheatgrass and early sagebrush/bluebunch wheatgrass)

Distribution: *Artemisia arbuscula/Agropyron spicatum* and *Artemisia longiloba/Agropyron spicatum* plant associations are occasionally found on higher elevation hills and ridges of the 45 Ranch (Figure 4). *Artemisia longiloba/Agropyron spicatum* is rare, documented only from northern end of the Walcot Ridge. Here it is found on gently sloped (7 to 11%), convex-shaped, E-NE to E facing (70 to 88 degrees) ridge slopes. Interestingly, *Artemisia arbuscula/Agropyron spicatum* is also found on this ridge system on similar aspects and gentle convex slopes. *Artemisia arbuscula/Agropyron spicatum* is more widespread on the allotment, with most stands located in the Walcot Ridge from Colt/Walcot Ridge north to the hills between the Little and South Fork Owyhee River confluence. It is most common on convex, gently to moderately sloping (usually less than 20%), N-NW to N to E-SE aspects (340 to 129 degrees), though it is occasionally found in intermittent drainages. It is also isolated on Spring Butte and in Juniper Basin (the only site less than 5,140 feet elevation). Both *Artemisia arbuscula/Agropyron spicatum* and *Artemisia longiloba/Agropyron spicatum* are found on shallow, gravelly loamy skeletal soils with numerous boulders, stones, and cobbles. Rocks are either embedded or found in vertically oriented stringers of loose talus patterning the hills with distinct stripes. In the Walcot Ridge region, soils are Durixerollic Haplargids of the Snowmore-Willhill Association, derived from rhyolite weathering with discontinuous duripans. In Juniper Basin the association is found on Xerollic Durargids of the Dougal-Bruncan Stony Sandy Loams, derived from loess with a shallow duripan. Stands dominated by *Artemisia longiloba* may have slightly higher clay content in the soil than those with *Artemisia arbuscula*.

Composition: *Artemisia arbuscula/Agropyron spicatum* and *Artemisia longiloba/Agropyron spicatum* are similar in species composition. *Artemisia arbuscula* and *A. longiloba* are morphologically similar low growing shrubs (less than 2 feet tall). On ecotonal gradients common between the two associations, the two low sagebrush species often co-occur. Differentiation of the two associations is based on the abundance of *Artemisia longiloba* versus *Artemisia arbuscula*. Shrub canopy cover in these low sagebrush stands ranges from 12 to 40%. *Artemisia tridentata wyomingensis* is the only other common shrub (with up to 5% cover), though *Eriogonum sphaerocephalum* is also occasionally present. *Agropyron spicatum* dominates the understory (with 12 to 30% cover) and both *Poa secunda* (4 to 15% cover) and *Stipa thurberiana* are locally common and abundant. Other common grasses with low cover are *Bromus tectorum* and *Sitanion hystrix*. The most commonly encountered forbs, all with usually less than 5% cover, are *Balsamorhiza hookeri*, *Blepharipappus scaber*, *Crepis occidentalis*, *Erigeron bloomeri*, *Erigeron chrysopsidis*, *Erigeron linearis*, *Eriogonum caespitosum*, *Lomatium cous*, *Lomatium macrocarpum*, *Lupinus brevicaulis*, *Lupinus lepidus*, *Phlox longifolia*, *Penstemon* spp., and *Trifolium macrocephalum*.

Ecological Condition: Nearly all of the *Artemisia arbuscula/Agropyron spicatum* stands sampled were late-seral A- or AB-ranked condition, having only light grazing and zero to 2% *Bromus tectorum* cover. Microbiotic soil crust was naturally low (12% or less) and the ground was covered with rocks and gravel. The rocky ground probably prevents over use by cattle. *Artemisia longiloba/Agropyron spicatum* stands were AB- and B-ranked condition (due to 5% *Bromus tectorum* cover). The only *Artemisia arbuscula/Agropyron spicatum* stand in B-ranked condition was in a moderately grazed intermittent drainage with disturbed soil and some dead centered grass clumps.

***Artemisia arbuscula/Festuca idahoensis* and  
*Artemisia longiloba/Festuca idahoensis***

(low sagebrush/Idaho fescue and early sagebrush/Idaho fescue)

Distribution: *Artemisia arbuscula/Festuca idahoensis* is a common plant association on the 45 Ranch (Table 2). Its distribution extends from Colt, north to the hills between the Little and South Fork Owyhee rivers, to Juniper Basin, on Spring Butte, throughout the plateau around the base of Spring Butte, and on to the benches in the Main Owyhee River canyon. The association is sometimes also in intermittent

drainages. *Artemisia longiloba/Festuca idahoensis*, by contrast, is rare on the allotment, documented only from Colt and Spring Butte. On the Biscuit and Swale mounded topography on the plateau around Spring Butte, *Artemisia arbuscula/Festuca idahoensis* forms a complex mosaic with *Artemisia tridentata wyomingensis/Festuca idahoensis*. Here, *Artemisia arbuscula/Festuca idahoensis* is found on all aspects in gently sloped (less than 11%) swales of thin, rocky silt loam soil between thick loess mounds (dominated by *Artemisia tridentata wyomingensis/Festuca idahoensis*). These soils are mainly Xerollic Durargids of the Bedstead-Arbidge Association and have a shallow duripan restricting water percolation in the spring. The *Artemisia arbuscula/Festuca idahoensis* community is also found on Xerollic Paleargids of canyon slopes. Interestingly, on ridge sites south of the confluence of the Little and South Fork Owyhee rivers, *Artemisia arbuscula/Festuca idahoensis* is restricted to sheltered, N-NW to E-NE facing (330 to 60 degrees) slopes between 11 and 34% where snow drifts might accumulate. Similarly, *Artemisia longiloba/Festuca idahoensis* is found on N-NW to N-NE aspects (341 and 22 degrees), though on more gentle slopes (e.g., 3 and 20%). It seems restricted to convex ridge or butte slopes at about 5,465 feet elevation. In this area both *Artemisia arbuscula/Festuca idahoensis* and *Artemisia longiloba/Festuca idahoensis* are on thin, gravelly, loamy skeletal soil, derived from rhyolite, with numerous cobbles embedded (e.g., the Snowmore-Willhill Association). *Artemisia longiloba/Festuca idahoensis* is found on sites with stronger claypan formation (Hironaka et al. 1983). Occasionally, vertically oriented stone and boulder talus stripes are also present.

**Composition:** The composition of both *Artemisia arbuscula/Festuca idahoensis* and *Artemisia longiloba/Festuca idahoensis* is very similar. *Artemisia arbuscula* usually has 18 to 30% cover, though, *Artemisia longiloba* cover is only 9% (based on one *Artemisia longiloba/Festuca idahoensis* plot). A few stands in Juniper Basin and along the south rim of the Main Fork canyon have scattered young *Juniperus occidentalis* trees. *Artemisia tridentata wyomingensis*, *Chrysothamnus nauseosus*, and *Eriogonum sphaerocephalum* are also sometimes present with low cover (less than 5%). However, in transitional stands, *Artemisia tridentata wyomingensis* cover may be as high as 15%. *Festuca idahoensis* usually has between 30 to 50% cover, forming a lush carpet the same height as the low sagebrush. *Poa secunda* is common and abundant (with 5 to 20% cover), while *Agropyron spicatum* and *Sitanion hystrix* are sometimes also present (with only low cover). The diversity of understory forbs is high but their total cover is low. The most frequently encountered forbs are *Allium acuminatum*, *Arenaria kingii*, *Aster scopulorum*, *Astragalus obscurus*, *Balsamorhiza hookeri*, *Blepharipappus scaber*, *Castilleja pallescens*, *Cordylanthus ramosus*, *Crepis occidentalis*, *Erigeron bloomeri*, *Eriogonum caespitosum*, *Eriophyllum lanatum*, *Haplopappus stenophyllus*, *Lomatium* spp., *Lupinus lepidus*, *Phlox longifolia*, and *Trifolium macrocephalum*.

**Ecological Condition:** All but a few stands of *Artemisia arbuscula/Festuca idahoensis* and *Artemisia longiloba/Festuca idahoensis* sampled were late-seral and in excellent A or AB-ranked condition. Due to the rocky, often uneven ground, these communities appear only lightly grazed. The most common disturbances, especially noticeable in the few B and C stands, are soil displacement from cattle hooves (pugging) and erosion-created grass clump pedestals. High quality stands have zero to trace amounts of *Bromus tectorum*, despite naturally low cover of microbiotic soil crust and exposed soil. *Bromus tectorum* cover is higher in B and C stands. The resiliency of *Festuca idahoensis* after light grazing appears high, though moderately grazed stands have some dead centered grass clumps.

***Artemisia arbuscula/Poa secunda***  
(low sagebrush/Sandberg's bluegrass)

**Distribution:** *Artemisia arbuscula/Poa secunda* is the least common low sagebrush plant association on the 45 Ranch (Table 2). It is found only in ephemerally moist swales and intermittent drainages on the plateau around the foot of Spring Butte. These sites are gently sloping (usually less than 3%) and have concave topography. Nearly all stands sampled had SE aspects (90 to 180 degrees), though the association was documented in northerly flowing drainages as well. The association was occasionally observed on concave, shallow soil slopes of Spring Butte. *Artemisia arbuscula/Poa secunda* occupies the most rocky and thin soils on this portion of the allotment. In these drainages, snowmelt and high

precipitation rain events have eroded away the loess soil leaving a cobble and stone pavement. Between the rocks is gravelly silt loam forming a playa-like cement. Soils are typically remnants of the Bedstead-Arbidge Association with shallow duripans. This plant association is often in mosaic with *Artemisia arbuscula*/*Festuca idahoensis* (on slightly thicker loess) and *Artemisia tridentata wyomingensis*/*Festuca idahoensis* (on mounds). It can also be adjacent to *Artemisia papposa* communities.

Composition: The *Artemisia arbuscula*/*Poa secunda* community is characterized by open stands of *Artemisia arbuscula* ranging from 10% cover (in early- to mid-seral stands) to 50% cover (typically less than 30%). *Artemisia tridentata wyomingensis* is occasionally present on deeper soil mounds. *Poa secunda* is the dominant grass species with nearly continuous cover (20 to 50%) between rocks. *Sitanion hystrix* is common and locally abundant with 5 to 10% cover. *Festuca idahoensis* and *Stipa webberi* are occasionally observed. Understory forbs are typical of intermittent drainages with any one of the following having up to 10% cover: *Arenaria kingii*, *Balsamorhiza hookeri*, *Eriogonum caespitosum*, *Haplopappus lanceolatus*, *Haplopappus stenophyllus*, *Lomatium cous*, *Lomatium leptocarpum*, and *Trifolium macrocephalum*. Other common forbs with low cover are *Aster scopulorum*, *Erigeron bloomeri*, *Microseris nutans*, *Phlox longifolia*, and *Phoenicaulis cheiranthoides*.

Ecological Condition: The *Artemisia arbuscula*/*Poa secunda* stands sampled were in A-, AB-, and B-ranked condition. The extremely rocky ground prevents heavy cattle use and the cover of *Bromus tectorum* is just a trace. However, when soils are moist in spring they are highly susceptible to pugging by cattle. This can exaggerate natural erosion and result in pedestalled grass clumps. The B-ranked stands also have some dead center *Poa secunda*. All stands sampled, except one, are late-seral.

## *Artemisia papposa* Series

### ***Artemisia papposa*** (Owyhee sagebrush)

*Artemisia papposa*-dominated stands were observed in a few intermittent drainages (e.g., Long Pull Draw and vicinity) on the plateau north of Spring Butte. It is an uncommon plant association on the 45 Ranch, sampled three times in 1998 (Table 2). No new sites were documented in 1999. See Moseley (1999) for a description of its distribution and composition.

## Miscellaneous Dwarf Shrubland Series

### ***Haplopappus nanus/Poa secunda*** (dwarf goldenweed/Sandberg's bluegrass)

*Haplopappus nanus* is the diagnostic shrub on barren rhyolitic rock balds in the Main Owyhee River canyon. The *Haplopappus nanus/Poa secunda* plant association is commonly seen in the *Juniperus occidentalis* zone and higher elevation Owyhee canyonlands. The sparse vegetation forms on thin soil or in cracks of bare bedrock found on canyon rims, benches, knobs, and ridge spines. The plant association is limited in extent on the 45 Ranch, sampled only once on a 16% sloped, E facing bench rim in the Main Owyhee River canyon. The association is usually on flat to moderate slopes, not vertical cliffs. Sites are characteristically devoid of soil but may have coarse gravel or even soil pockets deposited by water pooling in rock depressions. The stand sampled has very low vegetative cover with locally abundant *Haplopappus nanus* and *Chrysothamnus nauseosus* (up to 5% cover each), and less commonly, *Artemisia arbuscula*, *Juniperus occidentalis* (stunted saplings and seedlings), and *Symphoricarpos oreophilus parishii*. *Poa secunda* is the dominant grass (up to 5%). Scattered *Agropyron spicatum*, *Bromus japonicus*, *Danthonia californica*, *Festuca idahoensis*, *Sitanion hystrix*, and *Stipa thurberiana* are also present. Characteristic forbs, all with trace cover, included *Erigeron compositus*, *Erigeron latus*, *Eriogonum* spp., *Haplopappus acaulis*, *Lomatium macrocarpum*, *Penstemon deustus*, *Phoenicaulis cheiranthoides*, and *Scutellaria angustifolia*. Due to its inaccessible locations and excessive rockiness, this plant association is seldom grazed. However, noticeable *Bromus* spp. is present on exposed soil.

### ***Salvia dorrii/Oryzopsis hymenoides* and *Artemisia tridentata wyomingensis/Oryzopsis hymenoides*** (gray ball sage/Indian ricegrass and Wyoming big sagebrush/Indian ricegrass)

Distribution: Small, sparsely vegetated stands of *Salvia dorrii/Oryzopsis hymenoides* are located on the 45 Ranch. They are restricted to hot, erosive, and barren desertic sites. *Artemisia tridentata wyomingensis/Oryzopsis hymenoides* is found on similar sites. These plant associations were observed in Walcot Basin, Spring Creek Basin, and on interbedded sediment outcrops in the South Fork Owyhee River canyon south of Spring Creek Basin. They were also observed off the allotment in the Tent Creek Basin near Star Valley. *Salvia dorrii/Oryzopsis hymenoides* is restricted to low elevation sites (less than about 4,900 feet) with steep slopes (16 to 67%) and S to SW aspects (189 to 234 degrees). *Artemisia tridentata wyomingensis/Oryzopsis hymenoides* was also found on S to SW aspects with slopes over 14%, but in Walcot Basin at a higher elevation. It may also form small stands on similar barren soil outcrops on other aspects in the South Fork canyon. Both communities form on unstable, eroded, and dissected ground with variable microtopography. Soils are derived from interbedded sediments, which range from dark colored cinder gravel to whitish sand, silt, or ash and often have colluvial boulders, stones, and cobble embedded. Soils probably belong to the Troughs-Sugarcreek Association or Xerollic Haplargid types.

Composition: Stands of *Salvia dorrii/Oryzopsis hymenoides* and *Artemisia tridentata*

*wyomingensis/Oryzopsis hymenoides* are sparsely vegetated and highly variable in their structure and composition. In *Salvia dorrii/Oryzopsis hymenoides* stands, the cover of 1 to 2 foot tall *Salvia dorrii* ranges from 4 to 15%. Taller *Artemisia tridentata wyomingensis* and *Chrysothamnus nauseosus* are occasionally co-dominant (up to 10% cover) while *Artemisia spinosa*, *Atriplex confertifolia*, *Chrysothamnus humilis*, *Grayia spinosa*, *Leptodactylon pungens*, *Sarcobatus vermiculatus*, and *Tetradymia glabrata* are also sometimes associated with low cover. The *Artemisia tridentata wyomingensis/Oryzopsis hymenoides* plant association has similar shrub composition but low cover of *Salvia dorrii*. The stand sampled in Walcot Basin was on an unusual ash/clay soil outcrop and was dominated by *Chrysothamnus viscidiflorus* with scattered *Artemisia tridentata wyomingensis*. Understory grasses are sparse in both *Salvia dorrii/Oryzopsis hymenoides* and *Artemisia tridentata wyomingensis/Oryzopsis hymenoides* stands. *Oryzopsis hymenoides* is the most common grass with 2 to 5% cover, though *Bromus tectorum* is often co-dominant. *Agropyron spicatum*, *Poa secunda*, *Sitanion hystrix*, and *Stipa comata* (co-dominant in one stand in Tent Creek) are all common, but only with low cover. *Elymus cinereus* co-dominated the *Artemisia tridentata wyomingensis/Oryzopsis hymenoides* stand in Walcot Basin. Common forbs in both communities include *Astragalus lentiginosus*, *Astragalus tetrapteris*, *Castilleja chromosa*, *Cryptantha spiculifera*, *Erigeron aphanactis*, *Eriogonum ovalifolium*, *Leucocrinum montanum*, *Lygodesmia spinosa*, *Oenothera caespitosa*, *Phlox hoodii*, *Penstemon speciosus*, and *Sphaeralcea munroana*. Other forbs are desert annuals such as *Camissonia claviformis*, *Chorizanthe watsonii*, *Gilia leptomeria*, *Lupinus brevicaulis*, *Lupinus uncialis*, *Malacothrix torreyi*, *Mentzelia* spp., *Nama densum*, and *Phacelia glandulifera*. In *Artemisia tridentata wyomingensis/Oryzopsis hymenoides* stands (both Walcot Basin and Tent Creek), *Stanleya viridiflora* is conspicuous.

**Ecological Condition:** The ecological condition of *Salvia dorrii/Oryzopsis hymenoides* and *Artemisia tridentata wyomingensis/Oryzopsis hymenoides* stands on the 45 Ranch range from AB to BC depending on the extent of *Bromus tectorum* invasion (up to 10% cover in BC stands). Though the loose soil on these sites are susceptible to major damage by cattle, they are rarely trampled due to their steepness and lack of forage. *Bromus tectorum* naturally invades these barren sites. Though it is currently in good condition, the *Artemisia tridentata wyomingensis/Oryzopsis hymenoides* stand in Walcot Basin is most threatened by cattle grazing impacts. In general, these plant associations are unique and important elements of biodiversity, harboring rare and unusual species.

## Herbaceous Vegetation

### Miscellaneous Series

#### ***Artemisia ludoviciana*** (prairie sage)

*Artemisia ludoviciana*-dominated stands were observed in intermittent drainages (in Spring Creek Basin and the Main Owyhee River canyon) and in the Little Owyhee River bottom. The plant association was rarely observed on 45 Ranch. Two stands were sampled in 1998. No new stands were documented in 1999. See Moseley (1999) for a description of its distribution and composition.

#### ***Danthonia californica*** (California oatgrass)

The *Danthonia californica* plant association was observed in intermittent drainages on the plateau north of Spring Butte. It is an uncommon association on the 45 Ranch. Two stands were sampled in 1998. No new sites were documented in 1999. See Moseley (1999) for a description of its distribution and composition.

#### ***Eriogonum caespitosum/Poa secunda***

(mat buckwheat//Sandberg's bluegrass)

*Eriogonum caespitosum* dominated one intermittent drainage sampled on the canyon rim above Triple Draw Basin (south of Coyote Hole). This species assemblage is previously un-described and in need of more sampling. The relatively rare association is expected to occur elsewhere in the Owyhee uplands. The plant association occurs in a gently sloped, concave drainage which faces E-NE (72 degrees). The drainage carries water only during peak runoff events. The ground is extremely rocky, paved with basalt boulders, stones, and cobbles with gravel filling the rock interspaces. *Eriogonum caespitosum* occurs with 10% cover. *Poa secunda* is well represented (7% cover). *Sitanion hystrix* and *Balsamorhiza hookeri* each occur with 3% cover. *Arenaria kingii*, *Epilobium brachycarpum*, *Erigeron chrysopsidis*, *Muhlenbergia richardsonis*, and *Stipa webberi* are also present. Several rare or uncommon ephemeral annuals were observed in this stand, including *Camissonia pterosperma*, *Lupinus uncialis*, and *Mimulus suksdorfii*. The stand sampled was only lightly grazed but had moderate *Bromus tectorum* cover on bare gravel.

### ***Haplopappus acaulis/Phlox hoodii***

(stemless goldenweed/spiny phlox)

The *Haplopappus acaulis/Phlox hoodii* plant association is relatively common on the 45 Ranch but previously un-reported and rare elsewhere in the Owyhee uplands. The association occurs within pseudo-playas which resemble playas or vernal pools, being sparsely vegetated depressions with barren soil and evidence of ephemeral wetness, but differ in that they are not closed basins and do not pool water for extended periods of time. They are actually giant slickspots, characterized by whitish colored, smooth surfaced, crusted silt and clay soil with low productivity and a natric horizon (accumulation of sodium). These soils are mapped as Arbidge-Laped-Slickspots Complex and cover large areas on the plateau around the southwest base of Spring Butte. Pseudo-playa habitats occur sporadically throughout the plateau areas of the 45 Ranch, but are most common on or near the rim of the South Fork and Little Owyhee River canyons. *Haplopappus acaulis/Phlox hoodii* are often in mosaic with or grade into *Artemisia tridentata wyomingensis* plant associations. *Haplopappus acaulis* is often the only plant with significant cover (up to 15%) though *Phlox hoodii* may occur with up to 7% cover. Scattered shrubs, including *Artemisia arbuscula*, *Artemisia tridentata wyomingensis*, *Eriogonum microthecum*, *Grayia spinosa*, and *Tetradymia glabrata*, are present with low cover. *Poa secunda* and *Sitanion hystrix* are also often present with low cover. Other forbs observed include *Erigeron latus*, *Lepidium perfoliatum*, *Lewisia rediviva*, and *Phoeniculis cheiranthoides*. *Haplopappus acaulis/Phlox hoodii* and immediately adjacent *Artemisia tridentata wyomingensis* associations, provide specialized habitat for several plants rarely seen elsewhere on the 45 Ranch including *Astragalus calycosus*, *Cymopterus longipes*, *Penstemon janishiae*, and *Streptanthus cordatus*. Stands of the plant associations sampled on the 45 Ranch were in A- or AB-ranked ecological condition with minimal *Bromus tectorum* invasion. They are susceptible to pugging by cattle when wet and may serve as open loafing areas. Stands sampled were apparently only lightly grazed due to their lack of forage.

### ***Lepidium davisii* Vernal Pool**

(Davis' peppergrass vernal pool)

*Lepidium davisii* dominates 19 vernal pools/playas scattered on the plateau throughout the 45 Ranch. No new occurrences of this plant association were documented in 1999, though one new playa was located on the east rim of the South Fork Owyhee River canyon immediately off the allotment. See Moseley (1999) for a description of its distribution and composition.

