MALHEUR RIVER

WILDLIFE MANAGEMENT PLAN

Burns Paiute Tribe

Draft Report
June 2004

Malheur River

Wildlife Management Plan

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PROJECT ID # 200002700

Draft Report
June 2004

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1.0 Introduction

Hydropower development within the Columbia and Snake River Basins has significantly affected riparian, riverine, and adjacent upland habitats and the fish and wildlife species dependent upon them. Hydroelectric dams played a major role in the extinction or major loss of both anadromous and resident salmonid populations and altered instream and adjacent upland habitats, water quality, and riparian/riverine function.

Hydroelectric facility construction and inundation directly affected fish and wildlife species and habitats. Secondary and tertiary impacts including road construction, urban development, irrigation, and conversion of native habitats to agriculture, due in part to the availability of irrigation water, continue to affect wildlife and fish populations throughout the Columbia and Snake River Basins. Fluctuating water levels resulting from facility operations have created exposed sand, cobble, and/or rock zones. These zones are generally devoid of vegetation with little opportunity to re-establish riparian plant communities.

To address the habitat and wildlife losses, the United States Congress in 1980 passed the Pacific Northwest Electric Power Planning and Conservation Act (Act) (P.L. 96-501), which authorized the states of Idaho, Montana, Oregon, and Washington to create the Northwest Power Planning Council (Council). The Act directed the Council to prepare a program in conjunction with federal, state, and tribal wildlife resource authorities to protect, mitigate, and enhance fish and wildlife species affected by the construction, inundation and operation of hydroelectric dams in the Columbia River Basin (NPPC 2000).

Under the Columbia Basin Fish and Wildlife Program (Program), the region's fish and wildlife agencies, tribes, non-government organizations (NGOs), and the public propose fish and wildlife projects that address wildlife and fish losses resulting from dam construction and subsequent inundation. As directed by the Council, project proposals are subjected to a rigorous review process prior to receiving final approval.

An eleven-member panel of scientists referred to as the Independent Scientific Review Panel (ISRP) examines project proposals. The ISRP recommends project approval based on scientific merit. The Bonneville Power Administration (BPA), the Columbia Basin Fish and Wildlife Authority (CBFWA), Council staff, the U.S. Fish and Wildlife Service (USFWS), the National Oceanic and Atmospheric Administration (NOAA), and subbasin groups also review project proposals to ensure each project meets regional and subbasin goals and objectives. The Program also includes a public involvement component that gives the public an opportunity to provide meaningful input on management proposals.

After a thorough review, the Burns Paiute Tribe (BPT) acquired the Malheur River Mitigation Project (Project) with BPA funds to compensate, in part, for the loss of fish and wildlife resources in the Columbia and Snake River Basins and to address a portion of the mitigation goals identified in the Council's Program (NPPC 2000).

1.1 Project History

The *Malheur Wild and Scenic River Management Plan* (1993) and *The North Fork Malheur Scenic River Management Plan* (1993) identified the Project area as a key component in the restoration of aquatic and terrestrial habitat within the Malheur River basin. The Project is culturally significant to the BPT because it lies within their aboriginal territory. Historically, BPT members gathered roots, hunted, and fished along the Malheur River corridor. As a result, both the BPT and the public had a shared interest in permanently protecting the Project and improving habitat conditions for fish and wildlife species.

In 1998, the BPT submitted a proposal to BPA to acquire the Project, which included the Denny Jones Ranch and other Bureau of Land Management (BLM) and Oregon Division of State Lands (DSL) leases and grazing allotments. The project approval process and acquisition negotiations continued for several years until the BPT and BPA entered into a Memorandum of Agreement, which allowed for purchase of the Project in November 2000.

The 45,535-acre Project is located seven miles east of Juntura, Oregon and is adjacent to the Malheur River (Figure1). The Project includes 6,535 deeded acres owned by the BPT, 4,000 acres leased from the DSL, and 35,000 acres leased from the BLM, including 11 grazing allotments.

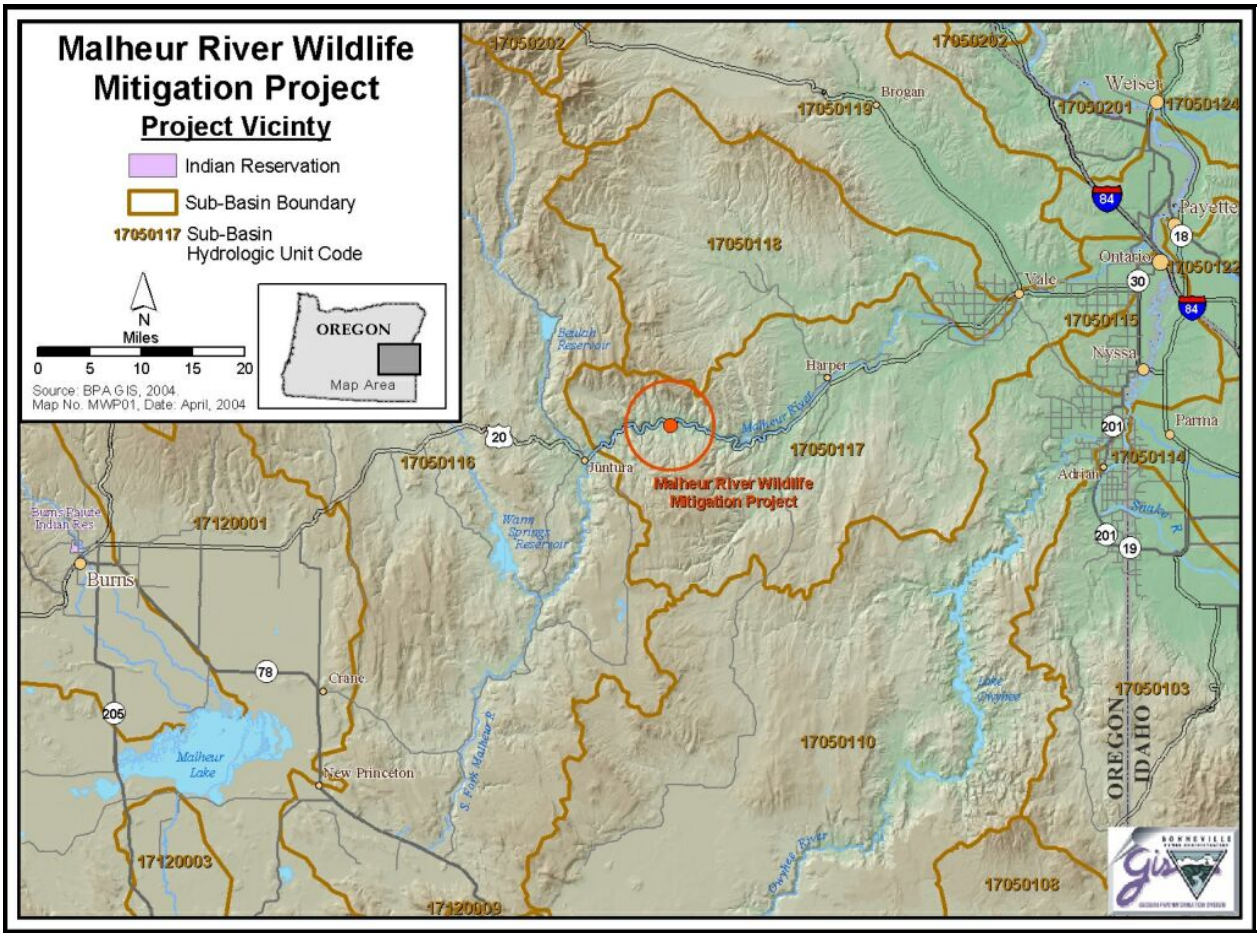

Figure 1. Location of the Malheur River Wildlife Mitigation Project.

The Denny Jones Ranch (Ranch) is comprised of meadow, wetland, and shrubsteppe habitats and stretches for seven miles along the Malheur River. It is the largest private landholding on the river between Riverside and Harper, Oregon. Approximately 938 acres of senior water rights are included with the Ranch. The BLM grazing allotment, located south of the Ranch, is largely shrubsteppe habitat punctuated by springs and seeps. Hunter Creek, a perennial stream, flows through the BLM parcel. Similarly, the DSL grazing allotment, which lies north of the Ranch, is predominantly shrub/juniper steppe habitat with springs and seeps dispersed throughout the upper end of draws (Figure 2).