### ***Poa secunda/Eriogonum* spp.**

(Sandberg's bluegrass/annual buckwheat)

*Poa secunda* dominated one desertic, barren hillside sampled in Spring Creek Basin during 1998. This previously un-described tentative *Poa secunda* community is rare on the 45 Ranch but has been

observed elsewhere in the Owyhee uplands. The sparsely vegetated community was restricted to a gently sloped, N-NE facing cinder gravel outcrop. *Poa secunda*, *Bromus tectorum*, and an annual *Eriogonum* species were the most common plants. *Allium* species, *Erigeron linearis*, and *Lupinus brevicaulis* were also noted. The site was in AB-rank ecological condition with scattered *Bromus tectorum*. This community needs more sampling.

## TREND ANALYSIS

Six nested frequency trend plots were established on the Ranch in 1982 and 1983. These plots were re-read in 1991 and 1999. The monitoring plots sample all of the major *Artemisia tridentata wyomingensis* plant associations and an important *Artemisia arbuscula* association and spatially distributed within the study area (Table 4, Figure 3). We completed an analysis of changes that occurred during the period between 1991 and 1999. Significant increases in the abundance of species were observed on all of the transects. Early seral species account for the largest increases in abundance. For example, *Poa secunda*, *Astragalus* spp. and *Phlox longifolia*, and *Aster scopulorum* increased, respectively, in *Artemisia arbuscula/Festuca idahoensis*, *Artemisia tridentata wyomingensis/Festuca idahoensis*, and *Artemisia tridentata wyomingensis/Agropyron spicatum* plant associations (plots 13S05W20, 14S05W04, and 14S05W15; Table 4). A notable increase in a later seral species was *Agropyron spicatum* on plot 14S05W15. No species were observed to significantly decline in abundance during the 1991 - 1999 time period.

## FLORA

Species Diversity: Vegetation surveys on the 45 Ranch during 1998-1999 documented a total of 463 vascular plant species (Appendix 2). Riparian surveys yielded 280 species, 274 of which were from 1998 (Moseley 1999). Upland surveys documented 313 species (some of which also occur in riparian habitats and including a few species from areas immediately adjacent, and expected within, the study area). The distribution of vascular plant species observed in upland environments is summarized by general habitat in Appendix 3. Fifty plant specimens collected during our surveys will be deposited as vouchers in the Albertson College of Idaho herbarium with duplicates sent to Boise State University's herbarium. Due to time constraints, non-vascular plants (mosses, lichen, and fungi) were not inventoried.

Of the upland species, 164 were found in *Artemisia tridentata* steppe communities (including all *A. tridentata* varieties, 8 plant associations) (Appendix 3). Other areas of high diversity were ecologically unique. For example, intermittently wet drainages, swales, and playas (including some *Artemisia arbuscula* and *Juniperus occidentalis* plant associations, *Artemisia papposa*, and other herbaceous communities) had 146 species. Areas with barren or desertic soils (e.g., *Atriplex confertifolia*, *Salvia dorrii*, and herbaceous pseudo-playa associations) had 125 species. In contrast, 82 species were found in low sagebrush steppe (e.g., *Artemisia arbuscula* and *A. longiloba*, 5 plant associations), 87 documented in *Juniperus occidentalis* woodland and savannah (5 plant associations), and 72 on cliffs, talus, and rimrock. These totals, however, are very general and only rough estimates of relative species diversity.

Rare Plant Species: Nineteen rare plant taxa are known from the 45 Ranch Allotment (Table 3). The distribution of rare plant element occurrences within the study area is shown in Figure 5. Our 1999 upland vegetation surveys yielded four new species not previously known from the 45 Ranch: *Astragalus tetrapteris*, *Camissonia pterosperma*, *Pectocarya setosa*, and *Penstemon janishiae*—all species more common in the Great Basin. We also found additional populations of *Astragalus newberryi* var. *castoreus*, *Hackelia ophiobia*, *Lupinus uncialis*, and *Pediocactus simpsonii* var. *robustior*. Six rare plant species occurrences were summarized in Moseley's (1999) report on riparian areas of the 45 Ranch. Four of these 6 species are considered riparian while *Haplopappus uniflorus* var. *howellii* occurs in intermittent drainages and *Lepidium davisii* occurs in vernal pools/playas. We did not find any new

occurrences of *Haplopappus uniflorus* var. *howellii* nor the often associated *Artemisia papposa* (see Moseley 1999). However, we did collect the very similar *Haplopappus lanceolatus* in similar habitats. Confusion with *H. uniflorus* var. *howellii* seems possible. We found one new *Lepidium davisii* playa 0.25 mi east of the allotment boundary, expanding a known population. The habitats, distribution, and management implications of the remaining 13 upland rare plant species are briefly described below.

***Astragalus newberryi* var. *castoreus*** (Newberry's milkvetch): *Astragalus newberryi* var. *castoreus* is a Great Basin species reaching the northeastern edge of its range on the Owyhee plateau. It is occasionally encountered on the 45 Ranch. Four populations were documented inside the allotment (Spring Creek Basin, Walcot Basin, Triple Draw Basin south of Coyote Hole, and in the South Fork Owyhee River canyon above Bull Camp), though others are to be expected. Another population was recorded in the Tent Creek drainage in the Star Valley area. *Astragalus newberryi* var. *castoreus* is usually seen on coarse sandy or desertic gravelly soils of canyon rims and slopes (where soils are derived from interbedded sediments) but also occasionally on heavier silt-clay soil. It is seen on all aspects except N and on a variety of slopes. It is usually found in open *Artemisia tridentata wyomingensis* stands with sparse understories and a mix of desertic shrubs (e.g., *Salvia dorrii*, *Tetradymia glabrata*, *Grayia spinosa*, and *Atriplex confertifolia*). Populations of *Astragalus newberryi* var. *castoreus* are always small and individuals widely scattered. Habitats range from virtually ungrazed to moderately grazed, depending on their accessibility to cattle. Most habitats are in good ecological condition with minimal soil disturbance and *Bromus tectorum* invasion (except in Walcot Basin where impacts are heavier). Thus, it is difficult to assess the threats to this species or the viability of its populations on the 45 Ranch.

***Astragalus tetrapterus*** (four-winged milkvetch): *Astragalus tetrapterus* is another Great Basin species reaching the northeastern edge of its range on the Owyhee plateau. One population is located in Walcot Basin and the other in the Tent Creek drainage of the Star Valley area. The species is documented from one other site in southern Idaho (near Salmon Falls Reservoir) where it is threatened by off-road vehicle traffic. In Walcot Basin it occurs on a distinctively barren and erosive southwest-facing (232 degrees), moderately steep (14%) slope composed of whitish-gray gravelly clay or ash (interbedded sediments). *Astragalus tetrapterus* occurs in an unusual, sparsely vegetated stand dominated by *Chrysothamnus viscidiflorus* with *Elymus cinereus* and scattered *Grayia spinosa*, *Artemisia tridentata wyomingensis*, *Oryzopsis hymenoides*, *Stanleya viridiflora*, and other herbs. The site in Tent Creek is sandier, but also barren and erosive, characterized by *Salvia dorrii*, *Stipa comata*, and forbs such as *Lupinus uncialis*. The Walcot Basin site is lightly grazed but it would take only a few cows seeking tasty *Elymus cinereus* to ruin this seemingly fragile site.

***Aspicilia fruticulosa*** (rim lichen): *Aspicilia fruticulosa* is a vagrant lichen found in open stands of *Artemisia tridentata wyomingensis* having a desert pavement soil surface. It was observed in 1997 on the rim of the South Fork Owyhee River canyon near Bull Camp. We did not observe it in 1999.

***Camissonia pterosperma*** (wingfruit suncup): *Camissonia pterosperma* is also a Great Basin species ranging into Idaho. Prior to its discovery on the 45 Ranch it had only been documented in the southern Lemhi Mountains and the sagebrush-steppe of the Idaho National Engineering and Environmental Laboratory (INEEL) reserve. On 45 Ranch the rare plant is located in an intermittent drainage on the west rim of the South Fork Owyhee River at Triple Draw Basin south of Coyote Hole. The east flowing drainage is ephemerally moist from runoff but only carries surface flow during large rain events. The plant was growing in thin gravel soils between basaltic cobbles, stones, and boulders of the drainage bottom. The site had a mixed herbaceous community dominated by *Eriogonum caespitosum*, *Bromus tectorum*, *Poa secunda*, *Sitanion hystrix*, *Balsamorhiza hookeri*, *Stipa webberii*, and *Arenaria kingii*. *Lupinus uncialis* was also present. *Camissonia pterosperma* is a small, ephemeral species easily overlooked or absent in drought years. Cattle disturbance of this site is minimal (due to its rockiness) though cow hooves could easily destroy this and other ephemeral plants during their spring growth.

***Chrysothamnus humilis*** (Truckee rabbitbrush): *Chrysothamnus humilis* is currently tracked as a

Review species because its rarity and potential threats in Idaho are poorly understood. However, it is common on the 45 Ranch and elsewhere on the Owyhee plateau. It is found on droughty, open, and rocky canyon rims and slopes mostly south of Spring Creek Basin where it is locally abundant and co-dominant with *Artemisia tridentata wyomingensis*. *Chrysothamnus humilis* is often associated with (but not restricted to) *Stipa thurberiana*-dominated understories. It is found in a variety of habitats (from rocky ground to silty interbedded sediments) on varying slopes and aspects (though rarely north). It could be an early to mid-seral species like other *Chrysothamnus* species. The shrub does not appear to be affected by grazing and is probably not rare or threatened enough to be tracked by the CDC.

***Cymopterus longipes* var. *ibapensis*** (longstalk spring-parsley): The taxonomy of this species is apparently unclear. Some botanists consider the taxon to be *Cymopterus ibapensis*. On the basis of Cronquist et al. (1997) collections from 45 Ranch are *Cymopterus longipes* var. *ibapensis*. There are also questions about the rarity of this species (or variety) in Idaho; *Cymopterus ibapensis* found in east-central Idaho's mountains is tracked as a Sensitive species but is it the same as these sagebrush-steppe specimens? The answer is unclear; perhaps *Cymopterus longipes* var. *ibapensis* is best tracked as a Review species. Nevertheless, on the 45 Ranch *Cymopterus longipes* var. *ibapensis* is often associated with *Lepidium davisii* vernal pools/playas. It is also found on ephemerally moist, heavy silt-clay soils of pseudo-playas or slickspots, often near canyon rims or swales. On these sites it may be associated with *Haplopappus acaulis* or in openings within stands of *Artemisia tridentata wyomingensis*/*Sitanion hystrix* and *Artemisia tridentata wyomingensis*/*Poa secunda*. *Cymopterus longipes* var. *ibapensis* can occur in large populations and does not appear to be rare or threatened on the 45 Ranch.

***Eatonella nivea*** (white false tickhead): *Eatonella nivea* is known on the 45 Ranch from one population located on gravelly desertic soil near Coyote Hole found in 1982. We did not observe it in 1998 or 1999.

***Hackelia ophiobia*** (Owyhee River stickseed): *Hackelia ophiobia* is a globally rare, regional endemic found only in the canyonlands of the Owyhee River system (e.g., the Main, East Fork, South Fork, and Little Owyhee rivers and their tributaries). It is documented on the 45 Ranch from at least six populations and is also adjacent to the allotment near Crutcher's Crossing and Star Valley. One new site was found in 1999 in Long Pull Draw where it forms a slot canyon gorge cutting through the rhyolite cliffs on the south side of the Main Owyhee River. *Hackelia ophiobia* is restricted to due north facing, nearly vertical rhyolitic cliffs but is occasionally on other northerly aspects in shady and sheltered crevices seeing little sunlight. There are many miles of un-surveyed potential habitat on the north facing cliffs above the Main Owyhee River forming the north boundary of the 45 Ranch allotment. Due to the inaccessibility of its habitat, there are no threats to this species.

***Lupinus uncialis*** (inch-high lupine): *Lupinus uncialis* is a Great Basin species ranging into Idaho on the Owyhee plateau. Six populations are known on the 45 Ranch, including two new populations located in 1999. The rare annual is also located immediately adjacent the study area north of the airstrip, near Crutcher's Crossing, and in the Tent Creek drainage near Star Valley. The two populations located in 1999 (at Triple Draw Basin south of Coyote Hole and near the southeast boundary of the study area up river from Bull Camp, Figure 5) occur on the canyon rim and on mid-canyon slopes of the South Fork Owyhee River. *Lupinus uncialis* is found on barren, loose soils such as coarse sand, gravel, cinder, desert pavement, and silty-ash outcrops. Some sites appear to be relic ant piles. Habitats are usually hot and droughty with aspects varying from SW-S-SE-E and slopes nearly flat to moderately steep. It is associated with open stands of *Artemisia tridentata* var. *wyomingensis*, *Salvia dorrii*, or *Atriplex confertifolia* mixed with *Grayia spinosa*, *Tetradymia glabrata*, and *Chrysothamnus* spp.. Understories are usually sparse with scattered *Oryzopsis hymenoides*, *Stipa* spp., *Poa secunda*, *Sitanion hystrix*, or *Agropyron spicatum* and various forbs. One sub-population was in the gravel of an intermittent drainage dominated by mixed herbaceous species (see *Camissonia pterosperma* above). It was also found with *Pectocarya setosa* in one area. Though populations are small, widely scattered, and fluctuate with spring rainfall, *Lupinus uncialis* is relatively common on the 45 Ranch. Habitats generally have only light cattle use and minor *Bromus tectorum* competition, though this species could easily be uprooted by cattle traffic on loose soils.

***Pectocarya setosa*** (moth combseed): The rarity of *Pectocarya setosa*'s within Idaho is not well known. The taxon is currently tracked as a Review species. Like *Lupinus uncialis*, it is a diminutive, easily overlooked desert annual of sandy, gravelly, or desert pavement soils. On the 45 Ranch, it is located within Walcot Basin and in the South Fork Owyhee River canyon, upstream of Bull Camp near the SE allotment boundary (Figure 5). *Pectocarya setosa* occurs in open *Artemisia tridentata wyomingensis*/*Stipa comata* and *Atriplex confertifolia*/*Agropyron spicatum* stands on hot south- to southwest-facing, moderately steep slopes. A variety of low cover desertic herbs, such as *Chorizanthe watsonii*, *Astragalus newberryi* var. *castoreus*, *Oenothera caespitosa*, and *Sphaeralcea munroana*, are associated. This species could be more common than previously thought, with its ephemeral populations dependent on spring rainfall. It may be susceptible to trampling by cattle but current livestock impacts are apparently minor.

***Pediocactus simpsonii* var. *robustior*** (Simpson's hedgehog cactus): One new population of *Pediocactus simpsonii* var. *robustior* is located in Spring Creek Basin in open *Artemisia tridentata* var. *wyomingensis*/*Stipa thurberiana*. It is found on exposed ridgecrests of various aspects and on mostly gentle slopes with shallow, rocky soils derived from interbedded sediments. Other associated species include *Atriplex confertifolia*, *Chrysothamnus humilis*, *Agropyron spicatum*, *Poa secunda*, *Erigeron* spp., *Phlox* spp., *Eriogonum ovalifolium*, and *Aster scopulorum*. Additional populations of *Pediocactus simpsonii* var. *robustior* are located off the allotment in Tent Creek and near Star Valley Knoll near Crutcher's Crossing. This species is widespread but populations are usually small and susceptible to impacts by collectors (not a likely problem on the 45 Ranch).

***Penstemon janishiae*** (Antelope Valley beardtongue): *Penstemon janishiae* is a Great Basin species previously known in Idaho only from the Owyhee Front lowlands. One population is located on the South Fork Owyhee River canyon rim above Triple Draw Basin, south of Coyote Hole. The species occurs on flat ground in poor, heavy silt-clay soil of a pseudo-playa area. These barren habitats are often within a mosaic of *Artemisia tridentata wyomingensis*/*Sitanion hystrix* and *Artemisia tridentata wyomingensis*/*Poa secunda*. Other associated species include *Tetradymia glabrata*, *Grayia spinosa*, *Cymopterus longipes* var. *ibapensis*, *Streptanthus cordatus*, and *Astragalus calycosus*. Another population was found in similar habitat on Tent Creek Point near Star Valley. Since populations are in openings in the sagebrush, cattle tend to travel through or loaf in these areas, trample the ground (especially when it is moist in spring), and facilitate invasion by *Bromus tectorum* and *Lepidium perfoliatum*.

***Symphoricarpos oreophilus* var. *parishii*** (Parish's snowberry): *Symphoricarpos oreophilus* var. *parishii* is a southwestern variety reaching the northern edge of its range in the vicinity of the 45 Ranch. It is a Review species because its rarity in Idaho is poorly documented. On the 45 Ranch, however, it is relatively common on sheltered or shady canyon rimrock, talus, crevices, and side-canyon draws. It often grows with other deciduous shrubs, such as *Holodiscus dumosus* or *Ribes* spp., or with *Juniperus occidentalis*. *Symphoricarpos oreophilus* var. *parishii* is seen in the canyons of the Main, East Fork, South Fork, and Little Owyhee rivers and their tributaries. Off the 45 Ranch it is documented from the south side of Juniper Mountain and surrounding canyons. It is mostly inaccessible to livestock and locally common. Thus, despite its limited range in Idaho, it may not be a rare plant.

Other regionally endemic, but locally common, species are present on the 45 Ranch. Due to their large and non-threatened populations, the CDC doesn't track them any longer. Nevertheless, they are floristically interesting and add important diversity to the flora of the region. These species are *Artemisia packardiae*, *Artemisia papposa* (Moseley 1999), *Erigeron latus*, *Ivesia baileyi*, and *Scutellaria nana*. See Table 3 for a brief synopsis of each species. In addition, there is potential habitat for numerous other rare plants on the 45 Ranch. Though currently unknown from the 45 Ranch, further surveys may yield occurrences of *Astragalus yoder-williamsii*, *Dimeresia howellii*, *Downingia bacigalupii*, *Glyptopleura marginata*, or others.

**Non-native Plant Species:** Surveys of riparian vegetation in 1998 found 17% of the riparian flora (48 species) consisting of non-native plants (Moseley 1999). In contrast, 14% (44 species) of the upland flora

surveyed in 1999 (including the hayfield and disturbed soils) were exotic species (Appendix 3). If species only encountered around the ranch, in the hayfield, or on other disturbed soils are not included in the upland flora, then the percent exotic species drops dramatically from 14% to 6%. Since the majority of the 45 Ranch's upland vegetation is intact and only lightly disturbed, this result was expected. The higher percent exotic species found in riparian vegetation was also expected since many introduced species (e.g., from hay fields) readily colonize freshly deposited, wet alluvium. Of the combined total flora of the 45 Ranch (eliminating overlapping species), 14% (66 total species) were non-native species. Moseley (1999) discussed four noxious weeds found mainly in riparian zones and occasionally around the ranch: *Cirsium arvense*, *Cardaria draba*, *Tamarix* sp., and *Onopordum acanthium*. No new populations of the latter two species were found during 1999 upland surveys. However, scattered *Cirsium arvense* individuals were seen in ephemeral draws below canyon rims but no new large populations found. Similarly, *Cardaria draba* was seen on severely trampled ground around some cattle reservoirs, salt licks, and roadsides but never in large populations. These small populations should be monitored or controlled if necessary.

Two other exotic species of concern observed during upland vegetation surveys were *Bromus tectorum* and *Halogeton glomeratus*. Though ubiquitous across the 45 Ranch allotment, *Bromus tectorum* usually had low cover. However, it has the potential to spread rapidly after major disturbances (e.g., intense fire, severe soil crust degradation, earth grading, etc.). This is especially true on hot, droughty canyon slopes, in overgrazed areas where soil microbiotic crust is damaged, and in burned areas already having moderate pre-fire *Bromus tectorum* cover. Activities promoting damage to the microbiotic soil crusts should be curtailed to prevent further *Bromus tectorum* invasion. Similarly, *Halogeton glomeratus* will invade overgrazed, trampled soil and can spread rapidly. No large populations were found on the 45 Ranch. Minor amounts were seen around salt licks and on roads, mainly south of Spring Creek Basin.

## FAUNA

Reptiles and Amphibians: Amphibian and reptile species observed during riparian and upland vegetation sampling, community surveys, and rare plant surveys on the 45 Ranch were recorded during the summers of 1998-1999. Species observation forms were completed and forwarded to Idaho State University and Conservation Data Center. Systematic searches for reptiles and amphibians were not conducted; however, eight reptile species were observed:

- Desert horned lizard
- Gopher snake
- Racer
- Sagebrush lizard
- Side-blotched lizard
- Western fence lizard
- Western rattlesnake
- Western terrestrial garter snake

The most commonly observed species was the racer, and along with the western terrestrial garter snake, mainly seen in scrub-shrub and emergent herbaceous riparian vegetation along the South Fork and Little Owyhee rivers. Racers were rarely observed in the sagebrush-steppe of the plateau. Gopher snake and western rattlesnake were also common, seen in both riparian vegetation and upland, often rocky or rimrock, shrub-steppe communities. Both sagebrush and western fence lizard were observed on rock outcrops in both juniper woodlands and sagebrush-steppe uplands. Several side-blotched lizards were observed on the rocky and sparsely vegetated east canyon rim of the South Fork (immediately upstream from Bull Camp on the boundary of the 45 Allotment). A desert horned lizard was observed within a plateau mosaic of *Artemisia tridentata wyomingensis*/*Poa secunda* and *Artemisia tridentata wyomingensis*/*Sitanion hystrix* near the south boundary of the study area on June 22, 1999. Since the majority of work occurred during the hottest periods of both the year and day, species observations were

less than expected. Systematic reptile surveys, using arrays of live traps and drift fences, may reveal more species on the 45 Ranch, including longnose leopard lizard, western whiptail lizard, short-horned lizard, common garter snake, rubber boa, striped whipsnake, and night snake.

We observed only one amphibian species, the Pacific tree frog. This species was very common, emerging in large numbers from pools, drying lakebeds, and livestock water ponds during August. Many unidentified tadpoles were also observed in these same ponds, possibly another species (i.e. western toad?). However, a late August visit did not confirm any different species. Spotted frogs were not observed, though historic sightings at the mouth of the Little Owyhee River exist. Systematic amphibian searches may discover other species on the 45 Ranch such as western toad, great basin spadefoot, and tiger salamander.

Avian Species: Avian species observed during riparian and upland vegetation sampling, community surveys, rare plant surveys, and other work were recorded by habitat. This information is compiled in Appendix 4. Though bird surveys were not the primary goal of our work, an impressive total of 80 species were observed in nine general habitats over two years. In 1998, most of our work occurred along the South Fork and Little Owyhee rivers, in riparian scrub-shrub (e.g., *Salix exigua* communities), river shoreline and emergent riparian zones (e.g., *Scirpus pungens* communities), and on river terraces (e.g., *Artemisia tridentata* var. *tridentata*/*Elymus cineris* communities). During 1999, work concentrated on canyon and plateau upland areas (e.g., *Artemisia tridentata* var. *wyomingensis* and *Artemisia arbuscula* shrub-steppe, *Juniperus occidentalis* forest and savannah).