The overall quality of upland ecosystems is very poor. Past land management of the Project area has fueled the rapid expansion of noxious weed populations that have taken place over the past several decades. Past land management practices have also led to a successional retrogression in most riparian areas and bunchgrass communities in close proximity to water (Wenick 2002).

The Project does host extensive mid-late succession plant communities that currently provide prime habitat for key species such as sage grouse. A close working relationship and cooperative management with the BLM's Vale District on neighboring allotted lands could greatly enhance the quality of habitat that is currently available to fish and wildlife.

Although this segment of the Malheur River continues to support a variety of native and exotic species of fish, survival and viability of fry is very poor. Elevated temperatures will likely remain an impediment to fish production in a vast majority of the river until woody riparian cover is reestablished in the basin (Wenick 2002).

Habitat protection and enhancement measures will benefit diverse fish and wildlife assemblages and plant communities, BPT members and the public. General management goals include improving water quality; enhancing upland, floodplain meadow and riverine habitats; controlling weeds; protecting springs and seeps; managing BLM grazing allotments to meet wildlife objectives; preserving cultural resources; and providing public hunting and recreation opportunities. Burns Paiute Tribal elders and plant ecologists intend to reintroduce culturally significant native plants to irrigated meadows adjacent to the Malheur River. The creation of microhabitats hosting vegetation long since removed from the site will also benefit many species of wildlife.

Since acquiring the Project, the BPT has been proactive in initiating a Citizen Advisory Group (CAG) and developing a coordinated resource management plan with neighboring landowners, county, state, and federal agencies. The BPT negotiated a 50 percent reduction in the stocking rate on BLM lands to enhance recovery of shrubsteppe plant communities. Representatives of the Malheur County Soil and Water Conservation District toured the Project and discussed land management actions to ensure the Project remains compliant with the Clean Water Act. The National Riparian Team also visited the Project to assess riparian areas and provide additional insight regarding stream corridor management. Weed scientists from the Agricultural Research Service, as well as industry professionals assisted in initiating actions to hinder weed proliferation on the Project. Fencing projects are underway to protect riparian areas from further degradation due to livestock encroachment.

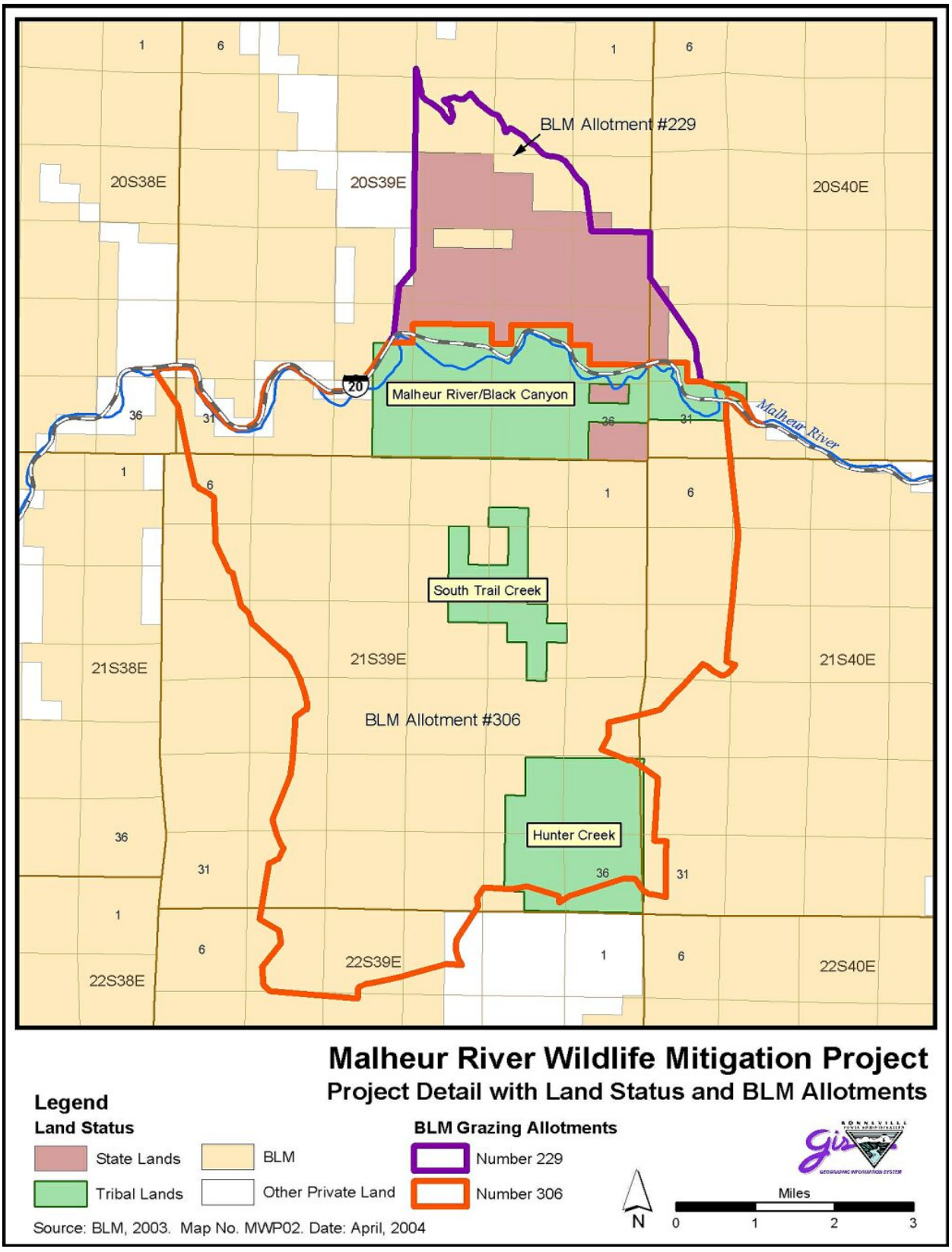

Figure 2. Project and surrounding area land ownership.

1.2 Historic Land Use

Historically, most of the Malheur subbasin (including the Project area) was within the BPT's territory. As Euro-American settlement increased in the early 1800s, land use within the Malheur subbasin changed dramatically. Beaver were trapped intensively by the Hudson's Bay Company, beginning in the early 1800s, and were largely extirpated by the mid-1800s (Ogden 1950, 1961, 1971; USFS 2000). In the late 1860s, the Federal government negotiated a treaty with the BPT that included a provision to establish a reservation.

The Treaty of 1868 reserved 1,792,000 acres for the BPT. In 1883, however, the Federal government terminated the treaty and abolished the reservation because of armed conflicts between BPT members and settlers over encroachment by Euro-Americans on reservation lands (the current reservation of about 1000 acres is outside of the Malheur subbasin and is located in Burns, Oregon)[1] (NPPC 2002).

By the early 1900s, settlers cleared most of the valley floor, including riparian shrub, wet meadow, and riparian habitats, for agriculture or pasture. Sagebrush steppe, which covered much of the mid and low elevation portions of the subbasin, has been severely altered by over 150 years of livestock grazing, fire suppression, and invasion of numerous exotic plant species. Juniper (*Juniperus occidentalis*) has increased in many higher elevation areas as well (MOWC 1999).

Similar trends exist on the Project. After more than 100 years of intense livestock grazing, introduced species such as cheatgrass *(Bromus tectorum)* and medusa head (*Elymus caput-medusae*) either have displaced or severely altered native upland herbaceous plant communities. As in adjacent areas, forage crops, comprised largely of introduced species, have replaced most native riparian meadow vegetation on the Project (BPT 2001). In addition, riparian meadow topography changed because of field leveling activities and installation of drainage and/or irrigation ditches. Under prior ownership, the Project's ability to provide high quality wildlife habitat was compromised because of high cattle stocking rates, lack of an ecologically sound grazing plan, proliferation of introduced vegetation, and disruption of natural disturbance regimes (J. Wenick, USFWS, pers. comm., 2002).