Other upland habitats, though small in total area and difficult to access, are shrubby draws, side-canyons, and talus (e.g., *Ribes* spp., *Holodiscus dumosus*). These areas are excellent avian habitats for a variety of species and should be further surveyed. Two other unique avian oases, also demanding more surveys, are ranch areas (e.g., poplar trees, hayfields) and pond shorelines (e.g., livestock water reservoirs, playas, dry lake beds). The latter habitat provides mudflats and aquatic areas, mainly in spring and early summer, for migrating waterfowl, shorebirds, and wading birds.

The sagebrush-steppe, especially *Artemisia tridentata* communities, had the most diverse avifauna with 31 species. Sagebrush-steppe obligate bird species, such as Brewer's sparrow, sage sparrow, and sage thrasher, were commonly observed and appear to have healthy populations. Less common sagebrush-steppe species of conservation concern were also observed. For example, black-throated sparrow were observed and singing in both Spring Creek Basin and on south-facing canyon slopes immediately upstream of the confluence of the Little Owyhee and South Fork Owyhee rivers. Sage grouse were observed twice (6 individuals near Juniper Camp and a single bird near Juniper Basin Reservoir) in the *Artemisia arbuscula*/*Festuca idahoensis* and *Artemisia tridentata wyomingensis*/*Festuca idahoensis* mosaic north of Spring Butte. However, old sage grouse droppings were commonly observed throughout the allotment. Loggerhead shrike were seen on several occasions and one nest, with nestlings, was found in an *Artemisia tridentata tridentata* on canyon slopes upstream of Bull Camp. An individual ferruginous hawk was observed near the south-boundary of the 45 Ranch. Gray flycatcher, short-eared owl, and other sparrows (not discussed above) were less common.

The second most important habitat for bird species was riparian scrub-shrub, supporting 24 species. Common yellowthroat, yellow warbler, lazuli bunting, song sparrow, and yellow-breasted chat were often observed or heard. Less common species included western wood-pewee and willow flycatcher. In this habitat, and throughout all areas, brown-headed cowbirds were uncommon and probably do not pose a significant threat to songbirds on the 45 Ranch.

*Juniperus occidentalis* forest and woodland habitats are also valuable habitat for songbird diversity. Though only 19 species were observed, forest species such as black-capped chickadee, cassin's finch (likely), and dark-eyed junco were seen. Mountain bluebirds were common, though species often observed in Great Basin juniper stands were less commonly observed. These included black-throated gray warbler and ash-throated flycatcher, the latter a rare species in Idaho. Townsend's solitaire was not

confirmed but are expected in juniper on the 45 Ranch, especially during the winter.

Overall, the 45 Ranch provides valuable and diverse habitats for many resident, wintering, and migrating avian species. The key to healthy bird populations lies in the maintenance of extensive, high quality riparian scrub-shrub, shrub-steppe, and juniper habitats.

Mammals: Though mammals were not systematically surveyed while conducting riparian and upland vegetation sampling, community surveys, and rare plant surveys on the 45 Ranch Allotment, common mammal species were occasionally observed. The following is a list of mammal species observed on the 45 Ranch during summers of 1998-1999:

- Beaver (sign)
- Bobcat (tracks)
- California bighorn sheep
- Coyote
- Golden-mantled ground squirrel
- Kangaroo rat (unknown species)
- Mountain cottontail
- Mountain lion (tracks)
- Mule deer
- Muskrat
- Myotis* spp.
- Pallid bat
- Pronghorn
- River otter
- Spotted bat (heard)
- Tamias* species (either least or yellow-pine chipmunk)

Most species were observed, as expected, near water sources, though, sometimes only sign was seen (e.g., bobcat and mountain lion tracks in mud). Beaver sign was observed at several locations along the South Fork Owyhee River. Sign included freshly chewed *Salix exigua* and branches piled near bank dens. Muskrat and river otter were actually observed, however. Muskrat were observed swimming in a pool at the confluence of the Little and South Fork Owyhee rivers (July 13, 1998) and in the South Fork Owyhee River above the confluence. A river otter pair was observed preening on a rock near the southern allotment boundary on the South Fork (July 20, 1998). A large amount of river otter sign was seen above Bull Camp on the South Fork, though none was seen elsewhere.

Upland species observations were not as common, though California bighorn sheep were observed on at least five occasions. A group (with 5 ewes, 1 lamb, and 1 ram) was seen on canyon rimrock outcrop about 1 mile south of Juniper Basin on July 15, 1998 (Spring Creek Basin Quad, T14S, RW, SE1/4 of NE1/4 of SW1/4 of S3). One ram was observed on the east rim of the Little Owyhee River canyon, about 2.5 miles upstream from the South Fork confluence, on July 22, 1998 (Spring Creek Basin Quad, T15S, R5W, SE1/4 of SE1/4 of SE 1/4 of S2). Another group (with 3 ewes and 2 lambs), was seen in *Artemisia tridentata wyomingensis*/*Festuca idahoensis* habitat (one quarter mile N of butte, point 5181, about 3 air miles SE of the 45 Ranch property on July 23, 1998; Grassy Ridge Quad, T15S, R4W, NE1/4 of SW1/4 of SE1/4 of S5). A large herd of about 25 animals was observed in *Artemisia tridentata* habitat above the east side of the 45 Ranch property, one-half mile W of the Landing Strip (July 25, 1998; Grassy Ridge Quad, T14S, R5W, SE1/4 of NE1/4 of SE1/4 of S25). On June 24, 1999, a lone ram was observed off the 45 Ranch Allotment, atop the north rim of the Owyhee River.

Most other upland species were observed throughout the sagebrush-steppe habitat. They included mule deer, somewhat common in the lower Little Owyhee River drainage and pronghorn (several animals observed once near Juniper Basin Reservoir). A yellow-bellied marmot was observed in *Artemisia tridentata tridentata* on the rocky canyon slope of the South Fork Owyhee upstream from Bull Camp.

Coyote, golden-mantled ground squirrel, *Tamias* species (either least or yellow-pine chipmunk), and mountain cottontail were occasionally observed in sagebrush-steppe habitat. Mountain cottontail were also observed in *Sarcobatus vermiculatus* and disturbed habitats around the ranch. Finally, bats were mist-netted by Lyle Lewis and assistants from the BLM on the night of 4 August, 1998. *Myotis* species and pallid bat were caught and spotted bats were heard (on several occasions).

Overall, the 45 Ranch has high habitat diversity for many species, ranging from the hayfield to riparian zones and sagebrush-steppe to juniper woodland. A systematic mammal survey would likely increase our knowledge of mammal species diversity. Species expected on the 45 Ranch, but not observed during our work, include (but are not limited to): pygmy rabbit, black and white-tailed jackrabbit, white-tailed antelope squirrel, various shrew species, Belding's and Townsend's ground squirrel, northern pocket gopher, desert and bushy-tailed woodrat, various mouse and vole species, porcupine, kit fox (rare, historic sighting), raccoon, American badger, long-tailed weasel, mink, western spotted skunk, and striped skunk.

### **Management and Monitoring Recommendations**

The vegetation on 45 Ranch is primarily mid- to late-seral and in good to excellent condition (B- and A-ranked). The ranch encompasses some of the highest quality, representative stands that we have observed on the Owyhee Plateau. The effects of resource-based land use practices and chronic disturbances, such as exotic species invasion, and their cumulative effects, however, present risks to the maintenance of representative and functional quality of the ecosystems present within the 45 Ranch Allotment.

To prevent loss and assist in the recovery of vegetative values, livestock grazing should be strongly curtailed on leossal soils during periods of high soil moisture (winter and spring). The allotment should be rested during the winter and spring months. Management should lessen the impact on current areas of impact (e.g., adjacent stock ponds and in the vicinity of salt licks) by reducing herd size rather than by promoting the use of currently un-utilized areas within the allotment (through, for example, water developments or the placement of salt blocks).

A significant set of trend-monitoring plots have been established on the allotment. These data will continue to grow as a valuable management asset. These data are limited, however, by a lack of representation among the range of different condition, or use, classes present within any given plant association. For example, all of the trend plots are currently adjacent roads and represent areas of moderate to high livestock use. In each case an additional (paired) plot could be located within an adjacent stand (of the same plant association) where livestock use is relatively low. Building a paired sample design into the existing trend monitoring plots would increase the referential power of the monitoring system. The system currently provides a reference for the evaluation of conditions between different allotments. Additional trend-monitoring plots, which sample the range of use patterns, are needed to provide a reference for the evaluation of changing conditions specifically within the 45 Ranch Allotment.

The capability to identify critical causal relationships between patterns in resource utilization and vegetation composition and structure, the quality of wildlife habitats, and the maintenance of biological diversity will require access to strictly controlled reference conditions. Due to happenstance coincidence between the placement of fencing and canyon breaklands, defacto livestock enclosures are present on the 45 Ranch (for example, located in Sections 27 and 20; T 14 S, R 5 W; in the vicinity of Spring Creek Basin). These are great places to go to study reference ecological conditions. These sites, while important, are limited in number and ecological scope. A well planned system of fenced livestock enclosures of sufficient number and size to represent long-term reference ecological conditions of the major plant associations on the 45 Ranch should be identified and constructed.

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## Figures

### List of Figures

- Figure 1. The location of the 45 Ranch study area is shown on the 1:250,000 scale Jordan Valley USGS topographical quadrangle. Inset: The study area is shown in relation to the perimeter of 1:24,000 USGS topographical quadrangles.
- Figure 2. Climatological data for sites in the vicinity of 45 Ranch. Mean monthly maximum and minimum temperature and precipitation are plotted for the following stations: (A) McDermitt, NV; (B) McDermitt26N, OR; and (C) Rome2NW, OR.
- Figure 3. Distribution of study plots. Stand level point observation and standard ecology plot locations are shown with the study area boundary and a UTM reference grid. Plot locations from both the riparian (Moseley 1999) and terrestrial inventories (this study) are included.
- Figure 4. Vegetation of 45 Ranch. Vegetation mapping units are described in the text and in Table 2.
- Figure 5. Rare plant and animal occurrences. Rare species observed in the vicinity of 45 Ranch are superimposed on the 1:250,000 Jordan Valley topographical quadrangle.

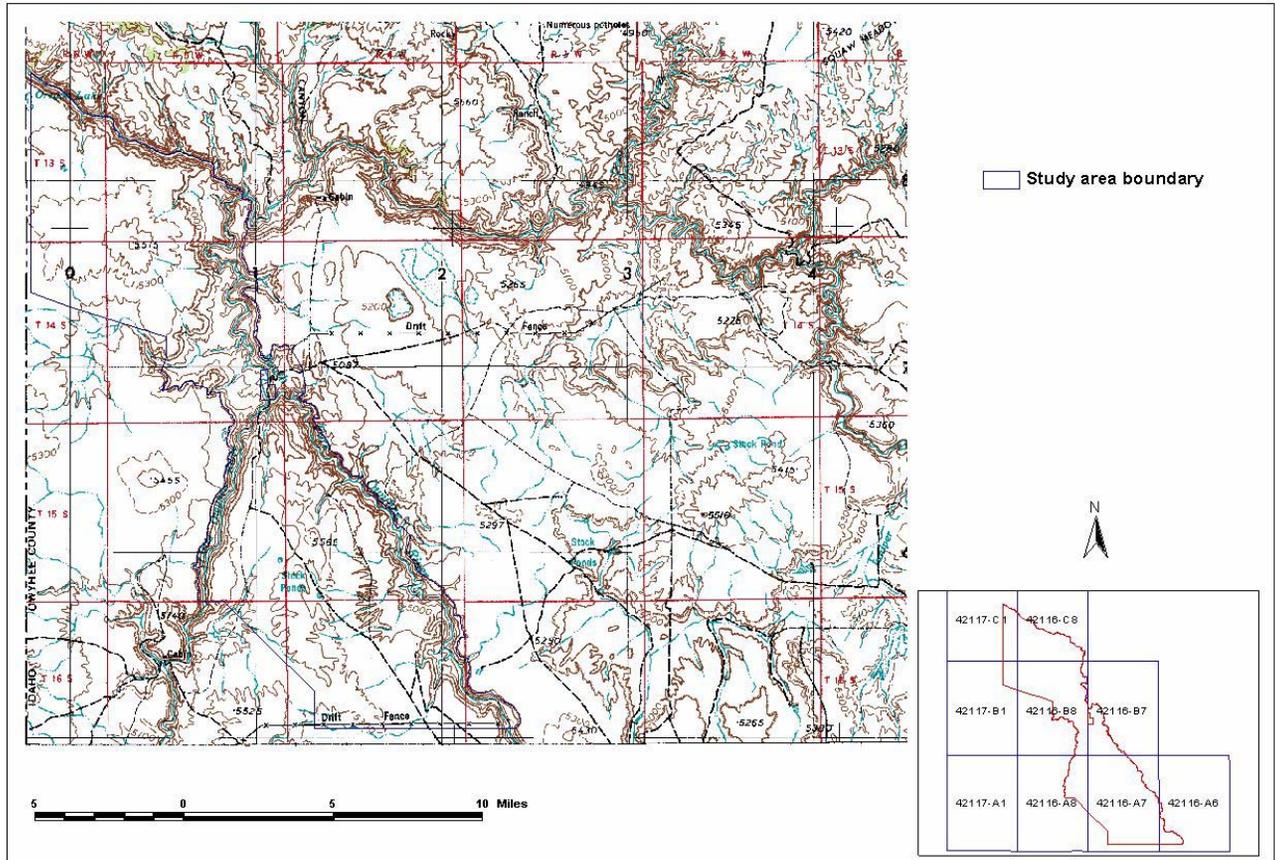


Figure 1. The location of the 45 Ranch study area is shown on the 1:250,000 scale Jordan Valley USGS topographical quadrangle. Inset: The study area is shown in relation to the perimeter of 1:24,000 USGS topographical quadrangles: 42117-C1, Beaver Charlie Breaks; 42116-C8, Bull Basin Camp; 42116-B7, Grassy Ridge; 42117-B1, Defeat Butte; 42116-B8, Spring Creek Basin; 42116-A6, Bull Camp Butte; 42116-A7, Coyote Hole; 42117-A1, Star Valley Knoll; and 42116-A8, 42117-C1, Beaver Charlie Breaks; 42116-C8, Bull Basin Camp; 42116-B7, Grassy Ridge; 42117-B1, Defeat Butte; 42116-B8, Spring Creek Basin; 42116-A6, Bull Camp Butte; 42116-A7, Coyote Hole; 42117-A1, Star Valley Knoll; 42116-A8, Star Valley; Star Valley.

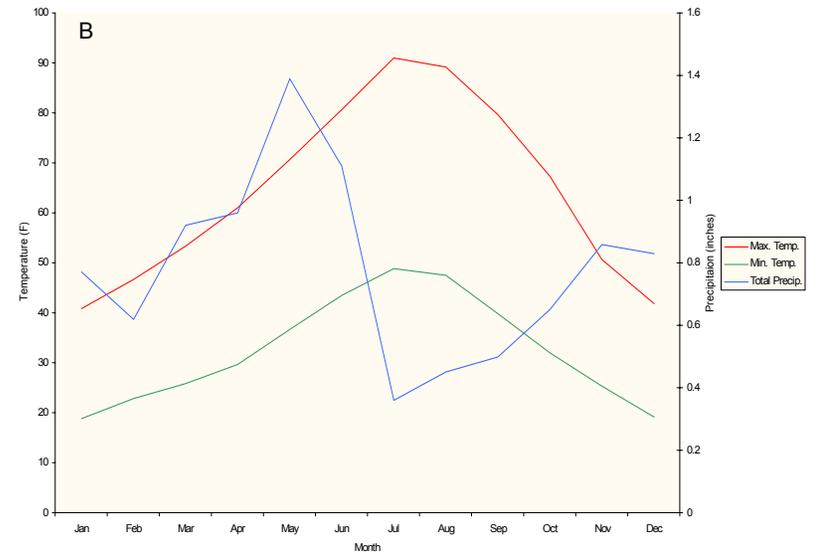
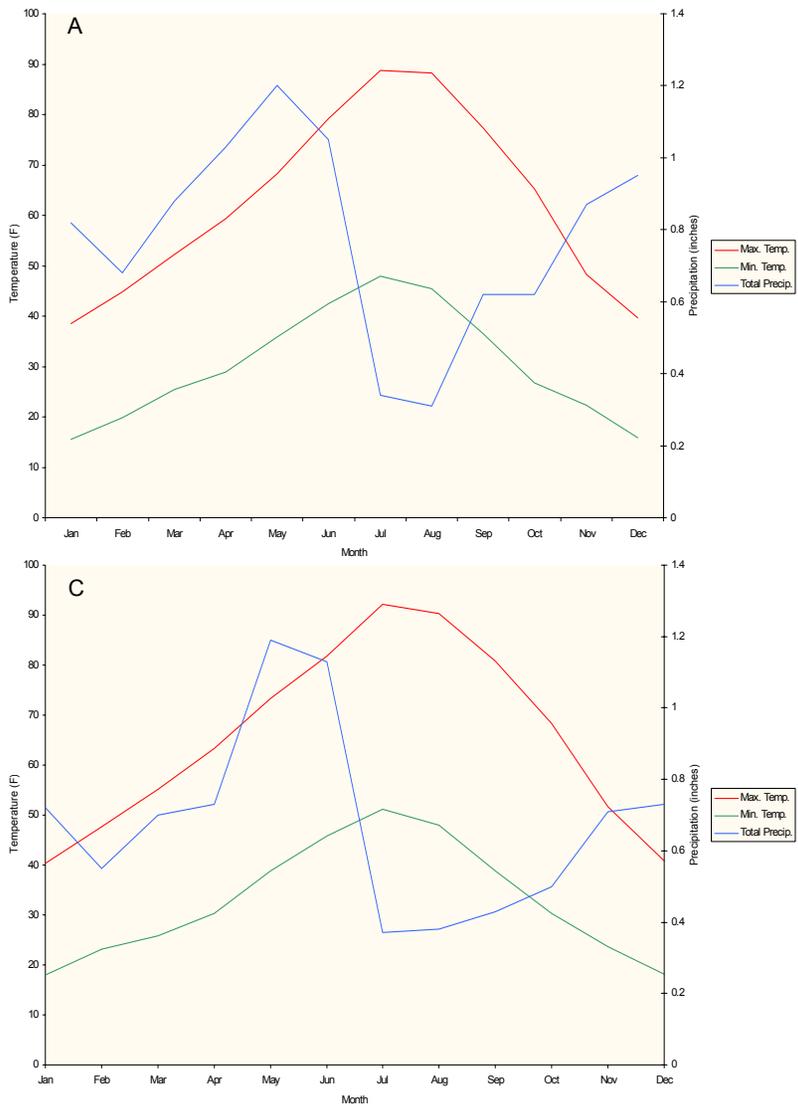


Figure 2. Climatological data for sites in the vicinity of 45 Ranch. Mean monthly maximum and minimum temperature and precipitation are plotted for the following stations: (A) McDermitt, NV; (B) McDermitt26N, OR; and (C) Rome2NW, OR. Data acquired from United States Department of Commerce, National Oceanic and Atmospheric Administration, Western Regional Climate Center, Reno, NV.

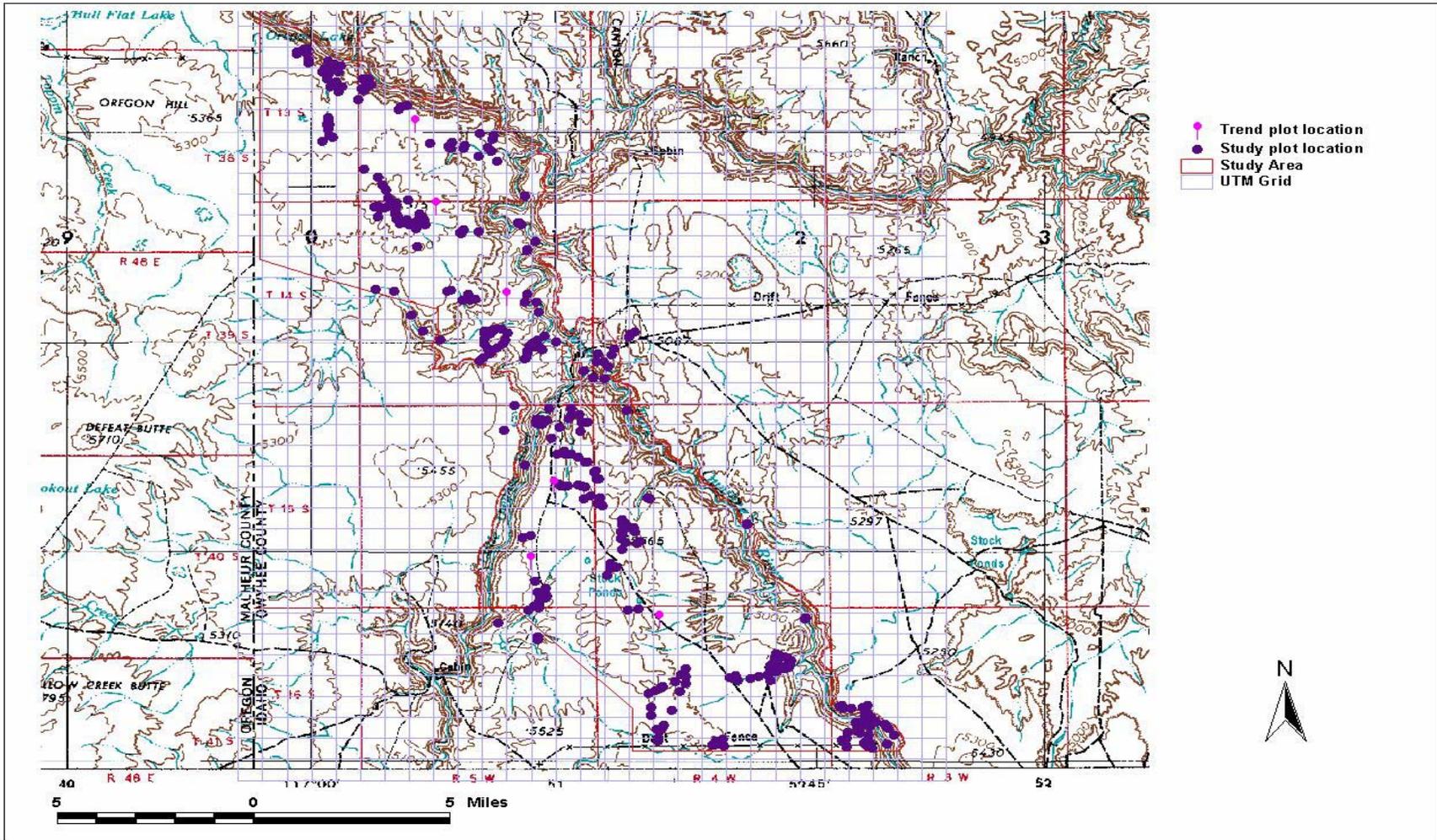


Figure 3. Distribution of study plots. Stand level point observation, standard ecology, and trend monitoring plot locations are shown with the study area boundary and a UTM reference grid. Plot locations from both the riparian (Moseley 1999) and terrestrial inventories (this study) are included.