1.3 Current Land Use

Oregon Division of State Lands owns the property that borders the Ranch on the north while private lands (Horse Camp) border deeded land on the southeast. State lands support livestock grazing operations and provide wildlife habitat and public recreation opportunities. Privately owned lands near the Project site are generally large cattle ranches. Livestock graze uplands while riparian meadows primarily support hay/pasture operations. Similarly, remaining Project lands are bordered by BLM lands (Figure 2), and are also grazed by livestock and provide wildlife habitat and public recreation.

Oregon Department of Fish and Wildlife (ODFW) owns and manages, for recreational purposes, approximately 4,067 acres west of the Project along 18 miles of the Malheur River between Riverside and Juntura (W. Bowers, ODFW, pers. comm., 2001).

[1] A comprehensive review of the Burns Paiute Tribe's history, "*Paiute Wadtika, Ma-Ni-Pu-Neen",* is included as Attachment 1.

2.0 Area Description

2.1 Climate

The Project averages 3,200 feet in elevation, with an annual rainfall of 12 inches consisting mainly of winter snowfall. The nearest weather station is located in Burns, Oregon, approximately 65 miles west of the Ranch. The annual average daily temperature is 46°F while 66°F is the average temperature in July. Winters are generally cold with 16°F the average minimum temperature in January (Johnsgard 1963). The average frost-free period is 83 days, with a range of 20 to 116 days (Gomm 1979).

2.2 Physiography

Three main geomorphic divisions occur in the Malheur Subbasin: 1) forested mountains in the northwestern portion, 2) grass-shrub uplands, and 3) low elevation terraces along the lower Malheur River (MOWC 1999). Glacial activity that ended about 11,000 years ago left u-shaped valleys and areas of unsorted glacial deposits and moraines (USFS 2000). Although forested mountains (Strawberry Mountain Range) occur in the north part of the subbasin, most the Malheur Subbasin consists of rolling, shrubsteppe hills underlain by old lacustrine sedimentary formations of Tertiary age, as well as lava flows of Tertiary to Recent age. The river canyons and valleys that dissect these hills result from block faulting and weathering of volcanic ash, basalts, and sediments (MOWC 1999).

Topography is the result of volcanic processes, limited glaciation, erosion, deposition and faulting (USFS 2000). Hanson et al. (1990), reports that the northwest portion of the Malheur Subbasin is mountainous terrain with a maximum elevation of 8,570 feet. Most of the Malheur Subbasin, however, consists of gently sloping to rolling lava plateau uplands dissected by river canyons or valleys with a minimum elevation of approximately 2,000 feet at the Malheur River's confluence with the Snake River. Elevation at the Project ranges from approximately 2,700 feet to over 5,000 feet with rugged topography (Figures 3-5).

Extensive low elevation floodplains and terraces parallel the Snake River and extend up the valleys where the Malheur River carved its way through igneous bedrock of volcanic origin (NPPC 2002). Today, sedimentary rocks, mostly tuffaceaous stream and lake deposits, occur along the Malheur River and throughout the subbasin (Laird 1964 in Fuste and McKenzie 1987).

Soils in the semi-arid portions of the subbasin, including the Project area, are generally of recent origin, thin, and poorly developed. A thin surface mantle of wind-born loess covers lacustrine sedimentary formations on some upland areas (NPPC 2002). Narrow alluvial floodplains may also occur along streams. These soils are light colored, low in organic matter, and generally calcareous (MOWC 1999). Floodplain soils in the lower watershed are diverse alluvial soils, generally easily erodible and alkali (MOWC 1999).

In contrast, soils in the mountainous areas in the northwest part of the subbasin are extremely diverse, depending on interactions with vegetation, topographic aspect, glacial history, and fluvial processes. Forested north slopes tend to have productive volcanic ash mantles from the Mount Mazama eruption 6,500 years ago (USFS 2000). Less protected south slopes have eroded over time to expose underlying silt loam soils. Ridges are comprised of shallow residual soils while Logan Valley soils are shallow with cemented hardpan (USFS 2000). Many soils in the forested northwest portion of the subbasin are of the Klicker series, underlain by basalt and andesite. These are stony, moderately deep, slightly acidic, and fine loamy soils (MOWC 1999).

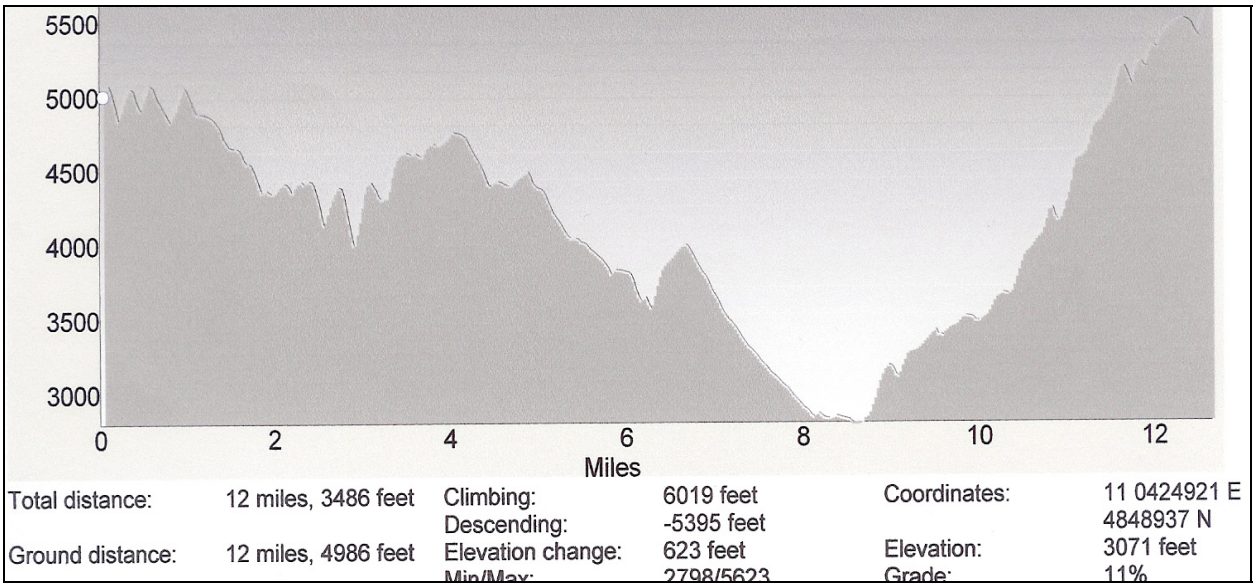

Figure 3. South (left) to north Project topographic profile (disregard percent grade).

The minimum elevation displayed in the north (right) to south profile (Figure 3) is 2,798 feet at the Malheur River, while the maximum elevation is 5,623 feet. This profile is a straight line that crosses the Malheur River at approximately Jonesboro. Elevation in the west (left) to east profile (Figure 4) ranges from 3,071 feet to 3,920 feet. The profile represents topography on a west to east line plotted approximately one mile north of the Malheur River.

Elevation on the BLM allotment located on the south side of the Malheur River along the profile line ranges from 3,036 feet to 4,049 feet with numerous steep canyons (Figure 5). The maximum elevation change is 820 feet. Draws and canyons generally run north and south.

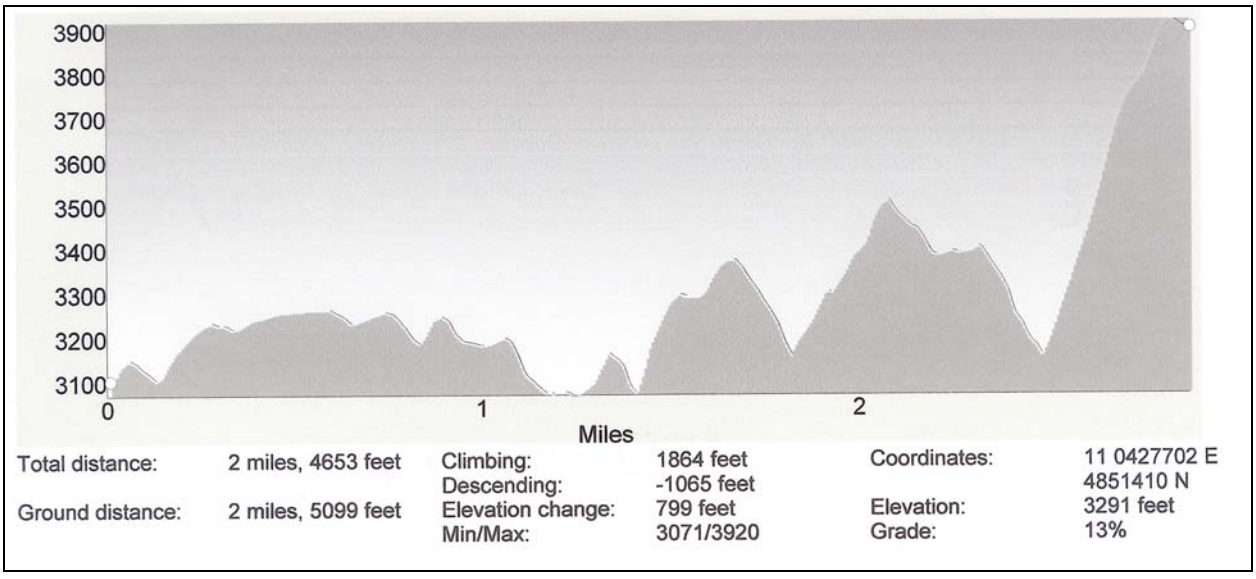

Figure 4. West (left) to east Project topographic profile one mile north of the Malheur River (disregard percent grade).

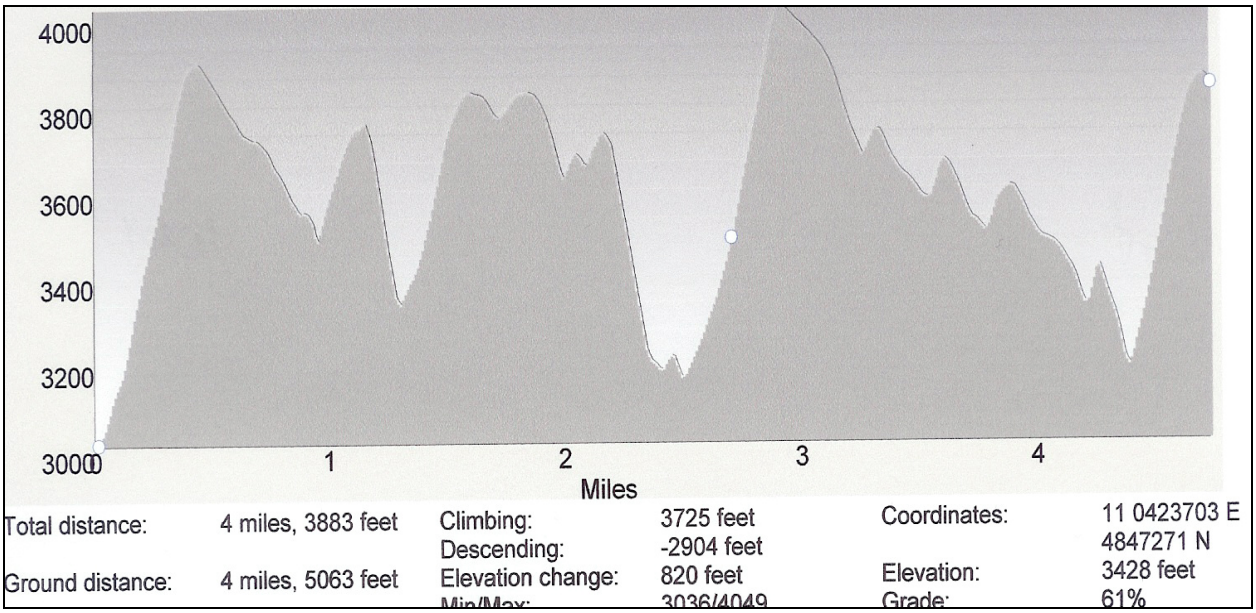

Figure 5. West (left) to east Project topographic profile approximately one mile south of the Malheur River (disregard percent grade).

2.3 Vegetation

Four primary plant communities are found on the Project, including shrubsteppe (sagebrush and juniper plant communities), riparian/riverine, wet meadow, and deciduous forest. A brief description of these plant communities/habitats, including abiotic factors and response to grazing and/or other habitat manipulation, as well as a summary of site-specific shrubsteppe habitat information is described in the following paragraphs. It is important to understand the unique features and response triggers/mechanisms inherent to these communities, especially those related to introduced vegetation and wildlife/livestock interactions, in order to develop comprehensive, ecologically/scientifically valid management plans.

2.3.1 Shrubsteppe Communities

2.3.1.1 Juniper/Sagebrush

Western juniper is unique to the intermountain west. While its center of development is central Oregon it also occurs throughout southeastern Oregon, southwestern Idaho, northwestern Nevada, and northeastern California in scattered, open stands, as single trees, and occasionally in more dense, extensive stands (Dealy et al. 1978,1978a). Tree densities vary within different localities.

2.3.1.1.1 Background

Western juniper occurs primarily as a single overstory species with wide spacing. Some stands occur with a mature overstory, whereas others have recently developed with a young overstory on sites previously occupied by big sagebrush communities. Crown cover of western juniper is less than 35 percent in most stands. Big sagebrush (*Artemisia tridentata*) is the dominant shrub; gray rabbitbrush (*Chrysothamnus nauseosus*) and green rabbitbrush (*Chrysothamnus viscidiflorus*) are present in varying amounts. On moist sites, the shrub layer becomes less

dominant and both western juniper and grass increase in importance. Occasionally, antelope bitterbrush (*Purshia tridentata*) and broom snakeweed (*Gutierrezia sarothrae*) are present (Driscoll 1964; Eckert1957).

Dominant grasses are bearded bluebunch wheatgrass (*Pseudoroegneria spicata*) or Idaho fescue (*Festuca idahoensis*). On some sites, these grasses are codominants. Common grasses are Thurber needlegrass (*Stipa thurberiana*), bottlebrush squirreltail (*Sitanion hystrix*), Sandberg bluegrass (*Poa sandbergii*), and cheatgrass. Occasionally plants of prairie junegrass and needle-and-thread occur in Idaho and Oregon stands (Burkhardt and Tisdale1969; Roberts 1975).

Forbs within the juniper community include locoweed (*Astragalus* spp.), phlox (*Phlox spp*.), biscuitroot (*Lomatium* spp.), fleabane *(Erigeron* spp.), buckwheat (*Eriogonum* spp.), pussy toes (*Antennaria* spp.), hawksbeard (*Crepis* spp.), annual agoseris (*Agroseris heterophylla*), rockcress (*Aribis* spp.), arrowleaf balsamroot (*Balsamorhiza sagittata*), and lambstongue groundsel (*Senecio integerrimus*).

The western juniper/big sagebrush/bearded bluebunch wheatgrass and western juniper/big sagebrush/Idaho fescue communities occupy level to hilly sites and ridges and northerly slopes in mountainous areas where moisture levels are higher than in sagebrush steppe. Precipitation ranges from approximately 10 to 15 inches per year. Macro relief is level to mountainous, and micro relief can be rough at rimrock sites or smooth in deeper soils. Idaho fescue dominates the understory on sites with highest moisture, and bearded bluebunch wheatgrass is dominant on the driest sites. A more varied mixture of these grasses occurs on sites of intermediate moisture regimens.

2.3.1.1.2 Edaphic Features

Soils are highly variable in western juniper communities. Relatively young stands (≤100 years) have been reported on deep sandy loam soils in areas supporting the big sagebrush type before advent of fire control (Burkhardt and Tisdale1976). Old growth stands (>100 years) have been found on rocky rims having shallow soils.