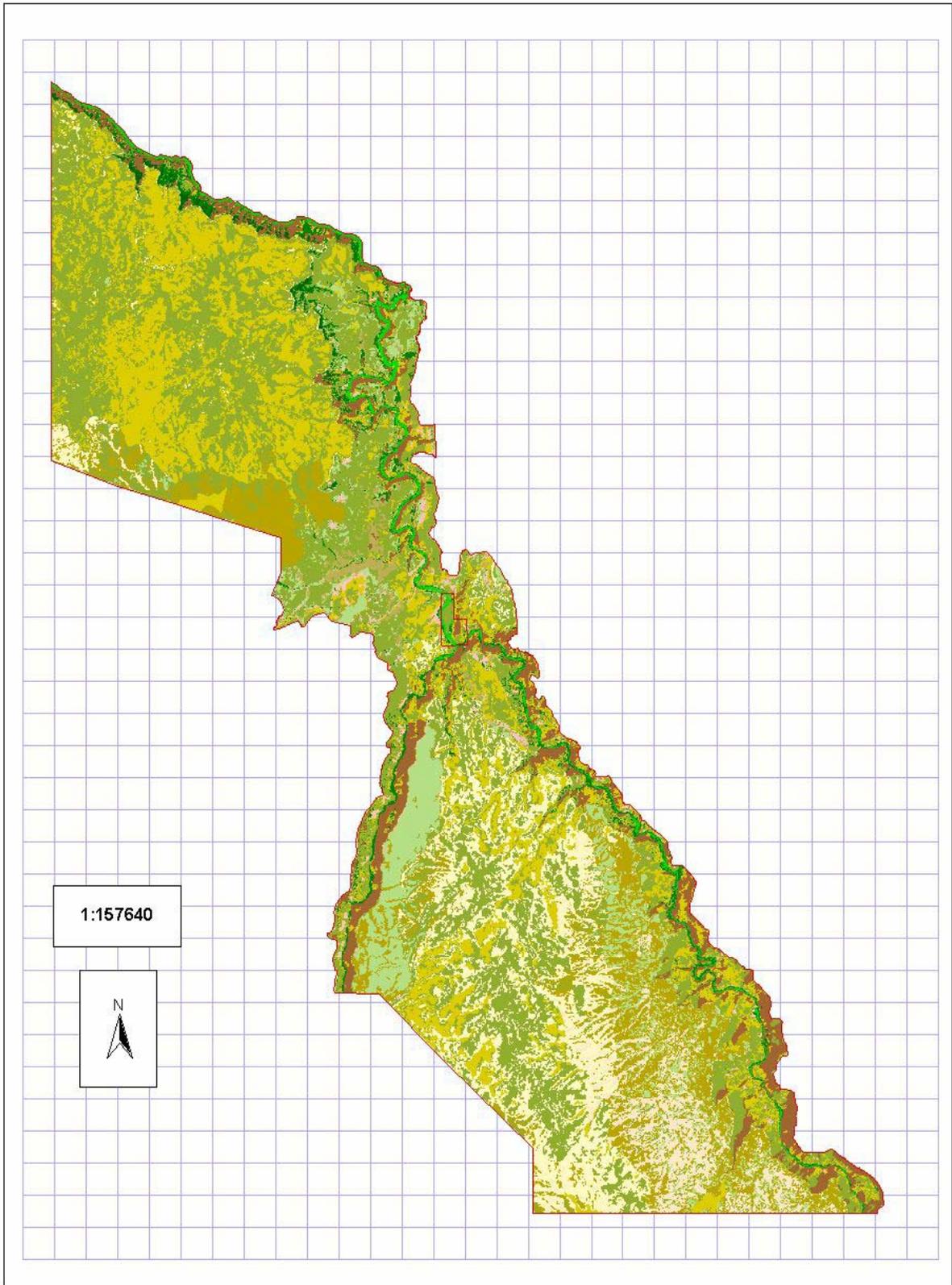


Figure 4. Vegetation of 45 Ranch. Vegetation mapping units are described in the text and in Table 2. The key is shown on following page. The UTM grid is provided for spatial orientation. Page 40

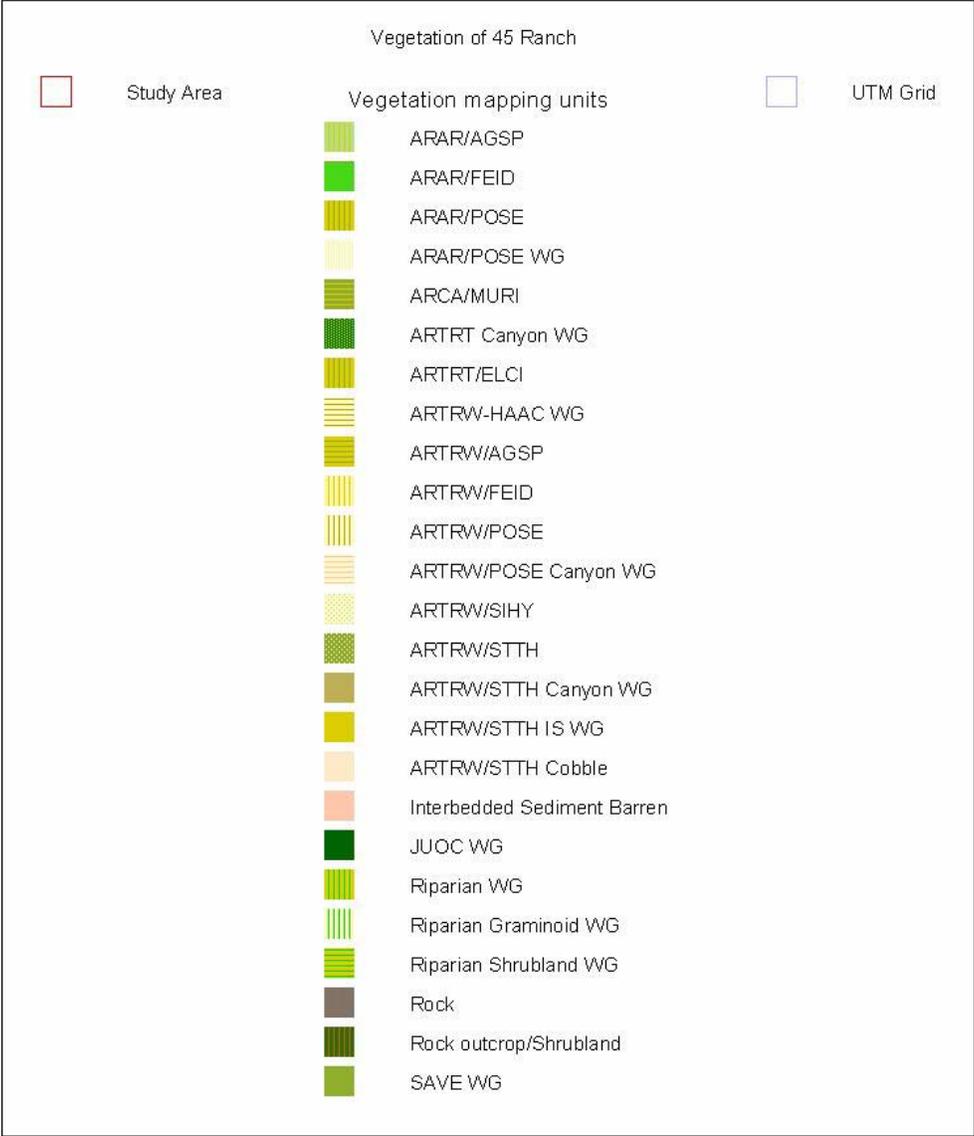


Figure 4 (continued). Vegetation of 45 Ranch - Key.

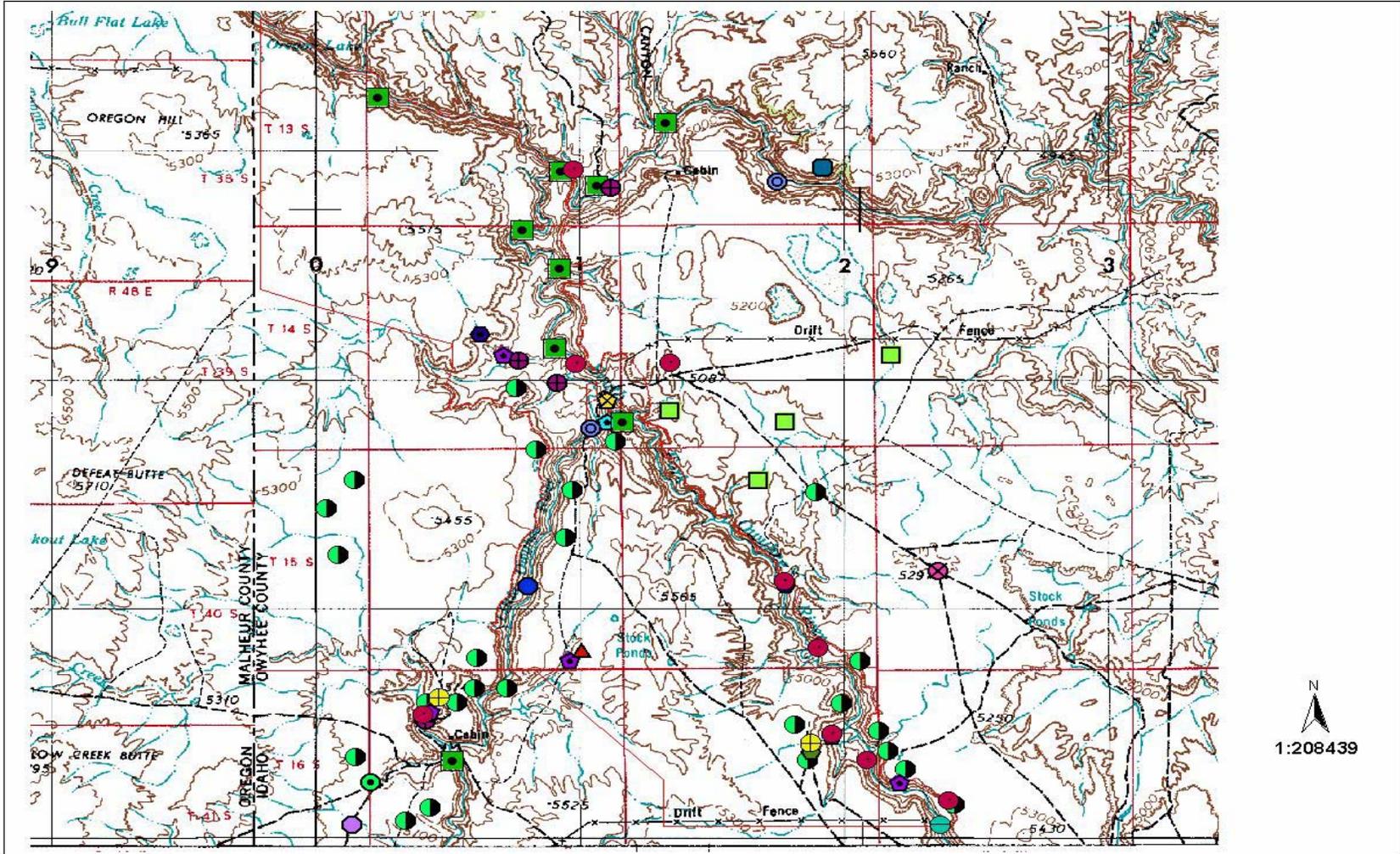


Figure 5. Rare plant and animal occurrences. Rare species observed in the vicinity of 45 Ranch are superimposed on the 1:250,000 Jordan Valley topographical quadrangle. The key to the symbols is on the following page.

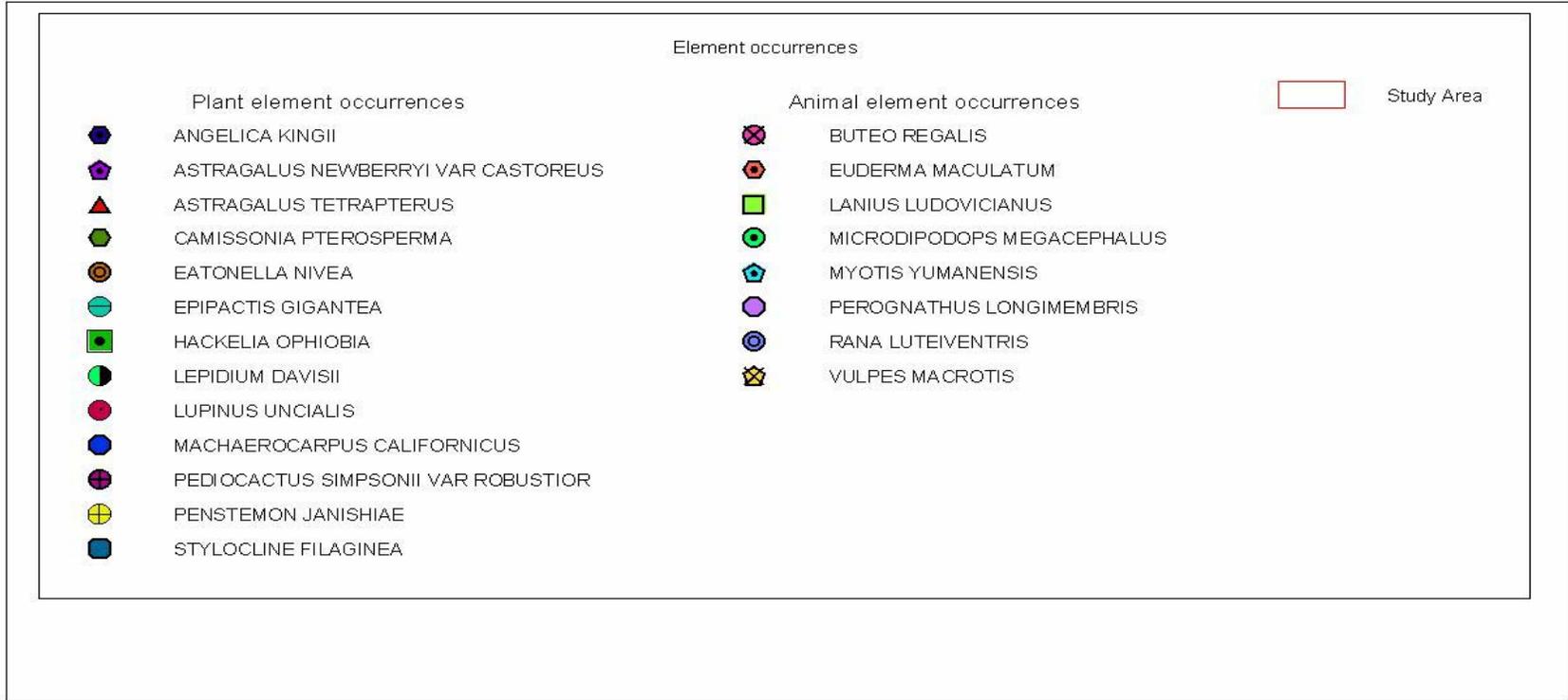


Figure 5 (continued). Rare plant and animal occurrences - symbol key.

## Tables

### List of Tables

- Table 1. Plant associations observed on the 45 Ranch Allotment, 1998-1999. Plant associations are listed alphabetically by series and physiognomic class (using the National Vegetation Classification system) with the conservation status rank.
- Table 2. Description and summary of vegetation mapping units. Vegetation map units are listed alphabetically by the code shown in Figure 4. The areal extent of each map unit (and included plant associations) is summarized by seral status and ecological condition.
- Table 3. Rare plant species observed on 45 Ranch. Rare vascular plant species are listed alphabetically with information on conservation status and distribution and habitat preference.
- Table 4. Summary of significant increases in species abundance on six nested frequency plots located within the 45 Ranch study area.

Table 1. Plant associations observed on the 45 Ranch Allotment, 1998-1999. Plant associations are listed alphabetically by series and physiognomic class (using the National Vegetation Classification system) with the conservation status rank. Riparian plant associations observed by Moseley (1999) that occur in intermittent drainage and pool habitats of plateau environments are included.

Scientific Name	Common Name	Rank (G rank/S rank)
<b>Woodland Vegetation</b>		
<i>Juniperus occidentalis</i> Series		
<i>Juniperus occidentalis/Artemisia arbuscula/Festuca idahoensis</i>	western juniper/low sagebrush/Idaho fescue	G3?/S3
<i>Juniperus occidentalis/Artemisia tridentata tridentata/Agropyron spicatum</i>	western juniper/basin big sagebrush/bluebunch wheatgrass	G?/S2
<i>Juniperus occidentalis/Artemisia tridentata vaseyana/Festuca idahoensis</i>	western juniper/mountain big sagebrush/Idaho fescue	G?/S2
<i>Juniperus occidentalis/Artemisia tridentata wyomingensis/Festuca idahoensis</i>	western juniper/Wyoming big sagebrush/Idaho fescue	G?/S2
<i>Juniperus occidentalis/Danthonia californica</i> <sup>1</sup>	western juniper/California oatgrass	G?/S2
<i>Juniperus occidentalis/Festuca idahoensis</i>	western juniper/Idaho fescue	G2/S2
<b>Evergreen Shrubland Vegetation</b>		
<i>Artemisia tridentata tridentata</i> Series		
<i>Artemisia tridentata tridentata/Agropyron spicatum</i>	basin big sagebrush/bluebunch wheatgrass	G2G4/S1
<i>Artemisia tridentata tridentata/Elymus cinereus</i>	basin big sagebrush/basin wildrye	G2/S1
<i>Artemisia tridentata tridentata/Stipa comata</i>	basin big sagebrush/needle-and-thread	G?/S1
<i>Artemisia tridentata wyomingensis</i> Series		
<i>Artemisia tridentata wyomingensis/Agropyron spicatum</i>	Wyoming big sagebrush/bluebunch wheatgrass	G5?/S3
<i>Artemisia tridentata wyomingensis/Festuca idahoensis</i>	Wyoming big sagebrush/Idaho fescue	G?/S1
<i>Artemisia tridentata wyomingensis/Poa secunda</i>	Wyoming big sagebrush/Sandberg's bluegrass	G4/S2
<i>Artemisia tridentata wyomingensis/Oryzopsis hymenoides</i>	Wyoming big sagebrush/Indian ricegrass	G5/S3?
<i>Artemisia tridentata wyomingensis/Sitanion hystrix</i>	Wyoming big sagebrush/squirreltail	G4G5/S1
<i>Artemisia tridentata wyomingensis/Stipa comata</i>	Wyoming big sagebrush/needle-and-thread	G2/S2
<i>Artemisia tridentata wyomingensis/Stipa thurberiana</i>	Wyoming big sagebrush/Thurber's needlegrass	G3?/S1
<b>Mixed Evergreen-Deciduous Shrubland</b>		
<i>Atriplex confertifolia</i> Series		
<i>Atriplex confertifolia/Agropyron spicatum</i>	shadscale/bluebunch wheatgrass	G3/S2
<i>Atriplex confertifolia/Oryzopsis hymenoides</i>	shadscale/Indian ricegrass	G3?/S1
<i>Atriplex confertifolia/Sitanion hystrix</i>	shadscale/squirreltail	G3G5/S1

<sup>1</sup> see Moseley (1999) for complete discussion of riparian and wetland plant associations.

Scientific Name	Common Name	Rank (G rank/S rank)
<b>Deciduous Shrubland Vegetation</b>		
<i>Artemisia cana</i> Series		
<i>Artemisia cana</i> /Dry Graminoid	silver sagebrush/dry graminoid	G3?/S1
<i>Artemisia cana</i> / <i>Muhlenbergia richardsonis</i>	silver sagebrush/mat muhly	G3/S2
Miscellaneous Series		
<i>Acer glabrum</i> - <i>Holodiscus dumosus</i> - <i>Ribes</i> spp.	Rocky Mountain maple/rock spirea/currant	? <sup>2</sup>
<i>Sarcobatus vermiculatus</i> / <i>Poa secunda</i>	greasewood/Sandberg's bluegrass	?
<b>Evergreen Dwarf Shrubland Vegetation</b>		
<i>Artemisia arbuscula</i> Series		
<i>Artemisia arbuscula</i> / <i>Agropyron spicatum</i>	low sagebrush/bluebunch wheatgrass	G5/S3
<i>Artemisia arbuscula</i> / <i>Festuca idahoensis</i>	low sagebrush/Idaho fescue	G5/S4
<i>Artemisia arbuscula</i> / <i>Poa secunda</i>	low sagebrush/Sandberg's bluegrass	G5/S4
<i>Artemisia longiloba</i> Series		
<i>Artemisia longiloba</i> / <i>Agropyron spicatum</i>	early sagebrush/bluebunch wheatgrass	G?/S1
<i>Artemisia longiloba</i> / <i>Festuca idahoensis</i>	early sagebrush/Idaho fescue	G3/S1
<i>Artemisia papposa</i> Series		
<i>Artemisia papposa</i>	Owyhee sagebrush--intermittent drainage	G1/S1
Miscellaneous Dwarf Shrubland Series		
<i>Haplopappus nanus</i> / <i>Poa secunda</i>	dwarf goldenweed/Sandburg's bluegrass	?
<i>Salvia dorrii</i> / <i>Oryzopsis hymenoides</i>	gray ball sage/Indian ricegrass	?
<b>Herbaceous Vegetation</b>		
<i>Artemisia ludoviciana</i>	prairie sage--intermittent drainage	G3/S2
<i>Danthonia californica</i>	California oatgrass--intermittent drainage	?
<i>Eriogonum caespitosum</i> / <i>Poa secunda</i>	mat buckwheat--intermittent drainage	?
<i>Haplopappus acaulis</i> / <i>Phlox hoodii</i>	stemless goldenweed/spiny phlox --pseudo-playa	?
<i>Lepidium davisii</i>	Davis' peppergrass--vernal pool	G1?/S1
<i>Poa secunda</i> / <i>Eriogonum</i> spp.	Sandberg's bluegrass--unclassified barren type/annual buckwheat	?

<sup>2</sup> Global and state conservation rank have not been determined.

Table 2. Description and summary of vegetation mapping units. Vegetation map units are listed alphabetically by the code shown in Figure 4. The areal extent of each map unit (and included plant associations) is summarized by seral status and ecological condition.