Eckert (1957), working in southeastern Oregon, found soils supporting western juniper to be in the Brown and Chestnut great soil groups that were derived primarily from residuum or colluvium of basalt and rhyolite origin. Some, however, developed on alluvial fans. Soil profiles were similar in many respects to those described by Dealy et al. (1978, 1978a) and Driscoll (1964).

2.3.1.1.3 Discussion

Western juniper, described as an "invader" in big sagebrush communities (Anderson 1956; Burkhardt and Tisdale 1969, 1976), is a robust dominant native species, which historically has been kept in a subordinate role on some sites because of natural fires (Dealy et al. 1978, 1978a). Fire control and severe livestock grazing since the late 1800s has resulted in reduced grass/forbs fuel loads for carrying fires. As a result, western juniper has increased its range and density in some areas.

Whether the increase of western juniper communities is an "invasion" or an "expansion" is important semantically because "invasion" has a negative connotation. It is more important that managers objectively recognize values of western juniper communities and retain them, if

desired. This is consistent with the strategy of preserved diversity (Bella and Overton 1972).The western juniper community is important for livestock production because of available shade, wildlife habitat (Leckenby1977, 1978a; Maser and Gashwiler 1978), recreational activities, and erosion protection. Maser and Gashwiler (1978) developed a provisional list of 83 species of birds and 23 species of mammals that use western juniper communities. Leckenby (1977) documented the importance of thermal qualities of western juniper communities for mule deer. Old-growth stands of western juniper provide a special habitat for cavity dwellers, such as the bushytailed woodrat.

2.3.1.1.4 Current Project Site Conditions

The juniper shrub community is most prominent on lands leased from DSL that comprise the northern portion of the Project (Figure 2). At the landscape scale (Figure 6), juniper occurs singularly and in homogenous and /or mixed stands (Figure 7). Juniper cover ranges from sparse (<1%) on xeric, open, south aspects dominated by sagebrush and rabbitbrush to approximately 17% (n = 5) on relatively mesic micro-sites and draws.

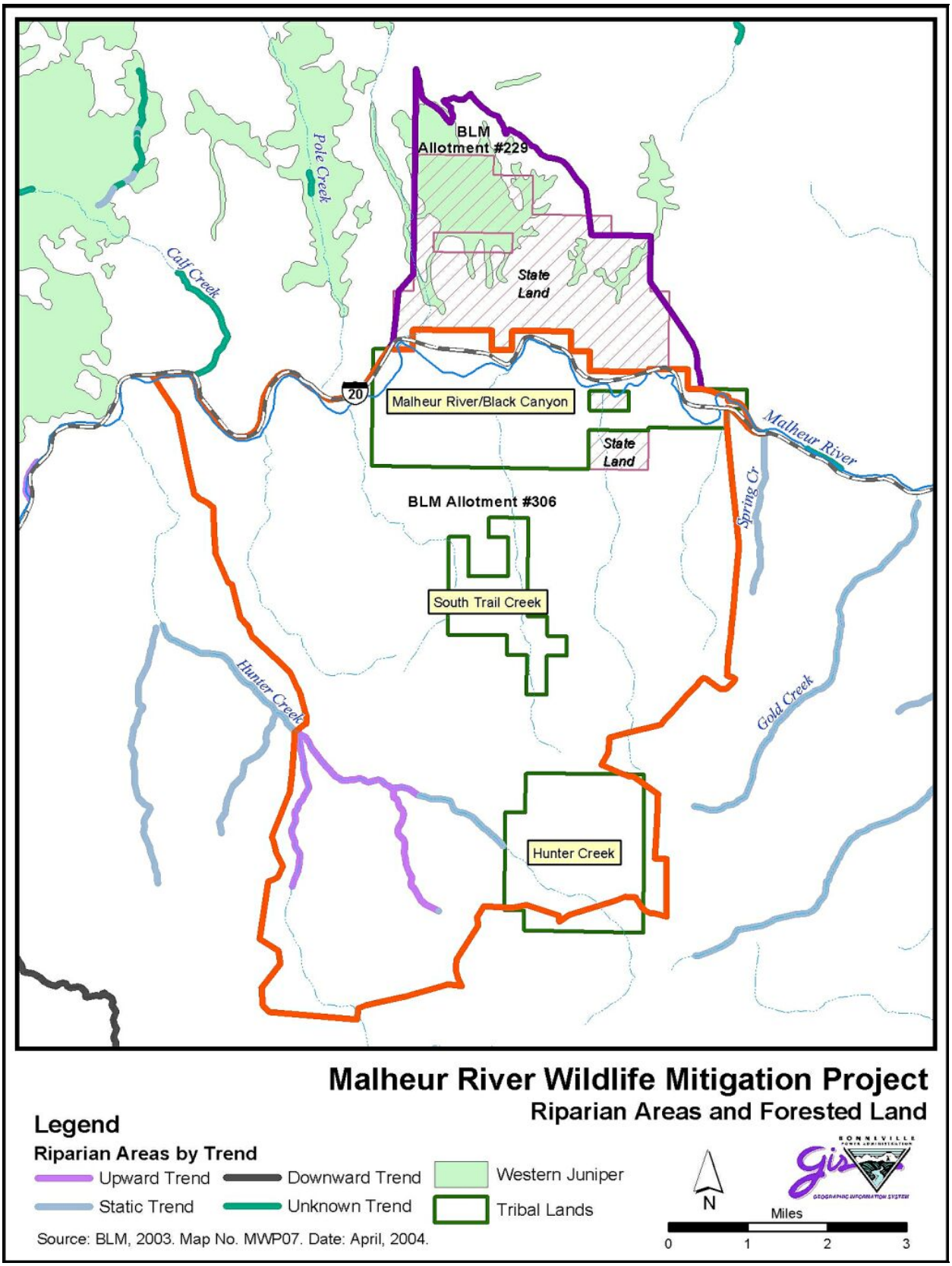

Figure 6. Juniper forest and riparian habitat at the landscape scale.

Figure 7. Juniper/sagebrush plant community interspersion on Project lands owned by DSL.

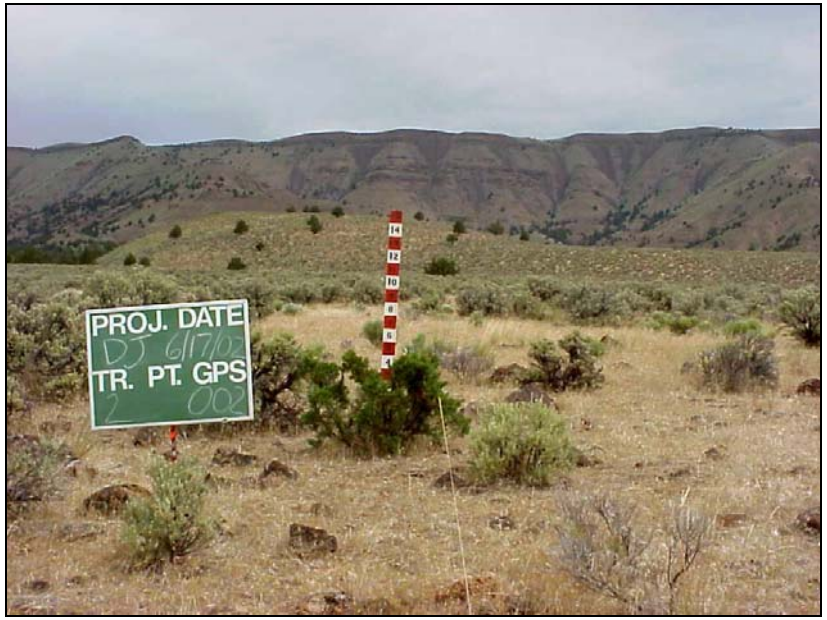

Figure 8. Juniper shrubs dispersed within the shrubsteppe community (HEP photo 2002).

Figure 9. Juniper dominated microsite on property owned by ODSL (HEP photo 2002).

Mean juniper cover is 6.5% while the median is 7.3%. Minimum and maximum percent cover for individual juniper transects ranges from 0.3% to 16.4% (n = 5). Sagebrush percent cover averages 13.6% while green rabbitbrush, gray rabbitbrush, bitterbrush, rigid sage, and horsebrush *(Tetradymia sp.)* each average less than 1% cover.