Association Code/Map Unit	Association Name/Map Unit Description	Seral Status	Ecological Condition	Acres
ARAR/AGSP	<i>Artemisia arbuscula/Agropyron spicatum</i>	late	A	2656.72
		late	B	18.91
ARAR/FEID	<i>Artemisia arbuscula/Festuca idahoensis</i>	late	A	477.04
		late	AB	6319.43
ARAR/POSE	<i>Artemisia arbuscula/Poa secunda</i>	late	A	1322.86
ARAR/POSE WG	<i>Artemisia arbuscula/Poa secunda</i> Working Group Inclusions (%): <i>Artemisia arbuscula/Poa secunda</i> (60) <i>Artemisia papposa</i> (5) <i>Artemisia tridentata wyomingensis/Poa secunda</i> (30) <i>Danthonia californica</i> (5)	late	AB	264.57
ARCA/MURI	<i>Artemisia cana/Muhlenbergia richardsonis</i> Inclusions (%): <i>Artemisia cana/Muhlenbergia richardsonis</i> (75) <i>Artemisia tridentata wyomingensis/Poa secunda</i> (25)	late	B	242.77
		late	A	49.79
ARTRT Canyon WG	<i>Artemisia tridentata tridentata</i> Canyon Working Group Inclusions (%): <i>Acer glabrum-Holodiscus dumosus-Ribes</i> spp. (30) <i>Artemisia tridentata tridentata/Agropyron spicatum</i> (30) <i>Artemisia tridentata tridentata/Elymus cinereus</i> (15) <i>Artemisia tridentata tridentata/Stipa comata</i> (15)	late	A	206.10
		mid	C	163.45
		mid- to late	AB	220.77
		mid- to late	B	895.80
		mid- to late	BC	33.96
ARTRT/ELCI	<i>Artemisia tridentata tridentata/Elymus cinereus</i>	early	D	50.37
		mid	BC	42.65
		mid- to late	AB	51.72
		mid- to late	BC	11.39

Association Code/Map Unit	Association Name/Map Unit Description	Seral Status	Ecological Condition	Acres
ARTRW-HAAC WG	<i>Artemisia tridentata wyomingensis</i> - <i>Haplopappapus acaulis</i> Mosaic Inclusions (%): <i>Artemisia tridentata wyomingensis</i> / <i>Agropyron spicatum</i> (30) <i>Artemisia tridentata wyomingensis</i> / <i>Poa secunda</i> (10) <i>Artemisia tridentata wyomingensis</i> / <i>Sitanion hystrix</i> (10) <i>Artemisia tridentata wyomingensis</i> / <i>Stipa thurberiana</i> (30) <i>Haplopappapus acaulis</i> - <i>Phlox hoodii</i> (20)	mid- to late	AB	1204.76
ARTRW/AGSP	<i>Artemisia tridentata wyomingensis</i> / <i>Agropyron spicatum</i>	early	D	16.40
		late	A	3579.54
		late	AB	1916.84
		late	B	2342.36
		mid	BC	1551.35
		mid	C	1368.98
		mid- to late	AB	474.15
		mid- to late	B	1813.79
		mid- to late	BC	1368.40
		mid- to late	C	495.18
ARTRW/FEID	<i>Artemisia tridentata wyomingensis</i> / <i>Festuca idahoensis</i>	late	A	5894.11
		late	AB	1135.67
		late	B	3030.90
		mid- to late	BC	143.00
ARTRW/POSE	<i>Artemisia tridentata wyomingensis</i> / <i>Poa secunda</i>	late	AB	2821.14
		late	BC	2627.00

Association Code/Map Unit	Association Name/Map Unit Description	Seral Status	Ecological Condition	Acres
ARTRW/POSE Canyon WG	<i>Artemisia tridentata wyomingensis</i> /Poa secunda Canyon Working Group Inclusions (%): <i>Artemisia arbuscula</i> /Agropyron spicatum (8) <i>Artemisia tridentata wyomingensis</i> /Agropyron spicatum (9) <i>Artemisia tridentata wyomingensis</i> /Festuca idahoensis (8) <i>Artemisia tridentata wyomingensis</i> /Poa secunda (75)	late	A	322.27
ARTRW/SIHY	<i>Artemisia tridentata wyomingensis</i> /Sitanion hystrix	late	A	2309.36
		late	AB	257.05
		late	B	678.51
		mid	BC	68.70
		mid- to late	AB	1000.20
		mid- to late	BC	49.79
ARTRW/STTH	<i>Artemisia tridentata wyomingensis</i> /Stipa thurberiana	early	D	30.49
		late	BC	941.92
		mid	C	1407.58
		mid	CD	24.51
		mid- to late	AB	3473.59
		mid- to late	C	870.52
ARTRW/STTH Canyon WG	<i>Artemisia tridentata wyomingensis</i> /Stipa thurberiana Canyon Working Group Inclusions (%): <i>Artemisia tridentata wyomingensis</i> /Stipa thurberiana (60) <i>Artemisia tridentata wyomingensis</i> /Oryzopsis hymenoides (30) <i>Salvia dorri</i> /Oryzopsis hymenoides (10)	late	AB	711.70

Association Code/Map Unit	Association Name/Map Unit Description	Seral Status	Ecological Condition	Acres
ARTRW/STTH IS WG	<i>Artemisia tridentata wyomingensis/Stipa thurberiana</i> Interbedded Sediment Working Group Inclusions (%): <i>Artemisia tridentata wyomingensis/Agropyron spicatum</i> (38) <i>Artemisia tridentata wyomingensis/Stipa thurberiana</i> (40) <i>Artemisia tridentata wyomingensis/Oryzopsis hymenoides</i> (10) <i>Atriplex confertifolia/Agropyron spicatum</i> (5) <i>Atriplex confertifolia/Oryzopsis hymenoides</i> (5) <i>Atriplex confertifolia/Sitanion hystrix</i> (2)	mid- to late	B	368.01
ARTRW/STTH Cobble	<i>Artemisia tridentata wyomingensis/Stipa thurberiana</i> cobble (stands occurring on cobbly intermittent drainages)	late	AB	2038.42
		mid- to late	BC	399.85
Interbedded Sediment Barren	Interbedded sediment barren Inclusions (%): <i>Artemisia tridentata wyomingensis/Agropyron spicatum</i> (5) <i>Artemisia tridentata wyomingensis/Stipa thurberiana</i> (10) <i>Artemisia tridentata wyomingensis/Oryzopsis hymenoides</i> (35) <i>Atriplex confertifolia/Agropyron spicatum</i> (5) <i>Poa secunda/Eriogonum</i> spp. (5) <i>Salvia dorri/Oryzopsis hymenoides</i> (40)	mid	BC	327.29
JUOC WG	<i>Juniperus occidentalis</i> Working Goup Inclusions (%): <i>Juniperus occidentalis/Artemisia arbuscula/Festuca idahoensis</i> (50) <i>Juniperus occidentalis/Artemisia tridentata vaseyana/Festuca idahoensis</i> (5) <i>Juniperus occidentalis/Artemisia tridentata wyomingensis/Agropyron spicatum</i> (5) <i>Juniperus occidentalis/Artemisia tridentata wyomingensis/Festuca idahoensis</i> (15) <i>Juniperus occidentalis/Danthonia californica</i> (10) <i>Juniperus occidentalis/Festuca idahoensis</i> (15)	late	A	82.21
		mid	AB	140.10
		mid	B	32.23
		mid	C	3.86
		mid- to late	A	132.77
		mid- to late	AB	3.86
		mid- to late	B	25.67
Riparian WG	Riparian Working Group (vegetation of upslope intermittent streams and seeps) Inclusions (%): <i>Berula erecta</i> (5) <i>Carex nebrascensis</i> (20) <i>Danthonia californica</i> (5) <i>Juncus balticus</i> (70)	mid	BC	3.67

Association Code/Map Unit	Association Name/Map Unit Description	Seral Status	Ecological Condition	Acres
Riparian Graminoid WG	Riparian graminoid (vegetation of perennial streams) Inclusions (%): <i>Eleocharis palustris</i> (15) <i>Eleocharis rostellata</i> (30) <i>Phragmites australis</i> (20) <i>Scirpus americanus</i> (10) <i>Scirpus pungens</i> (10) water (15)	late	B	219.42
		mid	C	13.51
Riparian Shrubland WG	Inclusions (%): alluvial gravel and sand (50) <i>Salix exigua</i> /Barren (12) <i>Salix exigua</i> /Mesic graminoid (13) water (25)	mid	C	1.93
		mid- to late	BC	511.97
Rock	Rock Inclusions: talus and bedrock outcrop with small stands of <i>Haplopappus nanus</i> / <i>Poa secunda</i> .	NA	NA	3305.90
Rock outcrop/Shrubland	Rock outcrop/Shrubland Inclusions: talus and bedrock outcrop with <i>Acer glabrum</i> - <i>Holodiscus dumosus</i> - <i>Ribes</i> spp., <i>Artemisia tridentata tridentata</i> / <i>Elymus cinereus</i> , and <i>Haplopappus nanus</i> / <i>Poa secunda</i> .	late	A	751.26
SAVE WG	<i>Sarcobatus vermiculatus</i> Working Group Inclusions: <i>Sarcobatus vermiculatus</i> / <i>Poa secunda</i> and other <i>Sarcobatus vermiculatus</i> stands	late	B	8.49
		mid	C	3.47
		mid- to late	B	102.09

Table 3. Summary of rare plant populations on the 45 Ranch study area. The distribution and habitats of rare plant species on 45 Ranch are summarized with conservation ranks. The locations of rare plant element occurrences are shown in Figure 5.

Scientific Name	Common Name	Rank	INPS Category (1999)	45 Ranch Element Occurrences	Habitat and Distribution	Comments
<i>Angelica kingii</i>	Nevada angelica	G7/S1	State Priority 1	001, 002	riparian; springs	see Moseley (1999)
<i>Aspicilia fruticulosa</i>	rim lichen	G3/S1	State Priority 1	N/A	vagrant lichen on gravelly desert pavement in <i>Artemisia tridentata wyomingensis</i> communities	1997 observation; occurrence located on the west rim near Bull Camp has not been mapped
<i>Astragalus newberryi</i> var. <i>castoreus</i>	Newberry's milkvetch	G5T5/S1	State Priority 1	004, 005, 007, 008	desertic gravelly soils & interbedded sediments in open <i>Artemisia tridentata wyomingensis</i> communities; canyon rims & slopes; Spring Ck. Basin and south	relatively common with widely scattered plants on varying habitats
<i>Astragalus tetrapterus</i>	four-winged milkvetch	G4/S1	State Priority 1	003	sparsely vegetated, gravelly sand & ash/clay outcrop in open mixed-shrub; Walcot Basin	also in Star V southern valley; only 1 other site known from Idaho
<i>Camissonia pterosperma</i>	wingfruit suncup	G4/S2	State Sensitive	N/A	thin gravel in rocky intermittent drainage; in mixed herbaceous community on canyon rim above Triple Draw Basin, south of Coyote Hole	other known sites in ID are in southern Lemhi Mts. & adjacent INEEL
<i>Chrysothamnus humilis</i>	Truckee rabbitbrush	G4/S1	Review	N/A	dry, open, & often rocky <i>Artemisia tridentata wyomingensis</i> communities, especially with <i>Stipa thurberiana</i> ; canyon rims & slopes; mostly Spring Ck. Basin & south	common on 45 Ranch & elsewhere on Owyhee plateau; probably not rare
<i>Cymopterus longipes</i> var. <i>ibapensis</i>	longstalk spring-parsley	G4T/S2	State Sensitive	N/A	often associated with <i>Lepidium davisii</i> vernal pools but also on heavy, clay soil pseudo-playas	taxonomic questions; true rarity is poorly understood
<i>Downingia insignis</i>	calicoflower	G7/S1	Review	N/A	riparian; drying mud, stock reservoirs	no new 1999 sites; see Moseley (1999)
<i>Eatonella nivea</i>	white false tickhead	G4/S3	State Sensitive	004	gravelly desertic soil	1982 observation

Scientific Name	Common Name	Rank	INPS Category (1999)	45 Ranch Element Occurrences	Habitat and Distribution	Comments
<i>Epipactis gigantea</i>	giant helleborine	G4/S3	State Priority 1	060	riparian; springs	see Moseley (1999)
<i>Hackelia ophiobia</i>	Owyhee River stickseed	G3/S2	Global Priority 3	007-010, 012	shady north facing, vertical rhyolitic cliffs and crevices; East Fork, Main, South Fork, & Little Owyhee River canyons	many miles of unsurveyed & inaccessible habitat; also in Star Valley & near Crutcher's Crossing
<i>Haplopappus uniflorus</i> var. <i>howellii</i>	Howell's goldenweed	G5T?/S1	Review	002	intermittent drainage; <i>Artemisia papposa</i> & <i>Danthonia californica</i> communities	no new 1999 sites; see Moseley (1999)
<i>Lepidium davisii</i>	Davis' peppergrass	G3/S3	Global Priority 3	096-098, 102, 103, 171	intermittent pools; vernal wet playas	no new 1999 sites; see Moseley (1999)
<i>Lupinus uncialis</i>	inch-high lupine	G4/S2	State Priority 2	001-003, 008	coarse sand, gravel, cinder, silt barrens, & desert pavement in open shrub; slopes, canyon rims, & intermittently wet areas; most common S of Spring Creek Basin along S. Fk. Owyhee	populations dependent on rainfall; also along East Fk. & Main Owyhee rivers & near Star Valley
<i>Machaerocarpus californicus</i>	fringed waterplantain	G4/S2	State Monitor	014	riparian; pools and moist sands of river bed	see Moseley (1999)
<i>Pectocarya setosa</i>	moth combseed	G5/S1	Review	N/A	gravelly sand & desert pavement in open <i>A. tridentata wyomingensis</i> & <i>Atriplex confertifolia</i> communities; barren slope of Walcot Basin & in S. Fk. Owyhee canyon near SE allotment boundary	common in Great Basin, rarity in Idaho unknown
<i>Pediocactus simpsonii</i> var. <i>robustior</i>	Simpson's hedgehog cactus	G4T4/S3	State Monitor	029	shallow, rocky soils; ridgetops in open <i>Artemisia tridentata wyomingensis</i> communities; in Spring Creek Basin	also near Crutcher's Crossing & in Star Valley area

Scientific Name	Common Name	Rank	INPS Category (1999)	45 Ranch Element Occurrences	Habitat and Distribution	Comments
<i>Penstemon janishiae</i>	Antelope Valley beardtongue	G4/S2	State Priority 2	N/A	heavy clay-silt soils of pseudo-playa slickspots in open <i>A. tridentata wyomingensis</i> / <i>Sitanion hystrix-Poa secunda</i> ; on canyon rim near Triple Draw Basin, S of Coyote Hole	other known sites in ID are on Owyhee Front; also in similar habitat near Star Valley
<i>Symphoricarpos oreophilus</i> var. <i>parishii</i>	Parish's snowberry	G5T?/S1	Review	N/A	sheltered & shady rimrock, talus, & side-canyon draws; often with other deciduous shrubs or <i>Juniperus occidentalis</i> in the Main, E. Fk., S. Fk., & Little Owyhee River canyons	common on 45 Ranch & surrounding canyons, especially on S side of Juniper Mt.; probably not a rare plant
<b>Other regionally endemic species on 45 Ranch not tracked by CDC:</b>						
<i>Artemisia packardiae</i>	Packard's mugwort	G3/S3	N/A	N/A	shady & sheltered rhyolitic cliffs & crevices	often with <i>Ivesia baileyi</i> ; common regional endemic
<i>Artemisia papposa</i>	Owyhee sagebrush	G4/S4	N/A	N/A	intermittent drainages N of Spring Butte; dominates community	no new 1999 sites; see Moseley (1999)
<i>Erigeron latus</i>	broad fleabane	G3/S3	N/A	N/A	shallow lithosolic soil; coarse gravel or cinder on rimrock & canyon rock outcrops or benches	sometimes with <i>Lupinus uncialis</i> ; common regional endemic
<i>Ivesia baileyi</i>	Bailey's ivesia	G5/S?	N/A	N/A	shady & sheltered rhyolitic cliffs & crevices	often with <i>Artemisia packardiae</i> ; common wide-regional endemic
<i>Scutellaria nana</i>	dwarf skullcap	G4/S2	N/A	N/A	shallow gravelly soil on rimrock & canyon rock outcrops of benches; often where water drainage is impeded by rock	sometimes with <i>Lupinus uncialis</i> ; common wide-regional endemic

Table 4. Summary of significant increases in species abundance on six nested frequency plots located within the 45 Ranch study area. Plant species that significantly (two-tailed, paired T-test,  $p \leq 0.05$ ) increased in abundance are listed by trend plot with the plant association and the nest frequency frame in which the increase occurred.

Trend Plot Id.	Plant Association	Species	Nested Frequency Frame Id.
13S05W20	<i>Artemisia arbuscula/Festuca idahoensis</i>	<i>Poa secunda</i>	2 - 4
		<i>Antennaria</i> spp.	4
		<i>Astragalus</i> spp.	4
		<i>Lomatium</i> spp.	2, 4
		<i>Agoseris</i> spp.	2 - 4
14S05W04	<i>Artemisia tridentata wyomingensis/Festuca idahoensis</i>	<i>Astragalus</i> spp.	2 - 4
		<i>Phlox longifolia</i>	2 - 4
		<i>Crepis</i> spp.	2
		<i>Agoseris</i> spp.	4
		<i>Balsamorhiza hookeri</i>	4
14S05W15	<i>Artemisia tridentata wyomingensis/Agropyron spicatum</i>	<i>Poa secunda</i>	2
		<i>Agropyron spicatum</i>	3
		<i>Lupinus</i> spp.	3, 4
		<i>Antennaria</i> spp.	2
		<i>Aster scopulorum</i>	2 - 4
15S05W13	<i>Artemisia tridentata wyomingensis/Sitanion hystrix</i>	<i>Poa secunda</i>	1 - 3
		<i>Erigeron bloomerii</i>	3, 4
		<i>Phlox longifolia</i>	4
		<i>Aster scopulorum</i>	3
		<i>Artemisia tridentata wyomingensis</i> seedlings	4
15S05W26	<i>Artemisia tridentata wyomingensis/Poa secunda</i>	<i>Poa secunda</i>	1 - 4
		<i>Sitanion hystrix</i>	3
		<i>Phlox hoodii</i>	3, 4
16S04W05	<i>Artemisia tridentata wyomingensis/Agropyron spicatum</i>	<i>Artemisia tridentata wyomingensis</i>	2

Appendix 1. Field forms and associated data dictionaries utilized in terrestrial descriptive work are reproduced in the following order:

1. Vegetation Point Observation Form.
2. Vegetation Point Observation Form - Data Dictionary.
3. Ecology Plot Card (available upon request).
4. Ecology Plot Card Data Dictionary (available upon request).

VEGETATION POINT OBSERVATION FORM

Site Name \_\_\_\_\_ Date \_\_\_\_\_  
Observers \_\_\_\_\_

Plot ID \_\_\_\_\_

Plant Association \_\_\_\_\_  
NVC Subgroup \_\_\_\_\_  
NVC Community Association \_\_\_\_\_  
Structural Condition \_\_\_\_\_ Seral Status \_\_\_\_\_

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_ Way Point \_\_\_\_\_ FOM \_\_\_\_\_

SLOPE \_\_\_\_\_ MICRO VERTICAL \_\_\_\_\_  
ASPECT \_\_\_\_\_ MICRO HORIZONTAL \_\_\_\_\_  
ELEVATION \_\_\_\_\_ TOPO MOISTURE \_\_\_\_\_

ECOLOGICAL CONDITION: \_\_\_\_\_ COMMENTS: \_\_\_\_\_

DISTRIBUTION PATTERN: \_\_\_\_\_

COMPOSITION COMMENTS: \_\_\_\_\_

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Plot ID \_\_\_\_\_

Plant Association \_\_\_\_\_  
NVC Subgroup \_\_\_\_\_  
NVC Community Association \_\_\_\_\_  
Structural Condition \_\_\_\_\_ Seral Status \_\_\_\_\_

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_ Way Point \_\_\_\_\_ FOM \_\_\_\_\_

SLOPE \_\_\_\_\_ MICRO VERTICAL \_\_\_\_\_  
ASPECT \_\_\_\_\_ MICRO HORIZONTAL \_\_\_\_\_  
ELEVATION \_\_\_\_\_ TOPO MOISTURE \_\_\_\_\_

ECOLOGICAL CONDITION: \_\_\_\_\_ COMMENTS: \_\_\_\_\_

DISTRIBUTION PATTERN: \_\_\_\_\_

COMPOSITION COMMENTS: \_\_\_\_\_

REV 9/28/98

Plot ID \_\_\_\_\_

Plant Association \_\_\_\_\_  
NVC Subgroup \_\_\_\_\_  
NVC Community Association \_\_\_\_\_  
Structural Condition \_\_\_\_\_ Seral Status \_\_\_\_\_

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_ Way Point \_\_\_\_\_ FOM \_\_\_\_\_

SLOPE \_\_\_\_\_ MICRO VERTICAL \_\_\_\_\_  
ASPECT \_\_\_\_\_ MICRO HORIZONTAL \_\_\_\_\_  
ELEVATION \_\_\_\_\_ TOPO MOISTURE \_\_\_\_\_

ECOLOGICAL CONDITION: \_\_\_\_\_ COMMENTS: \_\_\_\_\_

DISTRIBUTION PATTERN: \_\_\_\_\_

COMPOSITION COMMENTS: \_\_\_\_\_

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Plot ID \_\_\_\_\_

Plant Association \_\_\_\_\_  
NVC Subgroup \_\_\_\_\_  
NVC Community Association \_\_\_\_\_  
Structural Condition \_\_\_\_\_ Seral Status \_\_\_\_\_

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_ Way Point \_\_\_\_\_ FOM \_\_\_\_\_

SLOPE \_\_\_\_\_ MICRO VERTICAL \_\_\_\_\_  
ASPECT \_\_\_\_\_ MICRO HORIZONTAL \_\_\_\_\_  
ELEVATION \_\_\_\_\_ TOPO MOISTURE \_\_\_\_\_

ECOLOGICAL CONDITION: \_\_\_\_\_ COMMENTS: \_\_\_\_\_

DISTRIBUTION PATTERN: \_\_\_\_\_

## VEGETATION POINT OBSERVATION FORM - DATA DICTIONARY

Introduction. Plant community point observations are intended to rapidly build information on patterns in the distribution and condition of plant associations. Point observations may be taken in conjunction with other ecology plots methods.

On a walking route through the study area, data on the plant association present, stand level ecological condition and seral status, and the physical environment are repeatedly collected. New data is collected as a new plant association is encountered or with any significant change in the environmental parameters (slope, aspect, elevation), structural condition, seral status, or ecological condition. While *en route* through the study area, narrative descriptions will usually stabilize. Rather than re-describing similar observations, earlier descriptions should be referenced and embellished upon. Information, however, on structural condition, seral status, and the environmental parameters of slope, aspect, and elevation should be recorded at each and every opportunity.

Field	Value	Description (range of values)
Aspect	range	0 - 360 °; declination-corrected azimuth of slope aspect to the nearest degree.
Composition Comments	narrative	Description of the abundance of important (common or rare) species within the stand, substrate cover (bedrock, boulders, stones, cobbles, gravel, and soil), outstanding floristic features, or notable compositional peculiarities (i.e., with respect to the plant association).
Date	date	MM/DD/YY (month/day/year).
Distribution Pattern	narrative	Description of the size and placement of the stand in relation to adjacent stands and key environmental factors. Examples: a) extensive on this and adjacent slope aspects; b) occurs on small inclusions of deeper soil within a mosaic dominated by ARAR/AGSP on shallow soils; or c) restricted to lower slope positions with northerly aspects.
Ecological Condition	A B C D F	Pristine condition. Evidence of post-industrial human-caused disturbance is absent. Exotic species are absent. Little evidence of post-industrial human-caused disturbance is present. Stand composition and structure is predominantly natural. Exotic species are only common ( $\leq$ one percent cover). Post-industrial human-caused disturbance is apparent. Stand composition and structure is altered. Exotic species are well represented to abundant (5 - 25 percent cover). Evidence of post-industrial human-caused disturbance is prevalent. Stand composition and structure is altered. Native species are present, but are in peril of loss. Increasers dominate the stand. Invader species are a significant compositional component. Native stand composition, structure, and function are significantly altered. Re-establishment of native stand composition, structure, and function will require large energy inputs.
Ecological Condition; Comments	narrative	Identification and description of factors contributing to the assignment of ecological condition rank. These comments should help refine the rationale and criteria used in assessing the ecological condition of the association in question.
Elevation	range	0 - 25000; elevation in feet.
Latitude	range	Latitude in degrees and minutes (to three decimal places)
Longitude	range	Longitude in degrees and minutes (to three decimal places)
Micro Vertical, Micro Horizontal	1 2 3 4	Convex Straight Concave Undulating
NVC Subgroup	name	National Vegetation Classification subgroup (e.g., evergreen forest).
NVC Community Association	name	The physiognomically uniform existing vegetation named for the diagnostic (dominant, differential, indicator, or character) overstory and understory species.
Observers	name	The names of those observing the information recorded.
Plant Association	name	The name of the potential natural community as identified through the use of recognized authoritative field guides or classification keys.
Plot Id	alphanumeric	The plot identification is indicated as an eleven character alphanumeric string incorporating the current date and time (using the twenty-four hour clock) as follows: (date-time) YYMMDD-HHMM. The standard WHTF method may also be used.

Seral Status	PNC	The potential natural community; seral species are scarce to absent. Species composition and density are relatively stable. The dominant species are reproducing.	
	late	Late-seral species are well represented to abundant and increasing in abundance. Seral species may still persist.	
	mid	Late-seral species are well represented to abundant in the understory and are beginning to occupy the overstory or are present with low density and abundance.	
	early	Seral species are dominant in the overstory or late-seral species are present with low density and abundance or absent.	
	retro	Native species are either absent or so low in abundance as to make recolonization very difficult. Increasesers and invaders dominate. The vegetation is disclimax. Only mechanical manipulation will result in the reintroduction of native late-seral species.	
Site Name	name	The name of the site. Each site is assigned a unique name. Once assigned, the name should not change unless absolutely necessary. The following conventions are applied: 1) local place names are used first when available, 2) names of features on topographic maps are used when local names do not exist, and 3) no two sites within the state are given the same name.	
Slope	range	0 - 360 °; inclination of the surface of the soil from the horizontal.	
Structural Condition		<u>Shrubland, Herbland, and Grassland PNV</u> : Five character string incorporating code for height, canopy cover, and canopy layering (strata). Herbland. Grasses and herbs are the only life form present.	
Height classes:	HE	Herbland. Grasses and herbs are the only life form present.	
	LS	Low shrub. Shrubs are 0 - 1.5 feet tall.	
	Ma	Medium shrub. Shrubs are 1.6 - 2.5 feet tall.	
	Mb	Medium tall shrub. Shrubs are 2.6 - 4.0 feet tall.	
	Ta	Tall shrub. Shrubs are 4 - 6.5 feet tall.	
	Tb	Very tall shrub. Shrubs are $\geq 6.5$ (and $< 16.5$ ) feet tall.	
	Cover classes:	Na	$< 10$ percent canopy cover.
		Oa	$\geq 10$ and $< 15$ percent canopy cover.
		Ob	$\geq 15$ and $\leq 25$ percent canopy cover.
		Ma	$> 25$ and $\leq 40$ percent canopy cover.
Shrub strata	Mb	$> 40$ and $\leq 66$ percent canopy cover.	
	Da	$> 66$ percent cover.	
	N	No strata.	
	E	One stratum with $< 30$ percent difference in height.	
	U	Two or more strata (of the same life form) with $> 30$ percent difference in height. If shrubland, a second shrub strata must have $\geq 25$ percent cover. If herbland or grassland, a second herb or grass strata must have $\geq 10$ percent cover (including cryptograms).	
Topo Moisture	3	dry, well drained ridgetop or prow.	
	4	dry mid-slope.	
	5	mesic toe slope.	
	7	moist basin.	

## Appendix 2. Comprehensive plant species list.

The master species list for 45 Ranch Allotment with common names, 1998-1999. Vascular plant species are listed alphabetically by life form group. Nomenclature follows Cronquist et al. (1972 - 1997). Species that are not described in *Intermountain Flora* follow the nomenclature of Hitchcock and Cronquist (1973). For the most part, common names come from Hitchcock and Cronquist (1973). Riparian species observed by Moseley (1999) are indicated by an asterisk (\*).

Species	Common Name
TREES	
<i>Juniperus occidentalis</i>	western juniper
<i>Populus alba</i> (Lombardy)	Lombardy poplar
<i>Robinia pseudoacacia</i>	black locust
SHRUBS	
<i>Acer glabrum</i>	Rocky Mountain maple
<i>Amelanchier alnifolia</i>	serviceberry
<i>Artemisia arbuscula</i> var. <i>arbuscula</i>	dwarf sagebrush
<i>Artemisia cana</i>	silver sagebrush
<i>Artemisia longiloba</i>	early sagebrush
<i>Artemisia papposa</i>	Owyhee sagebrush
<i>Artemisia spinescens</i>	bud sagebrush
<i>Artemisia tridentata</i> var. <i>tridentata</i>	basin big sagebrush
<i>Artemisia tridentata</i> var. <i>vaseyana</i>	mountain big sagebrush
<i>Artemisia tridentata</i> var. <i>wyomingensis</i>	Wyoming big sagebrush
<i>Atriplex confertifolia</i>	shadscale
<i>Atriplex nuttalli</i>	saltsage
<i>Brickellia microphylla</i>	small-leaved brickellbush
<i>Chrysothamnus humilis</i>	Truckee rabbitbrush
<i>Chrysothamnus nauseosus</i>	rubber rabbitbrush
<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush
<i>Clematis ligusticifolia</i>	western clematis
<i>Cornus sericea</i>	red-osier dogwood
<i>Eriogonum microthecum</i>	slenderbush buckwheat
<i>Eriogonum sphaerocephalum</i>	rock buckwheat
<i>Eurotia lanata</i>	winterfat
<i>Grayia spinosa</i>	spiny hopsage
<i>Haplopappus nanus</i>	dwarf goldenweed
<i>Holodiscus dumosus</i>	gland ocean-spray
<i>Leptodactylon pungens</i>	granite pricklygilia
<i>Prunus virginiana</i>	common chokecherry
<i>Ribes aureum</i>	golden currant
<i>Ribes cereum</i>	squaw currant
<i>Ribes inerme</i>	whitestem gooseberry
<i>Ribes velutinum</i>	desert gooseberry
<i>Rosa woodsii</i>	Wood's rose
<i>Salix exigua</i>	sandbar willow
<i>Salix lasiandra</i>	Pacific willow
<i>Salix lasiolepis</i>	arroyo willow
<i>Salix lutea</i>	yellow willow
<i>Salvia dorrii</i>	gray ball sage
<i>Sambucus cerulea</i>	blue elderberry
<i>Sarcobatus vermiculatus</i>	greasewood
<i>Symphoricarpos oreophilus</i> var. <i>parishii</i>	Parish's snowberry
<i>Tamarix</i> sp.	tamarisk
<i>Tetradymia canescens</i>	spineless horse-brush
<i>Tetradymia glabrata</i>	little-leaved horse-brush
<i>Tetradymia spinosa</i>	cottonthorn horse-brush
PERENNIAL GRAMINOIDS	
<i>Agropyron cristatum</i>	crested wheatgrass

<i>Agropyron dasystachyum</i>	thickspike wheatgrass
<i>Agropyron intermedium</i>	intermediate wheatgrass
<i>Agropyron repens</i>	quackgrass
<i>Agropyron smithii</i>	western wheatgrass
<i>Agropyron spicatum</i>	bluebunch wheatgrass
<i>Agropyron trachycaulum</i>	slender wheatgrass
<i>x Agrositanion saxicola</i>	hybrid squirreltail wheatgrass
<i>Agrostis exarata</i>	spike bentgrass
<i>Agrostis stolonifera</i>	redtop bentgrass
<i>Alopecurus aequalis</i>	little foxtail
<i>Alopecurus geniculatus</i>	water foxtail
<i>Alopecurus pratensis</i>	meadow foxtail
<i>Beckmannia syzigachne</i>	American sloughgrass
<i>Bromus inermis</i>	smooth brome
<i>Calamagrostis inexpansa</i>	narrow-spiked reedgrass
<i>Carex athrostachya</i>	slender-beaked sedge
<i>Carex aurea</i>	golden sedge
<i>Carex douglasii</i>	Douglas' sedge
<i>Carex lanuginosa</i>	woolly sedge
<i>Carex nebrascensis</i>	Nebraska sedge
<i>Carex praegracilis</i>	clustered field sedge
<i>Dactylis glomerata</i>	orchardgrass
<i>Danthonia californica</i>	California oatgrass
<i>Deschampsia cespitosa</i>	tufted hairgrass
<i>Distichlis spicata</i>	desert saltgrass
<i>Eleocharis palustris</i>	common spike-rush
<i>Eleocharis rostellata</i>	beaked spike-rush
<i>Elymus cinereus</i>	basin wildrye
<i>Elymus triticoides var. triticoides</i>	creeping wildrye
<i>Festuca arundinacea</i>	tall fescue
<i>Festuca idahoensis</i>	Idaho fescue
<i>Glyceria elata</i>	tall mannagrass
<i>Glyceria grandis</i>	American mannagrass
<i>Hordeum brachyantherum</i>	meadow barley
<i>Hordeum jubatum</i>	foxtail barley
<i>Juncus balticus</i>	Baltic rush
<i>Juncus ensifolius</i>	dagger-leaf rush
<i>Juncus longistylis</i>	long-styled rush
<i>Juncus nevadensis</i>	Sierra rush
<i>Juncus orthophyllus</i>	straight-leaved rush
<i>Koeleria nitida</i>	junegrass
<i>Leersia oryzoides</i>	rice cutgrass
<i>Muhlenbergia asperifolia</i>	scratchgrass muhly
<i>Muhlenbergia richardsonis</i>	mat muhly
<i>Oryzopsis hymenoides</i>	Indian ricegrass
<i>Phalaris arundinacea</i>	reed canarygrass
<i>Phleum pratense</i>	timothy
<i>Phragmites australis</i>	common reed
<i>Poa ampla</i>	big bluegrass
<i>Poa bulbosa</i>	bulbous bluegrass
<i>Poa compressa</i>	Canada bluegrass
<i>Poa cusickii</i>	Cusick's bluegrass
<i>Poa interior</i>	inland bluegrass
<i>Poa nevadensis</i>	Nevada bluegrass
<i>Poa pratensis</i>	Kentucky bluegrass
<i>Poa secunda</i>	Sandberg's bluegrass
<i>Puccinellia nuttaliana</i>	Nuttall's alkaligrass
<i>Scirpus americanus</i>	Olney threesquare
<i>Scirpus fluviatilis</i>	river bulrush
<i>Scirpus pungens</i>	common threesquare
<i>Scirpus validus</i>	softstem bulrush
<i>Sitanion hystrix</i>	squirreltail
<i>Sparganium emersum</i>	simplestem bur-reed
<i>Spartina gracilis</i>	alkali cordgrass
<i>Sphenopholis obtusata</i>	wedgegrass
<i>Stipa comata</i>	needle-and-thread
<i>Stipa thurberiana</i>	Thurber's needlegrass
<i>Stipa webberi</i>	Webber's needlegrass

ANNUAL GRAMINOIDS

<i>Apera interrupta</i>	interrupted apera
<i>Bromus japonicus</i>	Japanese chess
<i>Bromus tectorum</i>	cheatgrass
<i>Cyperus aristatus</i>	awned flatsedge
<i>Deschampsia danthonioides</i>	annual hairgrass
<i>Echinochloa crusgalli</i>	barnyard grass
<i>Eleocharis sp.</i>	annual spike-rush
<i>Eremopyrum triticeum</i>	annual wheatgrass
<i>Crypsis alopecuroides</i>	foxtail pricklegrass
<i>Juncus bufonius</i>	toad rush
<i>Panicum capillare</i>	old witchgrass
<i>Polypogon monspeliensis</i>	rabbitfoot grass
<i>Vulpia bromoides</i>	barren fescue

PERENNIAL FORBS

<i>Achillea millefolium</i>	yarrow
<i>Agastache urticifolia</i>	nettle-leaf horse-mint
<i>Agoseris glauca</i>	pale agoseris
<i>Agoseris sp.</i>	agoseris
<i>Alisma plantago-aquatica</i>	water-plantain
<i>Allium acuminatum</i>	tapertip onion
<i>Allium lemmonii</i>	Lemmon's onion
<i>Allium nevadense</i>	Nevada onion
<i>Allium tolmiei</i>	Tolmie's onion
<i>Amsinckia menziesii</i>	Menzie's fiddleneck
<i>Amsinckia retrorsa</i>	rigid fiddleneck
<i>Angelica kingii</i>	Nevada angelica
<i>Antennaria dimorpha</i>	low pussy-toes
<i>Antennaria luzuloides</i>	woodrush pussy-toes
<i>Antennaria microphylla</i>	rosy pussy-toes
<i>Apocynum cannabinum</i>	common dogbane
<i>Arabis holboellii</i>	Holboell's rockcress
<i>Arabis microphylla</i>	littleleaf rockcress
<i>Arabis puberla</i>	hoary rockcress
<i>Arabis sp.</i>	rockcress
<i>Arabis sparsiflora</i>	elegant rockcress
<i>Arenaria congesta</i>	ballhead sandwort
<i>Arenaria kingii</i>	King's sandwort
<i>Arnica longifolia</i>	seep-spring arnica
<i>Arnica sororia</i>	twin arnica
<i>Artemisia dracunculus</i>	tarragon
<i>Artemisia ludoviciana</i>	prairie sage
<i>Artemisia packardiae</i>	Packard's mugwort
<i>Asclepias incarnata</i>	swamp milkweed
<i>Asclepias speciosa</i>	showy milkweed
<i>Aster ascendens</i>	long-leaved aster
<i>Aster eatonii</i>	Eaton's aster
<i>Aster hesperius</i>	western lined aster
<i>Aster scopulorum</i>	crag aster
<i>Astragalus atratus var. owyheensis</i>	mourning milkvetch
<i>Astragalus calycosus</i>	matted milkvetch
<i>Astragalus convallarius</i>	lesser rushy milkvetch
<i>Astragalus curvicaupus</i>	sickle milkvetch
<i>Astragalus eremiticus</i>	hermit milkvetch
<i>Astragalus filipes</i>	basalt milkvetch
<i>Astragalus kentrophyta</i>	thistle milkvetch
<i>Astragalus lentiginosus var. lentiginosus</i>	freckled milkvetch
<i>Astragalus lentiginosus var. salinus</i>	freckled milkvetch
<i>Astragalus newberryi var. castoreus</i>	Newberry's milkvetch
<i>Astragalus obscurus</i>	arcane milkvetch
<i>Astragalus purshii var. purshii</i>	woolly-pod milkvetch
<i>Astragalus sp.</i>	milkvetch
<i>Astragalus tetrapterus</i>	four-winged milkvetch
<i>Balsamorhiza hookeri</i>	Hooker's balsamroot
<i>Balsamorhiza sagittata</i>	arrowleaf balsamroot

<i>Berula erecta</i>	cut-leaved water-parsnip
<i>Brickellia grandiflora</i>	large-flowered brickellia
<i>Brickellia oblongifolia</i>	narrow-leaved brickellia
<i>Callitriche hermaphroditica</i>	autumnal water-starwort
<i>Calochortus bruneaunis</i>	Bruneau mariposa
<i>Calochortus eurycarpus</i>	wide-fruit mariposa
<i>Calochortus macrocarpus</i>	sagebrush mariposa
<i>Camissonia tanacetifolia</i>	tansy-leaf evening-primrose
<i>Cardaria draba</i>	hoary whitetop
<i>Castilleja angustifolia</i>	Northwest paintbrush
<i>Castilleja chromosa</i>	desert paintbrush
<i>Castilleja linariifolia</i>	narrow-leaved paintbrush
<i>Castilleja pallescens</i> var. <i>inverta</i>	dwarf pale Indian-paintbrush
<i>Castilleja</i> sp.	Indian-paintbrush
<i>Caulanthus crassicaulis</i>	thickstemmed wild cabbage
<i>Ceratophyllum demersum</i>	hornwort
<i>Cicuta maculata</i>	spotted water hemlock
<i>Cirsium arvense</i>	Canada thistle
<i>Crepis acuminata</i>	long-leaved hawksbeard
<i>Crepis atrabarba?</i>	slender hawksbeard
<i>Crepis occidentalis</i>	western hawksbeard
<i>Crepis</i> sp.	hawksbeard
<i>Cryptantha spiculifera</i>	Snake River cryptantha
<i>Cymopterus longipes</i> var. <i>ibapensis</i>	longstalk spring-parsley
<i>Cymopterus petraeus</i>	rock-loving cymopterus
<i>Delphinium andersonii</i>	desert larkspur
<i>Delphinium</i> sp.	larkspur
<i>Dodecatheon jeffreyi</i>	Jeffrey's shooting-star
<i>Draba douglasii</i>	Douglas' draba
<i>Epilobium ciliatum</i>	American willow-herb
<i>Epipactis gigantea</i>	giant helleborine
<i>Erigeron aphanactis</i>	basin rayless daisy
<i>Erigeron bloomeri</i>	scabland fleabane
<i>Erigeron chrysopsidis</i>	dwarf-yellow fleabane
<i>Erigeron compositus</i>	cut-leaved daisy
<i>Erigeron latus</i>	broad fleabane
<i>Erigeron linearis</i>	desert yellow daisy
<i>Erigeron lonchophyllus</i>	spear-leaved fleabane
<i>Erigeron poliospermis</i>	cushion fleabane
<i>Erigeron pumilus</i>	shaggy fleabane
<i>Eriogonum caespitosum</i>	mat buckwheat
<i>Eriogonum heracleoides</i>	Wyeth buckwheat
<i>Eriogonum ovalifolium</i>	cushion buckwheat
<i>Eriogonum strictum</i> ssp. <i>proliferum</i>	strict buckwheat
<i>Eriogonum umbellatum</i>	sulfur flower
<i>Eriophyllum lanatum</i>	woolly sunflower
<i>Euthamia occidentalis</i>	western goldenrod
<i>Fritillaria pudica</i>	yellow bell
<i>Galium multiflorum</i>	shrubby bedstraw
<i>Geum triflorum</i>	prairie smoke avens
<i>Glycyrrhiza lepidota</i>	American licorice-root
<i>Hackelia ophiobia</i>	Owyhee River stickseed
<i>Haplopappus acaulis</i>	stemless goldenweed
<i>Haplopappus carthamoides</i>	large-flowered goldenweed
<i>Haplopappus hirtus</i> var. <i>hirtus</i>	sticky goldenweed
<i>Haplopappus lanceolatus</i>	lance-leaved goldenweed
<i>Haplopappus stenophyllus</i>	narrowleaf goldenweed
<i>Haplopappus uniflorus</i> var. <i>howellii</i>	one-flowered goldenweed
<i>Haplopappus uniflorus</i> var. <i>uniflorus</i>	one-flowered goldenweed
<i>Helianthus nuttallii</i>	Nuttall's sunflower
<i>Heuchera parvifolia?</i>	common alumroot
<i>Heuchera rubescens</i>	red alumroot
<i>Iva axillaris</i>	poverty weed
<i>Ivesia baileyi</i>	Bailey's ivesia
<i>Lactuca pulchella</i>	blue lettuce
<i>Lepidium davisii</i>	Davis' peppergrass
<i>Lesquerella kingii</i>	King's bladderpod
<i>Leucocrinum montanum</i>	sand lily