Cheatgrass dominates the herbaceous community at almost 55% cover. Medusahead is also present in minor amounts (<1%). Total herbaceous cover is nearly 64% (n=5) with 55% comprised of cheatgrass, and the remaining nine percent consisting of native species such as bluebunch wheatgrass, Sandberg's bluegrass, locoweeds, and phlox.

Percent cover of cheatgrass ranges from approximately 54% (minimum) to slightly more than 85% (maximum) on individual transects (Table 1). The constancy[2] rating for juniper, sagebrush, and cheatgrass is "V" while gray rabbitbrush has a

[2] Constancy is the number of sampled plots/transects which contain a particular species, usually expressed on the scale: r (<1%), I (1-20%), II (21-40%), III (41-60%), IV (61-80%), and V (81-100%).

constancy rating of “IV”. In contrast, Medusahead is rated as “I”.

Table 1. Percent shrub/introduced vegetation within the juniper community on Project ODSL property (Ashley, unpublished data, 2002).

Vegetation Strata/Species	Transect No./Percent Cover					Mean	Median	Minimum	Maximum
Shrubs	**18**	**2**	**3**	**16**	**10**				
Juniper	16.40	0.30	0.30	7.30	8.20	6.50	7.30	0.30	16.40
Big Sagebrush	16.00	19.00	13.00	9.30	10.90	13.64	13.00	9.30	19.00
Gray Rabbitbrush	0.40	1.00	0.00	0.30	0.90	0.52	0.40	0.00	1.00
Green Rabbitbrush	0.00	0.00	1.30	0.00	0.00	0.26	0.00	0.00	1.30
Bitterbrush	0.00	0.00	0.00	0.00	4.50	0.90	0.00	0.00	4.50
Horse brush	0.00	0.00	0.00	0.00	0.70	0.14	0.00	0.00	0.70
Rigid Sagebrush	0.00	0.00	0.00	0.70	0.00	0.14	0.00	0.00	0.70
Introduced Vegetation									
% Total Canopy Cover	68.80	57.60	85.30	53.50	54.70	63.98	57.60	53.50	85.30
% Medusa Head	0.00	1.90	0.00	0.00	0.00	0.38	0.00	0.00	1.90
% Cheatgrass	51.10	48.80	78.80	50.00	44.20	54.58	50.00	44.20	78.80

2.3.1.2 Sagebrush

Four sagebrush plant communities (shrubsteppe) are inter-dispersed throughout the Project area. These include the basin big sagebrush/bunchgrass, Wyoming big sagebrush/bunchgrass, low sagebrush/bunchgrass, and stiff sagebrush/bunchgrass plant communities. Big sagebrush is generally associated with deep soils while stiff and low sagebrush are found on shallow and, in some cases, rocky soils (Dealy et al. 1981).

A comprehensive site-specific vegetation/soils analysis is not available for the Project. As a result, habitat planning and management will occur at the landscape level (course scale) for shrubsteppe habitats versus the plant community level (fine scale). In addition to the limited amount of detailed site-specific information, highly variable soil conditions associated with steep, rugged terrain, technical difficulty in identifying Wyoming sagebrush and basin big sagebrush under field conditions, state and federal grazing allotment requirements, and temporal/staff constraints limits current management options. As project managers identify and document plant community mosaics in the future and gain flexibility in grazing regimens, land management activities will target specific plant communities. Sagebrush communities are briefly discussed below and addressed at the landscape level in this plan.

2.3.1.2.1 Background

Southeastern Oregon shrubsteppe rangelands have been in a state of flux for at least the preceding 10,000 years. Shifts in climate and fire regimes historically created conditions that led to changes in the altitudinal residence of dominant plant community types such as juniper woodlands, shrublands, and grasslands. The last 150 years, however, has seen an unprecedented change in these communities (Miller et al. 1994).

Changes in shrubsteppe communities are often blamed on a select few influences such as livestock grazing and weed encroachment. Although grazing and introduced vegetation account for a significant amount of habitat degradation, other factors including cultivation, elevated carbon dioxide levels, altered fire frequencies, recreation, irrigation, and climate change all add to the accumulated effect on a landscape scale (Miller et al. 1994).

Historically, sagebrush steppe community dynamics were driven by non-directional change that facilitated long-term equilibrium without permitting new species to invade the site (prior to the introduction of exotic plants). Although the floristic composition of these plant communities was stable over time, disturbance drove the system to cycle in species dominance.

For a number of years after a fire, herbaceous perennials would dominate a burned area until open stands of sagebrush established a presence. With a prolonged absence of fire, sagebrush cover became dense and competition for resources depleted the herbaceous component. On an average of 25-50 years, this cycle repeated itself, creating ideal habitat for indicator species such as sage grouse in the process. Because of its dependence on fire, shrubsteppe was known as a pyric subclimax ecosystem before a reduction in fuels and wildfire suppression permanently altered this natural disturbance regime (J. Wenick, USFWS, pers. comm., 2002).

Shrubsteppe/sagebrush plant communities that occur on the Project are described below. Edaphic features, current conditions, and desired future conditions are included.

2.3.1.3 Basin Big Sagebrush/Bunchgrass

Beetle (1960) described the range of basin big sagebrush in Oregon as extending from the southern end of the Blue Mountains, northeastern Oregon, throughout the central and southeastern portions of the State. The land area occupied by basin big sagebrush constitutes a minor portion of the sagebrush complex in Oregon; much of its former range is now cultivated land. Over recent history, the distribution has changed little, but various uses have considerably altered the density of stands (Winward and Tisdale 1977).

Diversity of species in some stands creates a rich composition, whereas other stands appear to be almost monotypes. Associated plants that are common enough to be used in naming big sagebrush communities and that also occur with basin big sagebrush are Sandberg bluegrass, needle-and-thread, Idaho fescue, bearded bluebunch wheatgrass, giant wildrye (*Elymus cinereus*), and Thurber needlegrass (*Stipa thurberiana*) (Daubenmire 1970; Tisdale et al. 1965; Winward 1980). Structure varies considerably among big sagebrush stands, and that variability influences its cover and forage qualities.

2.3.1.3.1 Edaphic Features

In Oregon, basin big sagebrush is found primarily along valley bottoms and in lower foothill regions between 100 and 7,000 feet in elevation. This subspecies is also common to many sites with dry, shallow soils, southerly to westerly aspects, and at talus perimeters (Beetle 1960; Tisdale et al. 1965; Winward 1980).

Dealy et al. (1981) observed that the tallest stands of basin big sagebrush (to over 8 feet in height) grow in deep, well-drained soils adjacent to rivers and streams in southeastern Oregon. Big sagebrush/bunchgrass communities are common on shallow, moderate, and deep soils. Textures include silty clay loams through fine sandy loam and loamy sands to well-drained pumice sands (Culver 1964; Daubenmire 1970; Dealy 1971; Fosberg and Hironaka 1964; Hall 1973; Tisdale et al. 1965; Urness 1966; Volland 1976). The soil profiles generally show well-developed horizons and often include a very fine-textured B horizon. Brown and Chestnut soils are most commonly associated with big sagebrush communities, but some stands have been found on other soils.

Soils associated with big sagebrush communities influence the use of stands by burrowing mammals, the rooting depth of plants, the patterns of soil moisture through the seasons, and the responses of plants after disturbance. Stone-free soils of big sagebrush/fescue stands were favorable to voles, ground squirrels, and badgers (Daubenmire 1970). Rooting depths were greater or effective moisture was better in big sagebrush/giant wildrye stands compared with adjacent stands of other communities (Culver 1964). Cooler and moister sites were indicated by big sagebrush/fescue stands, but soil moisture was depleted earlier in the needle- grass phase of the big sagebrush/bearded blue- bunch wheatgrass community (Eckert 1957). On pumice soils, manipulation of big sagebrush and other disturbances increased undesirable species, such as rabbitbrush, horsebrush, and bottlebrush squirreltail (*Sitanion hystrix*); burning produced grasslands that were slowly reinvaded by big sagebrush (Volland 1976).

2.3.1.3.2 Discussion

The forage value of big sagebrush has been related to the extent and quality of other browse species within the same or adjacent stands (Dietz and Yeager 1959; Short et al. 1972; Smith 1950, 1952). Use by wildlife varies among taxa of big sagebrush. For example, mule deer and

domestic sheep preferred other subspecies to basin big sagebrush (Sheehy 1975; Winward 1980); basin big sagebrush was never grazed in Nevada (Brunner 1972).

Recognition of basin big sagebrush stands can aid the range manager in planning for maintenance or enhancement of cover and forage. Crown cover may increase dramatically because of crown enlargement after disturbance, and in such communities there is a greater potential for herbaceous production, native as well as introduced, than in some other big sagebrush communities (Winward 1980).

Burning of various big sagebrush/bunchgrass stands produces different responses among plant communities. Perennial grass cover is increased by burning of big sagebrush/ bearded bluebunch wheatgrass stands, but fescue plants are damaged by fire (Daubenmire 1970; Concannon 1978). Fires eliminate big sagebrush and initiate plant successions during which perennial grass dominates the sites for long periods.

The influence of grazing in big sagebrush/bunchgrass stands may vary relative to the dominant form of big sagebrush. Daubenmire (1970) suggested that a big sagebrush/Sandberg bluegrass community did not result from overgrazing or burning of big sagebrush/bearded bluebunch wheatgrass stands. In Oregon, the extent of Sandberg bluegrass increases as Idaho fescue declines, and this relationship is suggested as a measure of range condition (Tueller 1962). Sandberg bluegrass, along with bottlebrush squirreltail and longleaf phlox, increases as bearded blue bunch wheatgrass declines in burned stands of the big sagebrush/bearded bluebunch wheatgrass community (Concannon 1978). Tisdale et al. (1969) found that big sagebrush/Thurber needlegrass stands changed to big sagebrush/Sandberg bluegrass stands during heavy grazing.

2.3.1.4 Wyoming Big Sagebrush/Bunchgrass

Wyoming big sagebrush is the most common sagebrush throughout the high desert in Oregon (Winward 1980). Many plant species commonly occurring with Wyoming big sagebrush are also found with other taxa, such as basin or mountain big sagebrush. Major associated herbaceous species include bearded bluebunch wheatgrass, needle-and- thread, Thurber needlegrass, bottlebrush squirreltail, Sandberg bluegrass, and cheatgrass. Idaho fescue occurs occasionally with Wyoming big sagebrush (Schumaker and Hanson 1977; Winward 1980).

Many stands have a sparse grass/forbs layer because of heavy use by livestock and wildlife. Furthermore, natural, periodic burning (Winward 1980) has altered some stands and associated herbaceous understory. These disturbances and loss of understory are associated with increased density of sagebrush or other shrubs. There are few perennial forbs, antelope bitterbrush is not a natural component, and cryptogams may fill much of the bare areas in undisturbed stands. The lateral rooting of this subspecies may compete more with herbaceous species than that of other big sagebrush taxa (Winward and Tisdale 1977). A correlation between crown cover or crown diameter and production has been determined for this sub-species (Rittenhouse and Sneva 1977). The stands are not structurally dense, yet they may totally occupy a site.

2.3.1.4.1 Edaphic Features

Wyoming big sagebrush/bunchgrass is most common at elevations of less than 6,000 feet and on more xeric mountain sites than other big sagebrush communities (Winward 1980). Relatively shallow to moderately deep soils are present under stands of Wyoming big

sagebrush/bunchgrass; often the soil is slightly calcareous in the surface layer (Winward 1980; Winward and Tisdale 1977).

2.3.1.4.2 Discussion

Wyoming big sagebrush was of low to intermediate palatability for mule deer and domestic sheep in Oregon compared with six other sagebrush taxa (Sheehy 1975; Winward 1980). Conversely, this subspecies was as palatable as antelope bitterbrush and often severely grazed in parts of Nevada (Brunner 1972). Sparse grass-forbs layers are common in Wyoming big sagebrush/bunchgrass stands, and they offer little forage from associated plant species.

Some stands of Wyoming big sagebrush provide dense, low cover for small mammals. Often, however, the shrubs are too small or scattered to provide much protection for large mammals and birds. Disturbances of the grass-forbs layer causes only moderate increases in density of this subspecies.

2.3.1.5 Stiff Sagebrush/Bunchgrass

Stiff sagebrush, also called scabland sagebrush, communities occur from the Cascade Range and Blue Mountains of Washington through central and southeast Oregon into Idaho (Daubenmire 1970). This short sagebrush species occurs frequently at the northern end of the Great Basin within eastern Oregon. It is common within Wasco, Wheeler, Crook, Gilliam, Jefferson, Umatilla, Union, Wallowa, and Harney Counties in Oregon (Beetle 1960). Winward (1980) found stiff sagebrush stands distributed primarily in northern and northeastern Oregon, but stiff sagebrush was also located from northern Harney County east through Malheur County into Idaho.

Stiff sagebrush/bunchgrass plant communities are often floristically rich but may appear impoverished because of spacing between plants and sparse ground cover (Daubenmire 1970). Common associated plant species include several mosses (Tortula, Bryum, Ceratodon, Grimmia), woodlandstar (*Lithophragma bulbifera*), biscuitroot (*Lomatium* sp.), spring draba (*Draba verna*), autumn willowweed (*Epilobium paniculatum*), pink microsteris (*Microsteris gracilis*), dwarf monkeyflower (*Mimulus nanus*), Sandberg bluegrass, cheatgrass, Pacific fescue (*Festuca pacifica*), bearded bluebunch wheatgrass, and bottlebrush squirreltail (Culver 1964; Daubenmire 1970; Winward 1980). Hall (1973) found dwarf squirreltail (*Sitanion hystrix* var. *hordeoides*), false agoseris (*Microseris troximoides*), biscuitroot, and bighead clover (*Trifolium macrocephalum*) common to stiff sagebrush stands in the Blue Mountains.

2.3.1.5.1 Edaphic Features

Stiff sagebrush in the Great Basin of Oregon occurs exclusively on various aspects of rocky scablands that have undulating or rolling relief. Stiff sagebrush/bunchgrass stands range in elevation from 3,000 to 7,000 feet. They are usually on gentle slopes or benches from flat to 20% slope and occasionally up to 40% slope (Beetle 1960; Culver 1964; Hall 1973; Winward 1980).

Stiff sagebrush communities are associated with very shallow to shallow (4 to 11 inches), stony soils that have been developed from basalt and rhyolite (Culver 1964; Daubenmire 1970; Hall 1973; Winward 1980). Soil textures vary from loams to fine clay loams. Soil profiles usually become saturated with water in winter and spring and are regularly subjected to frost heaving or frost boils.

2.3.1.5.2 Discussion

Although many plant species within this community provide diverse, valuable forage for grazing animals, the small shrubs and open stands provide little cover for other than the smallest birds and mammals. Both big game and livestock use stiff sagebrush as browse (Daubenmire 1970; Hall 1973; Winward 1980).

The lack of leaves (this is the only deciduous shrubby sagebrush in the area) in winter severely reduces the little cover this species offers on the scablands during periods of thermal stress. Even in winter, however, the shrubs do provide some protection to soils from erosion by wind (Hall 1973).

Stressful environmental conditions for plant growth, such as waterlogging and consistent frost heaving of very shallow soils, make successful seedings of domestic grasses highly improbable (Hall 1973; Winward 1980). Removal or control of the stiff sagebrush cover would increase thermal stress for small animals, reduce the forage available for both large and small animals, and increase erosion by wind.

2.3.1.6 Low Sagebrush/Bunchgrass

Low sagebrush/bunchgrass communities typically occur adjacent to or intermixed with big sagebrush communities but are distinctly separate stands of edaphic climax vegetation associated with shallow, stony soils (Dealy 1971; Dealy and Geist 1978; Franklin and Dyrness 1973). Low sagebrush is common in most counties east of the Cascade Range in Oregon. Beetle (1960) reported that low sagebrush occurs in Baker, Grant, Crook, Jefferson, Wheeler, Harney, Malheur, Lake, Klamath, and Jackson Counties. Low sagebrush is a gray to green dwarf shrub formed of irregular, short, and stiff branches. It produces a small crown between 0.4 and 0.8 meter (1.3 and 2.6 feet) wide (Beetle 1960; Brunner 1972).