<i>Lewisia rediviva</i>	bitterroot
<i>Lomatium cous</i>	cous desert-parsley
<i>Lomatium dissectum</i>	fern-leaved lomatium
<i>Lomatium leptocarpum</i>	gumbo lomatium
<i>Lomatium macrocarpum</i>	large-fruit desert-parsley
<i>Lomatium nudicaule</i>	barestem lomatium
<i>Lomatium sp.</i>	desert-parsley
<i>Lotus tenuis</i>	slender bird's-foot trefoil
<i>Lupinus argenteus</i>	silvery lupine
<i>Lupinus lepidus</i>	prairie lupine
<i>Lupinus sp.</i>	lupine
<i>Lygodesmia spinosa</i>	spiny skeletonweed
<i>Machaerocarpus californicus</i>	fringed waterplantain
<i>Medicago sativa</i>	alfalfa
<i>Mentha arvensis</i>	field mint
<i>Mentzelia laevicaulis</i>	blazing-star
<i>Mertensia oblongifolia</i>	leafy bluebells
<i>Microseris nutans</i>	nodding microseris
<i>Microseris troximoides</i>	false agoseris
<i>Mimulus guttatus</i>	yellow monkey-flower
<i>Monardella odoratissima</i>	monardella
<i>Montia chamissoi</i>	water montia
<i>Myriophyllum sp.</i>	water-milfoil
<i>Oenothera caespitosa</i>	desert evening-primrose
<i>Oenothera elata</i>	western evening-primrose
<i>Oenothera villosa</i>	common evening-primrose
<i>Orobanche corymbosa</i>	flat-topped broomrape
<i>Orobanche fasciculata</i>	clustered broomrape
<i>Orobanche sp.</i>	broomrape
<i>Orthocarpus luteus</i>	yellow owl-clover
<i>Pediocactus simpsonii var. robustior</i>	Simpson's hedgehog cactus
<i>Penstemon deustus</i>	hot rock penstemon
<i>Penstemon gairdneri</i>	Gairdner's penstemon
<i>Penstemon humilis var. humilis</i>	lowly penstemon
<i>Penstemon janishiae</i>	Antelope Valley beardtongue
<i>Penstemon sp.</i>	penstemon
<i>Penstemon speciosus</i>	royal penstemon
<i>Perideridia montana</i>	yampah
<i>Phacelia hastata</i>	whiteleaf phacelia
<i>Phlox hoodii</i>	Hood's phlox
<i>Phlox longifolia</i>	longleaf phlox
<i>Phoenicaulis cheiranthoides</i>	daggerpod
<i>Plantago major</i>	common plantain
<i>Potamogeton nodosus</i>	long-leaved pondweed
<i>Potamogeton pectinatus</i>	fennel-leaved pondweed
<i>Potamogeton pusillus</i>	small pondweed
<i>Potentilla anserina</i>	common silverweed
<i>Potentilla glandulosa</i>	sticky cinquefoil
<i>Potentilla gracilis</i>	cinquefoil
<i>Ranunculus aquatilis</i>	water buttercup
<i>Ranunculus cymbalaria</i>	shore buttercup
<i>Rorippa calycina</i>	persistentsepal yellowcress
<i>Rorippa nasturtium-aquaticum</i>	water-cress
<i>Rumex crispus</i>	curly dock
<i>Rumex occidentalis</i>	western dock
<i>Rumex salicifolius</i>	narrow-leaved dock
<i>Rumex venosus</i>	veiny dock
<i>Sagittaria cuneata</i>	wapato
<i>Scrophularia lanceolata</i>	figwort
<i>Scutellaria angustifolia</i>	narrow-leaved skullcap
<i>Scutellaria nana</i>	dwarf skullcap
<i>Sedum debile</i>	weak-stemmed stonecrop
<i>Senecio integerrimus</i>	western groundsel
<i>Sium suave</i>	water parsnip
<i>Smilacina racemosa</i>	false spikenard
<i>Solidago canadensis</i>	Canada goldenrod
<i>Solidago missouriensis</i>	Missouri goldenrod
<i>Sphaeralcea munroana</i>	white-stemmed globe-mallow

*Stachys palustris*  
*Stanleya viridiflora*  
*Stephanomeria tenuifolia*  
*Streptanthus cordatus*  
*Taraxacum officinale*  
*Thelypodium flexuosum?*  
*Thelypodium laciniatum*  
*Thermopsis rhombifolia*  
*Trifolium eriocephalum*  
*Trifolium fragiferum*  
*Trifolium longipes*  
*Trifolium macrocephalum*  
*Trifolium repens*  
*Triglochin palustre*  
*Typha latifolia*  
 unknown forb spp.  
*Urtica dioica*  
*Veronica americana*  
*Veronica anagallis-aquatica*  
*Viola* sp.  
*Wyethia amplexicaulis*  
*Zanichellia palustris*  
*Zigadenus venenosus*

swamp hedge-nettle  
 perennial stanleya  
 narrow-leaved skeletonweed  
 heart-leaved streptanthus  
 dandelion  
 nodding thelypody  
 thickleaved thelypody  
 mountain yellowpea  
 woolly-head clover  
 strawberry clover  
 long-stalked clover  
 big-head clover  
 white clover  
 marsh arrow-grass  
 cat-tail  
  
 stinging nettle  
 American brooklime  
 water speedwell  
 violet  
 northern mule's-ears  
 horned pondweed  
 meadow death camas

ANNUAL/BIENNIAL FORBS

*Agoseris heterophylla*  
*Alyssum desertorum*  
*Amaranthus albus*  
*Amaranthus californicus*  
*Artemisia biennis*  
*Aster frondosus*  
*Atriplex patula*  
*Bassia hyssopifolia*  
*Blepharipappus scaber*  
*Camelina microcarpa*  
*Camissonia boothii* var. *alyssoides*  
*Camissonia claviformis*  
*Camissonia pterosperma*  
*Capsella bursa-pastoris*  
*Castilleja exilis*  
*Centaurium exaltatum*  
*Chaenactis douglasii*  
*Chamaesyce serpyllifolia*  
*Chenopodium album*  
*Chenopodium botrys*  
*Chenopodium fremontii*  
*Chenopodium glaucum*  
*Chenopodium leptophyllum*  
*Chorispora tenella*  
*Chorizanthe watsonii*  
*Cirsium canovirens*  
*Cirsium vulgare*  
*Collinsia parviflora*  
*Collomia grandiflora*  
*Conium maculatum*  
*Conyza canadensis*  
*Cordylanthus ramosus*  
*Cryptantha circumscissa*  
*Cryptantha echinella*  
*Cryptantha* sp.  
*Cryptantha watsonii*  
*Descurainia richardsonii*  
*Descurainia sophia*  
*Downingia insignis*  
*Downingia laeta*  
*Draba verna*  
*Eatonella nivea*

annual agoseris  
 desert alyssum  
 white pigweed  
 California amaranth  
 biennial wormwood  
 short-rayed aster  
 spear orache  
 bassia  
 blepharipappus  
 hairy falseflax  
 alyssum-like evening-primrose  
 club-fruit evening-primrose  
 wingfruit suncup  
 shepherd's purse  
 annual paintbrush  
 Great Basin centaury  
 hoary false-yarrow  
 thyme-leaved spurge  
 lambsquarter  
 Jerusalem-oak  
 Fremont's goosefoot  
 oakleaf goosefoot  
 slimleaf goosefoot  
 blue mustard  
 Watson's spine-flower  
 gray-green thistle  
 bull thistle  
 blue-eyed Mary  
 large-flowered collomia  
 poison hemlock  
 Canada fleabane  
 bushy birdbeak  
 matted cryptantha  
 prickly cryptantha  
 cryptantha  
 Watson's cryptantha  
 mountain tansymustard  
 flaxweed  
 calicoflower  
 Great Basin downingia  
 spring whitlow-grass  
 white false tickhead

<i>Epilobium brachycarpum</i>	panicked willow-herb
<i>Epilobium pygmaeum</i>	smooth spike-primrose
<i>Epilobium torreyi</i>	Torrey's spike-primrose
<i>Eriastrum sparsiflorum</i>	Great Basin woolstar
<i>Eriogonum vimineum</i> var. <i>vimineum</i>	broom buckwheat
<i>Erodium cicutarium</i>	filaree
<i>Galium aparine</i>	goose-grass cleavers
<i>Gayophytum ramosissimum</i>	hairstem groundsmoke
<i>Gayophytum</i> sp.	groundsmoke
<i>Geranium carolinianum</i>	Carolina crane's-bill
<i>Gilia inconspicua</i>	sinuate gilia
<i>Gilia leptomeria</i>	sand gilia
<i>Gnaphalium chilense</i>	cudweed
<i>Gnaphalium palustre</i>	lowland cudweed
<i>Halogeton glomeratus</i>	halogeton
<i>Kochia scoparia</i>	summer cypress
<i>Lactuca serriola</i>	prickly lettuce
<i>Lappula redowskii</i>	western stickseed
<i>Layia glandulosa</i>	white daisy tidytips
<i>Lemna minor</i>	duckweed
<i>Lepidium campestre</i>	pepperwort
<i>Lepidium perfoliatum</i>	clasping pepperweed
<i>Lilaea scilloides</i>	flowering quillwort
<i>Limosella aquatica</i>	mudwort
<i>Linanthus septentrionalis</i>	northern linanthus
<i>Lithophragma glabrum</i>	smooth prairiestar
<i>Lithophragma tenellum</i>	slender prairiestar
<i>Lupinus brevicaulis</i>	sand lupine
<i>Lupinus uncialis</i>	inch-high lupine
<i>Machaeranthera canescens</i>	hoary aster
<i>Madia exigua</i>	little tarweed
<i>Madia gracilis</i>	common tarweed
<i>Malacothrix torreyi</i>	Torrey malacothrix
<i>Medicago lupulina</i>	black medic
<i>Melilotus alba</i>	white sweet-clover
<i>Melilotus officinalis</i>	common yellow sweet-clover
<i>Melilotus</i> sp.	sweet-clover
<i>Mentzelia albicaulis</i>	white-stemmed mentzelia
<i>Microsteris gracilis</i>	microsteris
<i>Mimulus floribundus</i>	floriferous monkey-flower
<i>Mimulus nanus</i>	dwarf purple monkey-flower
<i>Mimulus suksdorfii</i>	Suksdorf's monkey-flower
<i>Monolepsis nuttaliana</i>	patata
<i>Montia perfoliata</i>	miner's lettuce
<i>Myosorus aristatus</i>	bristly mouse-tail
<i>Myosorus minimus</i>	tiny mouse-tail
<i>Nama densum</i>	matted nama
<i>Navarretia intertexta</i>	needle-leaf navarretia
<i>Nemophila breviflora</i>	Great Basin nemophila
<i>Nicotiana attenuata</i>	coyote tobacco
<i>Onopordum acanthium</i>	Scotch thistle
<i>Pectocarya setosa</i>	moth combseed
<i>Phacelia glandulifera</i>	sticky phacelia
<i>Phacelia heterophylla</i>	varileaf phacelia
<i>Phacelia linearis</i>	threadleaf phacelia
<i>Phacelia rattanii</i>	Rattan's phacelia
<i>Plagiobothrys leptocladus</i>	slenderbranch popcorn-flower
<i>Plagiobothrys scouleri</i> var. <i>pencillatus</i>	Scouler's popcorn-flower
<i>Plectritis macrocera</i>	white plectritis
<i>Polygonum aviculare</i>	prostrate knotweed
<i>Polygonum confertiflorum</i>	closeflowered knotweed
<i>Polygonum heterosepalum</i>	dwarf desert knotweed
<i>Polygonum hydropiperoides</i>	common waterpepper
<i>Polygonum lapathifolium</i>	curltop ladythumb
<i>Polygonum persicaria</i>	spotted ladythumb
<i>Potentilla rivalis</i>	brook cinquefoil
<i>Psilocarphus brevissimus</i>	dwarf woolly-heads
<i>Ranunculus testiculatus</i>	bur buttercup

*Rorippa islandica*  
*Sisymbrium altissimum*  
*Sonchus asper*  
*Thlaspi arvense*  
*Tragopogon dubius*  
*Trifolium cyathiferum*  
*Trifolium dubium*  
*Trifolium variegatum*  
*Verbascum thapsus*  
*Veronica peregrina*  
*Xanthium strumarium*

FERNS AND ALLIES

*Cystopteris fragilis*  
*Equisetum arvense*  
*Equisetum laevigatum*  
*Equisetum variegatum*  
*Marsilea vestita*

marsh yellowcress  
tumblemustard  
prickly sow-thistle  
field pennycress  
salsify  
cup clover  
least hop clover  
white-tip clover  
common mullein  
purslane speedwell  
common cocklebur

brittle bladder-fern  
common horsetail  
smooth scouring rush  
variegated horsetail  
clover-fern

Appendix 3. Upland vascular plant species List for the 45 Ranch Allotment, June-September, 1998-1999.

Plant species are listed alphabetically by life form group with the estimated abundance within general terrestrial habitats. As in Appendix 2, nomenclature follows Cronquist et al. (1992 - 1997) or, alternatively, Hitchcock and Cronquist (1973). Exotic species are indicated by "X." General terrestrial habitats are described at the end of the table.

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
SHRUBS and TREES								
<i>Acer glabrum</i>							U	
<i>Amelanchier alnifolia</i>							U	
<i>Artemisia arbuscula</i> var. <i>arbuscula</i>		A	U	A	A	U	U	
<i>Artemisia cana</i>			U	U				
<i>Artemisia longiloba</i>		A						
<i>Artemisia papposa</i>				A				
<i>Artemisia spinescens</i>			U					
<i>Artemisia tridentata</i> var. <i>tridentata</i>			U	U	C		C	
<i>Artemisia tridentata</i> var. <i>vaseyana</i>					C			
<i>Artemisia tridentata</i> var. <i>wyomingensis</i>		U	A	U	C	C	C	
<i>Atriplex confertifolia</i>			U			A		
<i>Atriplex nuttalli</i>				U*				
<i>Brickellia microphylla</i>							U*	
<i>Chrysothamnus humilis</i>			C			A		
<i>Chrysothamnus nauseosus</i>		U	C	U	C	C	C	
<i>Chrysothamnus viscidiflorus</i>			C	U	U	U	U	
<i>Clematis ligusticifolia</i>			U				U	
<i>Eriogonum microthecum</i>			U			U		
<i>Eriogonum sphaerocephalum</i>		C	U	U	U	U	U	
<i>Eurotia lanata</i>			U			U		
<i>Grayia spinosa</i>			C			C	U	
<i>Haplopappus nanus</i>							C	

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
<i>Holodiscus dumosus</i>					U		C	
<i>Juniperus occidentalis</i>				A	A		U	
<i>Leptodactylon pungens</i>			C		U	U	U	
<i>Populus alba</i> (Lombardy)	X							U
<i>Prunus virginiana</i>							U	
<i>Ribes aureum</i>							U	
<i>Ribes cereum</i>				U	C		C	
<i>Ribes inerme</i>							U	
<i>Ribes velutinum</i>					U		C	
<i>Robinia pseudoacacia</i>	X							U
<i>Rosa woodsii</i>							U	
<i>Salvia dorrii</i>						A		
<i>Sambucus cerulea</i>							U	
<i>Sarcobatus vermiculatus</i>			U			C		
<i>Symphoricarpos oreophilus</i> var. <i>parishii</i>					C		C	
<i>Tetradymia canescens</i>			U					
<i>Tetradymia glabrata</i>			U		U	U		
<i>Tetradymia spinosa</i>			U			U		
GRAMINOIDS								
<i>Agropyron cristatum</i>	X							U
<i>Agropyron repens</i>	X							C
<i>Agropyron smithii</i>			U	U				
<i>Agropyron spicatum</i>		A	A	A	A	A	C	
<i>Agropyron trachycaulum</i>				U				
x <i>Agrositanion saxicola</i>			U					
<i>Agrostis stolonifera</i>	X			U				C
<i>Bromus inermis</i>	X							C
<i>Bromus japonicus</i>	X			U	U		U	C

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
<i>Bromus tectorum</i>	X	U	C	C	C	C	C	A
<i>Carex douglasii</i>			U	U				
<i>Dactylis glomerata</i>	X							U
<i>Danthonia californica</i>				A			C	
<i>Deschampsia danthonioides</i>				U				
<i>Eleocharis palustris</i>				U				
<i>Elymus cinereus</i>			U	U	U	U	C	
<i>Eremopyrum triticeum</i>	X							C
<i>Festuca idahoensis</i>		A	A	A	A		U	
<i>Hordeum brachyantherum</i>				U				
<i>Hordeum jubatum</i>								U
<i>Juncus balticus</i>				U				
<i>Koeleria nitida</i>				U				
<i>Muhlenbergia richardsonis</i>				C				
<i>Oryzopsis hymenoides</i>		U	C	U		C		
<i>Phalaris arundinacea</i>	X							C
<i>Poa bulbosa</i>	X							U
<i>Poa compressa</i>	X							U
<i>Poa cusickii</i>			U	U	U			
<i>Poa nevadensis</i>			U	C				
<i>Poa pratensis</i>	X			U				C
<i>Poa secunda</i>		A	A	A	C	C	C	
<i>Puccinellia nuttaliana</i>								U
<i>Sitanion hystrix</i>		C	A	C	U	C	U	
<i>Stipa comata</i>			A			C		
<i>Stipa thurberiana</i>		U	A	U	C	C	U	
<i>Stipa webberi</i>			U	C				
<i>Vulpia bromoides</i>	X					U		U

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
FORBS								
<i>Achillea millefolium</i>				U				
<i>Agastache urticifolia</i>							U	
<i>Agoseris glauca</i>			U		U			
<i>Agoseris heterophylla</i>		U	U	U	U			
<i>Agoseris sp.</i>		U	U	U				
<i>Allium acuminatum</i>		U	C	U	U	U	U	
<i>Allium lemmonii</i>		U		U		U		
<i>Allium nevadense</i>			U			U		
<i>Allium tolmiei</i>				U				
<i>Alyssum desertorum</i>	X		U					U
<i>Amaranthus albus</i>	X							U
<i>Amaranthus californicus</i>								U
<i>Amsinckia menziesii</i>		U	U		U			
<i>Amsinckia retrorsa</i>								U
<i>Antennaria dimorpha</i>		C	C	U	U			
<i>Antennaria luzuloides</i>				U				
<i>Antennaria microphylla</i>					C			
<i>Arabis holboellii</i>		U	U	U	U			
<i>Arabis microphylla</i>							U	
<i>Arabis puberla</i>		U	U	U		U		
<i>Arabis sp.</i>			U	U				
<i>Arabis sparsiflora</i>			U		U			
<i>Arenaria congesta</i>				C				
<i>Arenaria kingii</i>		U	U	C				
<i>Arnica sororia</i>					U			
<i>Artemisia ludoviciana</i>				U				
<i>Artemisia packardiae</i>							U	

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
<i>Aster ascendens</i>				U				
<i>Aster scopulorum</i>		C	C	C	U	U		
<i>Astragalus atratus</i> var. <i>owyheensis</i>			U	U				
<i>Astragalus calycosus</i>			U			C		
<i>Astragalus convallarius</i>					U			
<i>Astragalus curvicaupus</i>			U		U			
<i>Astragalus eremiticus</i>		U	U		U		U	
<i>Astragalus filipes</i>			U					
<i>Astragalus kentrophyta</i>			U					
<i>Astragalus lentiginosus</i> var. <i>lentiginosus</i>			U			U		
<i>Astragalus lentiginosus</i> var. <i>salinus</i>						U		
<i>Astragalus newberryi</i>			U			U		
<i>Astragalus obscurus</i>		C	C	U	U	U		
<i>Astragalus purshii</i> var. <i>purshii</i>		U	C	U		U		
<i>Astragalus</i> sp.		U	U		U			
<i>Astragalus tetrapterus</i>						U		
<i>Atriplex patula</i>								U
<i>Balsamorhiza hookeri</i>		C	U	C				
<i>Balsamorhiza sagittata</i>					U			
<i>Bassia hyssopifolia</i>	X							C
<i>Blepharipappus scaber</i>		C	U	U	U			
<i>Brickellia grandiflora</i>							U	
<i>Brickellia oblongifolia</i>			U				U	
<i>Calochortus bruneaunis</i>		U	U		U	U	U	
<i>Calochortus eurycarpus</i>		U						
<i>Calochortus macrocarpus</i>		U	U		U			
<i>Camelina microcarpa</i>	X		U	U			U	U
<i>Camissonia boothii</i> var. <i>alyssoides</i>			U					

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
<i>Camissonia claviformis</i>			U			C		
<i>Camissonia pterosperma</i>				U				
<i>Capsella bursa-pastoris</i>	X							U
<i>Cardaria draba</i>	X							U
<i>Castilleja angustifolia</i>		U	U		U	U		
<i>Castilleja chromosa</i>		U	U		U	U		
<i>Castilleja linariifolia</i>					U			
<i>Castilleja pallescens</i> var. <i>inverta</i>		C	U	C				
<i>Castilleja</i> sp.			U					
<i>Caulanthus crassicaulis</i>			U					
<i>Chaenactis douglasii</i>		U	U	U	U	U	U	
<i>Chamaesyce serpyllifolia</i>								U
<i>Chenopodium album</i>	X							C
<i>Chenopodium fremontii</i>								U
<i>Chenopodium glaucum</i>								U
<i>Chenopodium leptophyllum</i>								U
<i>Chorispora tenella</i>	X							C
<i>Chorizanthe watsonii</i>			U			U		
<i>Cirsium arvense</i>	X							C
<i>Cirsium canovirens</i>		U	U	U	C	U	U	
<i>Cirsium vulgare</i>	X							U
<i>Collinsia parviflora</i>		U	C	U	C			
<i>Conyza canadensis</i>							U	U
<i>Cordylanthus ramosus</i>		U	U	U				
<i>Crepis acuminata</i>		U	C	U	C	U	U	
<i>Crepis atrabarba?</i> <sup>3</sup>			U					

<sup>3</sup> “?” indicates a questionable identification.

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
<i>Crepis occidentalis</i>		C	C	C	U	C		
<i>Crepis sp.</i>			U	U				
<i>Cryptantha circumscissa</i>			U					
<i>Cryptantha echinella</i>						U		
<i>Cryptantha sp.</i>				U	U			
<i>Cryptantha spiculifera</i>			U			C		
<i>Cryptantha watsonii</i>			U			U		
<i>Cymopterus longipes var. ibapensis</i>			U	C		C		
<i>Cymopterus petraeus</i>							U	
<i>Delphinium andersonii</i>			U					
<i>Delphinium sp.</i>		U	U	U		U		
<i>Descurainia richardsonii</i>			U		U	U		
<i>Descurainia sophia</i>	X		U			U		C
<i>Draba douglasii</i>				U				
<i>Draba verna</i>					U			
<i>Epilobium brachycarpum</i>		U	C	C	U	C		
<i>Epilobium pygmaeum</i>				U				
<i>Eriastrum sparsiflorum</i>		U	U	U	U	U		
<i>Erigeron aphanactis</i>		U	U	U		U	U	
<i>Erigeron bloomeri</i>		C	U	C	U			
<i>Erigeron chrysopsidis</i>		C	C	C		U		
<i>Erigeron compositus</i>					U		U	
<i>Erigeron latus</i>			U		U	U	U	
<i>Erigeron linearis</i>		U	C	U	U	U	U	
<i>Erigeron poliospermis</i>			U					
<i>Erigeron pumilus</i>			U		C			
<i>Eriogonum caespitosum</i>		C	C	C	U	U	U	
<i>Eriogonum heracleoides</i>			U		C			

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
<i>Eriogonum ovalifolium</i>		C	C	U		C		
<i>Eriogonum strictum ssp. proliferum</i>			U	U	U		U	
<i>Eriogonum umbellatum</i>		U	U					
<i>Eriogonum vimineum var. vimineum</i>			U					
<i>Eriophyllum lanatum</i>		C	U	U	U		U	
<i>Erodium cicutarium</i>	X					U		U
<i>Fritillaria pudica</i>			U	U				
<i>Galium aparine</i>			U				U	
<i>Galium multiflorum</i>							U	
<i>Gayophytum ramosissimum</i>				U		U		
<i>Gayophytum sp.</i>		U	U	U	U			
<i>Geum triflorum</i>				U	U			
<i>Gilia inconspicua</i>			U	U		U		
<i>Gilia leptomeria</i>						U		
<i>Glycyrrhiza lepidota</i>			U					
<i>Hackelia ophiobia</i>							U	
<i>Halogeton glomeratus</i>	X							C
<i>Haplopappus acaulis</i>			U	U		A	U	
<i>Haplopappus carthamoides</i>				U				
<i>Haplopappus lanceolatus</i>				U				
<i>Haplopappus stenophyllus</i>		C	U	U	U			
<i>Haplopappus uniflorus var. howellii</i>				U				
<i>Haplopappus uniflorus var. uniflorus</i>				U				
<i>Heuchera parvifolia?</i>					U			
<i>Heuchera rubescens</i>							U	
<i>Iva axillaris</i>			U	U				C
<i>Ivesia baileyi</i>							C	
<i>Kochia scoparia</i>	X							C

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
<i>Lactuca serriola</i>	X			U				C
<i>Lappula redowskii</i>			U			U		
<i>Layia glandulosa</i>						U		
<i>Lepidium davisii</i>				C				
<i>Lepidium perfoliatum</i>	X		U	U		U		C
<i>Lesquerella kingii</i>			U					
<i>Leucocrinum montanum</i>			U			U		
<i>Lewisia rediviva</i>			U	U		U		
<i>Limosella aquatica</i>				U				
<i>Linanthus septentrionalis</i>		U			U			
<i>Lithophragma glabrum</i>					U			
<i>Lithophragma tenellum</i>				U	U			
<i>Lomatium cous</i>		C	C	C	U			
<i>Lomatium dissectum</i>			U					
<i>Lomatium leptocarpum</i>		U		U				
<i>Lomatium macrocarpum</i>		C	U	C	U	U	U	
<i>Lomatium nudicaule</i>		U		U				
<i>Lomatium sp.</i>		U						
<i>Lupinus argenteus</i>			U					
<i>Lupinus brevicaulis</i>		U	U	U		U		
<i>Lupinus lepidus</i>		U	C	U				
<i>Lupinus sp.</i>			U					
<i>Lupinus uncialis</i>				U		U		
<i>Lygodesmia spinosa</i>						C		
<i>Machaeranthera canescens</i>			U		C			
<i>Madia exigua</i>				U				
<i>Madia gracilis</i>								U
<i>Malcothrix torreyi</i>						U*		

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
<i>Medicago lupulina</i>	X							U
<i>Medicago sativa</i>	X							C
<i>Melilotus alba</i>	X							U
<i>Melilotus officinalis</i>	X							U
<i>Melilotus sp.</i>	X		U					
<i>Mentzelia albicaulis</i>			U	U		U		
<i>Mentzelia laevicaulis</i>						U		
<i>Mertensia oblongifolia</i>			U		U			
<i>Microseris nutans</i>		U	U	C				
<i>Microseris troximoides</i>		U	U		U	U		
<i>Microsteris gracilis</i>		U	C	C	U	U		
<i>Mimulus floribundus</i>							U	
<i>Mimulus nanus</i>			U	U		U		
<i>Mimulus suksdorfii</i>				U				
<i>Monardella odoratissima</i>				U				
<i>Montia perfoliata</i>			U			U		
<i>Myosorus aristatus</i>				U				
<i>Nama densum</i>						U*		
<i>Nemophila breviflora?</i>			U					
<i>Oenothera caespitosa</i>			U			C		
<i>Orobanche corymbosa</i>		U	U			U		
<i>Orobanche fasciculata</i>		U	U			U		
<i>Orobanche sp.</i>		U	U					
<i>Orthocarpus luteus</i>				U				
<i>Pectocarya setosa</i>			U			U		
<i>Pediocactus simpsonii var. robustior</i>			U					
<i>Penstemon deustus</i>		U	U	U	C		C	
<i>Penstemon gairdneri</i>			U					

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
<i>Penstemon humilis</i> var. <i>humilis</i>		U	U	C				
<i>Penstemon janishiae</i>						U		
<i>Penstemon</i> sp.			U		U			
<i>Penstemon speciosus</i>		U	U		U	U		
<i>Phacelia glandulifera</i>						U*		
<i>Phacelia hastata</i>					U			
<i>Phacelia heterophylla</i>							U	
<i>Phacelia linearis</i>		U	U	U			U	
<i>Phacelia rattanii</i>							U	
<i>Phlox hoodii</i>		U	C	U		U		
<i>Phlox longifolia</i>		C	C	C	U	U		
<i>Phoenicautis cheiranthoides</i>		U	U	U	U	U		
<i>Plagiobothrys leptocladus</i>				U				
<i>Plagiobothrys scouleri</i> var. <i>pencillatus</i>				U				
<i>Plantago major</i>	X							U
<i>Plectritis macrocera</i>			U				U	
<i>Polygonum aviculare</i>	X			U				C
<i>Polygonum confertiflorum</i>				U				
<i>Polygonum heterosepalum</i>				U				
<i>Psilocarphus brevissimus</i>				U				
<i>Ranunculus testiculatus</i>	X		U					C
<i>Rumex crispus</i>	X							U
<i>Rumex venosus</i>			U			U		
<i>Scutellaria angustifolia</i>					U		U	
<i>Scutellaria nana</i>		U		U		U		
<i>Sedum debile</i>							U	
<i>Senecio integerrimus</i>			U	U	U			
<i>Sisymbrium altissimum</i>	X		U			U		C

Species	Exotic	Low Sagebrush Steppe	<i>Artemisia tridentata</i> Steppe	Intermittent Drainages, Swales, & Playas	<i>Juniperus occidentalis</i> Woodland & Savannah	Barren & Desertic Soils	Cliffs, Talus, Rimrock, & Steep Slot Canyons	Disturbed Soils--Ranch, Hayfield, & Roadsides
<i>Sphaeralcea munroana</i>			U			C		
<i>Stanleya viridiflora</i>			U			U		
<i>Stephanomeria tenuifolia</i>							U	
<i>Streptanthus cordatus</i>						U		
<i>Taraxacum officinale</i>	X							U
<i>Thelypodium flexuosum?</i>			U					
<i>Thelypodium laciniatum</i>							C	
<i>Tragopogon dubius</i>	X	U	U	U	U	U	U	U
<i>Trifolium macrocephalum</i>		U		C				
unknown forb spp.						U		
<i>Verbascum thapsus</i>	X							C
<i>Veronica peregrina</i>		U		C				
<i>Wyethia amplexicaulis</i>				U				
<i>Zigadenus venenosus</i>		U	U				U	
FERNS and ALLIES								
<i>Cystopteris fragilis</i>			U		U			

#### Abundance Codes

- A = abundant (locally dominant or co-dominant species with high cover and/or constancy)  
C = common (often associated but usually low cover and/or constancy)  
U = uncommon  
U\* = uncommon species observed just outside boundary of 45 Allotment but expected in suitable habitat

#### Descriptions of general habitats.

Low Sagebrush Steppe includes the following plant associations: *Artemisia arbuscula/Agropyron spicatum*, *Artemisia arbuscula/Festuca idahoensis*, or *Artemisia arbuscula/Poa secunda* understories and *Artemisia arbuscula/Agropyron spicatum* or *Artemisia arbuscula/Festuca idahoensis*

*Artemisia tridentata* Steppe includes the following plant associations: *Artemisia tridentata wyomingensis/Agropyron spicatum*, *Artemisia tridentata wyomingensis/Festuca idahoensis*, *Artemisia tridentata wyomingensis/Oryzopsis hymenoides*, *Artemisia tridentata wyomingensis/Poa secunda*, *Artemisia tridentata wyomingensis/Sitanion hystrix*, *Artemisia tridentata wyomingensis/Stipa comata*, and *Artemisia tridentata wyomingensis/Stipa thurberiana* and canyon slope *Artemisia tridentata tridentata/Agropyron spicatum*. *Artemisia tridentata tridentata* and *Sarcobatus vermiculatus* alluvial bar plant associations described by Moseley (1999) are not included.

Intermittent Drainages, Swales, & Playas includes the following plant associations: selected *Artemisia arbuscula* plant associations, *Artemisia papposa*, *Eriogonum caespitosum/Poa secunda*, *Danthonia californica*, *Lepidium davisii* Vernal Pool, and *Juniperus occidentalis/Danthonia californica*.

*Juniperus occidentalis* Woodland & Savannah includes the following plant associations: *Juniperus occidentalis/Artemisia arbuscula/Festuca idahoensis*; *Juniperus occidentalis/Artemisia tridentata wyomingensis/Agropyron spicatum*, *Juniperus occidentalis/Artemisia tridentata wyomingensis/Festuca idahoensis*, *Juniperus occidentalis/Artemisia tridentata vaseyana/Festuca idahoensis*, and *Juniperus occidentalis/Festuca idahoensis*.

Barren Areas & Desertic Soils includes the following plant associations and habitats: *Atriplex confertifolia/Agropyron spicatum*; *Atriplex confertifolia/Oryzopsis hymenoides*; *Atriplex confertifolia/Sitanion hystrix*; *Haplopappus acaulis/Phlox hoodii*; *Salvia dorrii/Oryzopsis hymenoides*; small sand dunes; gravelly desert-pavement and cinder patches; and barren silt, clay, or ash sediments.

Cliffs, Talus, Rimrock, & Steep Slot Canyons includes rock balds; *Haplopappus nanus/Poa secunda*; talus with or without mixed shrub garland; cliff bases, crevices, and faces; and cliffy breaks with rocky slot canyon washes.

Ranch Area, Hayfield, Disturbed Soils, & Roadsides does not include riparian areas described by Moseley (1999).

Appendix 4. Avian Species List for 45 Ranch, mid-June to mid-September, 1998 and 1999.

The presence of each species within broad habitats is summarized.

Species	Riparian Scrub-Shrub	River Terrace	River, Pond, & Spring-- Shorelines & Emergent Riparian Wetlands	Ranch & Human Impacted Areas	Cliff, Talus, & Rimrock	River & Pond Aquatic Areas	Upland Shrub-Stepp e	Shrubby Draws, Side-canyon s & Talus	Juniper Forest and Savannah
Accipitor sp. <sup>4</sup>				X <sup>5</sup>					Z
American Goldfinch?		X? <sup>6</sup>							
American Kestrel				X	X		X		
American Robin	X	X	X	X					X
Ash-throated Flycatcher									X
Barn Swallow				X					
Belted Kingfisher	X				X	X			
Black-billed Magpie		X	X		X				
Black-capped Chickadee									X
Black-headed Grosbeak									X
Black-necked Stilt			X						
Black-throated Gray Warbler									X
Black-throated Sparrow							X		
Brewer's Blackbird	X		X	X					
Brewer's Sparrow	X						X; N		
Brown-headed Cowbird				X			X		

<sup>4</sup> Northern Goshawk or Cooper's Hawk.

<sup>5</sup> "X" indicates a species that was observed; "H", a species that was heard; and "N", a nest located.

<sup>6</sup> "?" indicates questionable identification.

Species	Riparian Scrub-Shrub	River Terrace	River, Pond, & Spring-- Shorelines & Emergent Riparian Wetlands	Ranch & Human Impacted Areas	Cliff, Talus, & Rimrock	River & Pond Aquatic Areas	Upland Shrub-Stepp e	Shrubby Draws, Side-canyon s& Talus	Juniper Forest and Savannah
California Quail	X	X		X	X				
Canyon Wren					X			X	
Cassin's Finch?							X?		X
Chipping Sparrow									X
Chukar	X	X			X			X	
Cliff Swallow		X		X	X	X	X		
Common Merganser						X			
Common Nighthawk				X	X		X		
Common Poorwill				X					
Common Raven					X		X		
Common Snipe			X						
Common Yellowthroat	X	X							
Dark-eyed Junco									X
Dipper			X			X			
European Starling	X			X					
Ferruginous Hawk							X		
Golden Eagle					X				
Gray Catbird?	H?							X?	
Gray Flycatcher							X		X
Great-blue Heron			X						
Great-horned Owl					H				
Green-winged Teal						X			
Horned Lark			X		X		X		
House Finch		X		X			X		X
House Sparrow				X					

Species	Riparian Scrub-Shrub	River Terrace	River, Pond, & Spring-- Shorelines & Emergent Riparian Wetlands	Ranch & Human Impacted Areas	Cliff, Talus, & Rimrock	River & Pond Aquatic Areas	Upland Shrub-Stepp e	Shrubby Draws, Side-canyon s& Talus	Juniper Forest and Savannah
House Wren	X								
Killdeer			X	X			X		
Lark Sparrow							X		
Lazuli Bunting	X	X						X	
Loggerhead Shrike		X					X; N		X
Mallard						X			
Mountain Bluebird							X		X
Mourning Dove	X				X		X		X
Northern Flicker	X	X		X	X				X
Northern Harrier		X					X		
Northern Oriole				X					
Osprey				X		X			
Prairie Falcon					X		X		
Red-breasted Nuthatch									X
Red-tailed Hawk				X	X		X		X
Red-winged Blackbird	X								
Rock Wren		X			X		X	X	
Sage Grouse							X		
Sage Sparrow	X				X		X		X
Sage Thrasher		X					X		
Savannah Sparrow	X	X					X		X
Say's Phoebe	X	X		X; N	X				
Short-eared Owl							X		
Song Sparrow	X								
Spotted Sandpiper			X						

Species	Riparian Scrub-Shrub	River Terrace	River, Pond, & Spring-- Shorelines & Emergent Riparian Wetlands	Ranch & Human Impacted Areas	Cliff, Talus, & Rimrock	River & Pond Aquatic Areas	Upland Shrub-Steppe	Shrubby Draws, Side-canyons & Talus	Juniper Forest and Savannah
Spotted Towhee?								X?	
Townsend's Solitaire?								H?	
Turkey Vulture					X		X		X
Vesper Sparrow			X				X		
Violet-green Swallow	X			X		X	X		
Western Kingbird	X			X					
Western Meadowlark		X					X		
Western Wood-Pewee	X								
White-faced Ibis			X						
White-throated Swift					X	X	X		
Willow Flycatcher	X								
Yellow Warbler	X			X					
Yellow-breasted Chat	X								
Yellowlegs sp.?			X						

## Appendix 5. Spatial data metafile information.

### Introduction

The 45 Ranch terrestrial inventory and assessment project required the construction of a spatial database regarding the distribution, composition, and structure of plant communities and the distribution of rare plant populations. In the discussion that follows the origin, content, and structure of the digital files that constitute this spatial database are documented. The native data set environment for all files is Microsoft DOS PC, ArcView 3.2. GIS analyses were conducted by Steven K. Rust (Plant Research Ecologist, Idaho Department of Fish and Game, Boise) except as indicated.

### Spatial Reference Information

Projection	UTM
Zone	11
Datum	NAD27
Zunits	NO
Units	METERS
Spheroid	CLARKE1866
Xshift	0.0000000000
Yshift	0.0000000000
Parameters	(none)

### Study Area Boundary

Principal File: *45rutmbn.shp* (polygon shape file)

Origin: The file was clipped from a state-wide coverage of conservation sites and managed areas and subsequently projected from Idaho Transverse Mercator (ITM) to Universal Transverse Mercator (UTM), Zone 11.

Content: The shape file consists of two polygons: (1) the 45 Ranch allotment boundary and (2) the boundary of the 45 Ranch deeded property owned by The Nature Conservancy.

### Rare Plant Populations

Principal File: *45rp&aeos.shp* (point shape file)

Origin: The file was derived from element occurrence longitude/latitude centroid data stored in the Biological and Conservation Data System (Idaho Conservation Data Center 2000). The point file was created through a spatial clip of a state-wide coverage and subsequently projected from ITM to UTM, Zone 11.

Content: The point file is attributed by the following fields. Detailed descriptions and standards for these data are provided by The Nature Conservancy (1996).

Eocode  
Elcode  
Longitude  
Latitude  
Precision  
Minelev  
Maxelev  
Lastobs  
Sname

Comname  
 Grank  
 Srank  
 Usfs\_r1  
 Usfs\_r4  
 Usfs\_r6  
 Blm  
 Fedstat  
 Idstat"

**Study Plot Locations**

Principal File: *45vegpoints.dbf*. The file is utilized in ArcView as a theme event.

Origin: Data for 45 Ranch were extracted from the Quantitative Ecology Data System (Idaho Conservation Data Center 1996), and subsequently reformatted from PARADOX to DBASE. Point locations (UTM X and UTM Y, below) were derived from navigation grade GPS units (as described in the Methods section).

Content: The database file consists of the following fields:

Plot id  
 UTM X  
 UTM Y  
 Structural condition  
 Seral status  
 Ecological condition  
 Association  
 Nvc subgroup  
 Nvc community

See Appendix 1 for descriptions of field and recording protocols for these data. Codes for structural condition evolved through the project and are listed below.

**STRUCTURAL CONDITION**

Value	Description
hedae	herbland, dense
hema	herbland, moderately closed
hembe	herbland, closed
henan	herbland, sparse
heoae	herbland, open
heobe	herbland, moderately open
ls(ma)mae	low shrub-medium shrub mosaic, moderately closed
ls(ma)oe	low shrub-medium shrub mosaic, open
ls(ma)obe	low shrub-medium shrub mosaic, moderately open
ls(mb)mae	low shrub-medium tall shrub mosaic, moderately closed
ls(mb)oe	low shrub-medium tall shrub mosaic, open
lsmae	low shrub, moderately closed
lsambe	low shrub, closed

Value	Description
Isnae	low shrub, sparse
Isnan	low shrub, sparse
Isoae	low shrub, open
Isoan	low shrub, open
Isobe	low shrub, moderately open
Itmam	large tree, moderately closed, mature growth form
Itmao	large tree, moderately closed, old growth form
Itmbm	large tree, closed, mature growth form
Itmbo	large tree, closed, old growth form
Itoao	large tree, open, old growth form
Itobm	large tree, moderately open, mature growth form
Itobo	large tree, moderately open, old growth form
ma(Is)mae	medium shrub-low shrub mosaic, moderately closed
madae	medium shrub, dense
mamae	medium shrub, moderately closed
mamau	medium shrub, moderately closed, two or more strata
mambe	medium shrub, closed
mambu	medium shrub, closed, two or more strata
manae	medium shrub, sparse
manan	medium shrub, sparse
maoae	medium shrub, open
maoan	medium shrub, open
maobe	medium shrub, moderately open
maobu	medium shrub, moderately open, two or more strata
mb(Is)mae	medium tall shrub-low shrub mosaic, moderately closed
mb(Is)mau	medium tall shrub-low shrub mosaic, moderately closed, two or more strata
mb(Is)mbe	medium tall shrub-low shrub mosaic, closed
mbdae	medium tall shrub, dense
mbdau	medium tall shrub, dense, two or more strata
mbmae	medium tall shrub, moderately closed
mbmau	medium tall shrub, moderately closed, two or more strata
mbmbe	medium tall shrub, closed
mbmbu	medium tall shrub, closed, two or more strata
mbnan	medium tall shrub, sparse
mboae	medium tall shrub, open
mboan	medium tall shrub, open
mbobe	medium tall shrub, moderately open
mtmam	medium tree, moderately closed, mature growth form
mtmao	medium tree, moderately closed, old growth form
mtmay	medium tree, moderately closed, young growth form

Value	Description
mtmbm	medium tree, closed, mature growth form
mtmbo	medium tree, closed, old growth form
mtmby	medium tree, closed, young growth form
mtobm	medium tree, moderately open, mature growth form
mtobo	medium tree, moderately open, old growth form
pomam	pole tree, moderately closed, mature growth form
pomay	pole tree, moderately closed, young growth form
pomby	pole tree, closed, young growth form
pooao	pole tree, open, old growth form
poobo	pole tree, moderately open, old growth form
pooby	pole tree, moderately open, young growth form
sambu	sapling tree, closed, young growth form
tamae	tall shrub, moderately closed
tamau	tall shrub, moderately closed, two or more strata
tambe	tall shrub, closed
tambu	tall shrub, closed, two or more strata
taoae	tall shrub, open
taobe	tall shrub, moderately open
tbdae	very tall shrub, dense
tbdau	very tall shrub, dense, two or more strata
tbmbe	very tall shrub, closed
tbobe	very tall shrub, moderately open
vtmao	giant tree, moderately closed, old growth form
vtmbo	giant tree, closed, old growth form
vtobo	giant tree, moderately open, old growth form

### Trend Monitoring Plot Locations

Principal File: *trendplots.dbf*. The file is utilized in ArcView as a theme event.

Origin: The database file was created in ArcView through the use of the extension, Getxy.avx.

Content: The file consists of the following fields:

- Unique (unique identifier)
- X (UTM easting)
- Y (UTM northing)
- Trend\_plot (nested frequency plot study site location number)

The nested frequency trend plot data and associated analysis conducted for this project are contained in the Microsoft Excel spreadsheet named, *nest freq trend data.xls*.

### Vegetation

Principal File Sets: *45rvege.shp* (polygon shape file); *45rmrgdveg* grid theme.

Origin: The vegetation themes were derived from Landsat 5 Thematic Mapper (TM) data. The data were obtained by Bart Butterfield (Senior GIS Analyst, Idaho Department of Fish and Game, Boise) from Utah State University, Landscape Ecology: Modeling and Analysis Center; spatially clipped to the extent of Owyhee County, Idaho. The data consist of a composite of scenes for several independent satellite acquisitions (path/row, acquisition date): 41/30, 9/1/95; 41/31, 8/26/93; 40/31, 8/19/93; 42/30, 7/29/92. Bart Butterfield conducted an initial unsupervised classification of the Landsat 5 TM data utilizing bands 3, 4, and 5 and values for normalized difference vegetation index (NDVI - a derived index of vegetative greenness). Forty classes were allowed. This grid theme was clipped to the extent of the 45 Ranch study area. Through a series of regional groupings small heterogeneous areas (with fewer than nine pixels) were aggregated into surrounding regions. A supervised classification of the resultant data was stratified on soils (as represented by the SSURGO data set for Owyhee County [USDA Natural Resources Conservation Service 1996]) and based on observed and modeled distribution patterns. This result was clipped to the 45 Ranch study area boundary and converted to a shape file for distribution and printing.

Content: Both the shape file and theme grid are attributed by the following fields. The content and standards for these data are summarized above.

- Id (polygon unique identifier - no equivalent in grid theme)
- Gridcode (key field of grid theme value attribute table - Value)
- Assoc. (Association)
- Struc. Cond. (Structure)
- Ser. Stat. (Seral Status)
- Ecol. Cond. (Ecological Condition)

### **Spatial Data Evaluated for Use**

Digitized National Wetland Inventory maps are available for the Coyote Hole and Bull Camp Butte USGS 1:24,000 quadrangles. The files were created through an environmental analysis of proposed Mountain Home Air Force Base training range developments. The files were considered for use in compilation of the vegetation map for 45 Ranch. They were not used, however, as they provide only partial coverage of the study area and due to concerns for their current accuracy.

**Map Pocket**

Map 1. Vegetation map of 45 Ranch Allotment.