Stands vary from small 5-acre patches to wide "flats" a mile or more across. Associated plants create a rich diversity of species within these stands. Grass species include bearded bluebunch wheatgrass, Idaho fescue, Thurber needlegrass, Sandberg bluegrass, prairie junegrass, one-spike oatgrass (*Danthonia unispcata*), bottlebrush squirreltail, cheatgrass, and western needlegrass (*Stipa occidentalis*). Forbs found in this community include woolly eriophyllum (*Eriophyllum lanatum*), Bloomer fleabane (*Erigeron bloomeri*), low pussytoes (*Antennaria dimorpha*), yarrow (*Achillea millefolium*), gay penstemon (*Penstemon laetus)*, Nevada biscuitroot (*Lomatium nevadenses*), Holboell rockcress (*Arabis hoelboellii*), starved milkvetch (*Astragalus miser*), obscure milkvetch (*Astragalus obscurus*), spreading phlox (*Phlox diffusa*), longleaf phlox (*Phlox longifolia*), Hooker balsamroot (*Balsamorhiza hookeri*), annual agoseris, daggerpod (*Pheonicaulis cheiranthoides*), bighead clover, and nineleaf biscuitroot (*Lomatium triternatum*) (Culver 1964; Dealy 1971; Dean 1960; Eckert 1957, 1958; Hall 1973; Segura-Bustamante 1970; Volland 1976; Winward 1980).

As with other structurally short sagebrushes, low sagebrush shrubs are too small and too scattered to provide cover for large mammals, but the dense crowns do shelter small animals, such as lizards, snakes, birds, and mice. The evergreen low sagebrush, however, does maintain minimal cover qualities through winter better than deciduous stiff sagebrush.

2.3.1.6.1 Edaphic Features

Low sagebrush/bunchgrass communities occur on dry, relatively sterile, often alkaline sites (Beetle 1960). Although Beetle (1960) reported low sagebrush often occurring on alkaline sites, Dealy (1971), studying low sagebrush in Oregon, reported low sagebrush only on acid to neutral sites.

Low sagebrush thrives on shallow, stony, fine-textured soils derived from basaltic, andesitic, or rhyolitic parent materials. These soils may have basic, neutral, or acidic PH factors. In addition, soils associated with low sagebrush are generally less than two feet deep, may contain an impermeable (or at least restrictive) clay B horizon, become saturated with water in late winter and spring, and are extremely droughty in summer (Brunner 1972; Culver 1964; Dealy 1971; Dealy and Geist 1978; Eckert 1957; Fosberg and Hironaka 1964; Hall 1973; Segura-Bustamante 1970; Volland 1976; Winward 1980).

Lack of physical support during spring periods of soil saturation can result in damage from trampling (Hall 1973). Extremes of water saturation, frost heaving, and drying in these soils make plant survival tenuous at best. Though plant species are well adapted, even the low sagebrush and Sandberg bluegrass roots are pedestaled and broken during seasonal cycles of frost heaving and soil drying. Often cracks in the underlying base rock, or interrupted restrictive layers in the solum produce dispersed soil micro sites that are deeper and better drained than surrounding soil. This permits establishment and survival of a few scattered ponderosa pines, western juniper, curlleaf mountain mahogany, antelope bitterbrush, or other shrubs (Dealy and Geist 1978; Segura-Bustamante 1970).

Most stands occupy sites from 3,000 to 9,000 feet in elevation. The stands are on most aspects, but commonly are located on gentle slopes (2% to 15 %) in rolling to undulating or flat uplands, top-of-rim edges, level and sloping plateaus, and crests and slopes of ridges (Culver 1964; Dealy 1971; Dean 1960; Eckert 1957, 1958; Hall 1973; Segura-Bustamante 1970; Volland 1976; Winward 1980).

2.3.1.6.2 Discussion

Low sagebrush stands are used intensively by wildlife and are particularly important to large ruminants, including livestock. Mule deer prefer these communities during mild weather in winter and spring (Leckenby 1978). Use by pronghorn and sage grouse is also high, though less seasonal. Indigenous species of wildlife intensively graze the associated forbs and grasses. Browsing of low sagebrush by insects, mice, rabbits, hares, sage grouse, and ruminants is also extensive.

Forage species develop as much as 2 weeks earlier in low sagebrush stands than in the adjacent antelope bitterbrush, tall sagebrush, rabbitbrush, western juniper, curlleaf mountain mahogany, or ponderosa pine communities. Grazing animals follow the sequence of forage development that is induced by differences in site factors among these communities. Similar grazing patterns exist elsewhere and appear to be an expression of resource partitioning related to rates of plant growth, which in turn are correlated with different plant habitats.

In a short-grass zone, DeBoer (1974) found that herds of grazing wildlife preferred plant communities produced by a shallow soil overlying a restrictive hardpan (a soil environment similar to that of short sagebrush stands). Low total herbaceous production and low rates of growth on these sites apparently permitted earlier season grazing that was nonselective for

plant species and that maintained growth of vegetative parts that were highly digestible. Two other vegetation zones, both characterized by more precipitation, deeper soils, and lack of a restrictive layer, produced higher rates of plant growth (soil environments similar to those of tall sagebrushes and other steppe communities). There, the grazing animals exhibited marked selectivity of forage species and grazed these stands much later and less intensively than those of the shortgrass zone.

Low sagebrush was one of the most preferred sagebrushes offered to mule deer and domestic sheep (Sheehy 1975). Some sub-species of low sagebrush are grazed more extensively than others by mule deer and other wildlife (Brunner 1972; Dealy 1971; Leckenby 1978; Volland 1976; Winward 1980). In addition, the plant composition of many stands offers a rich diversity of seasonal forages.

Height, crown cover, and plant density of low sagebrush/bunchgrass stands provide little structure to create hiding or thermal cover for animals larger than ground squirrels, mice, and small birds; these communities are primarily habitats for production of forage. Total crown cover of all vegetation was less in low sagebrush/bunchgrass stands compared to adjacent big sagebrush communities of similar composition (Segura- Bustamante 1970). Crown cover of western juniper, however, was similar among stands dominated by either sagebrush. Abundance of forbs increased steadily, whereas total crown cover decreased in those stands. Densities of bearded bluebunch wheatgrass, Thurber needlegrass, Sandberg bluegrass, and Idaho fescue were greater where these grasses occurred with low sagebrush compared with big sagebrush/ bunchgrass stands (Segura-Bustamante 1970).

Management designed to improve production of forage from low sagebrush/bunchgrass communities should be planned after careful evaluation of the tradeoffs and risks. Low sagebrush sites are fragile, generally will not produce much more forage after treatment, are not suitable for cultivation, and occur on soils that are too shallow for crested wheatgrass or other readily available introduced species (Dealy 1971; Hall 1973; Volland 1976; Winward 1980). Abundance of remnant forbs and grasses may improve with changes in grazing management (Dealy 1971; Winward 1980), but some stands in poor condition have not responded even where they were completely protected for 30 years or more as suggested by Welch et al. (2003).

2.3.1.6.3 Current Project Site Conditions

Like most shrubsteppe habitats across the western United States, the Project is affected by altered fire regimens, a history of overgrazing, and invasion of exotic weeds such as medusahead rye and cheatgrass. These factors result in increased sagebrush cover with few herbaceous native perennials (both bunchgrasses and forbs) under the shrub canopy, or medusahead/cheatgrass grasslands with very few other species present. Because the disturbance (fire) that once drove these systems has been altered and/or replaced by anthropogenic influenced disturbances such as overgrazing by livestock, plants that are more adapted to present conditions (weedy annuals) dominate many of these communities. Cheatgrass and medusahead not only displace native perennial bunchgrasses, but also expose soils to increased erosion because these weeds are not rhyzomatous and have few roots.

Climatic conditions such as low precipitation and high summer temperatures on the Project may hasten some sites to cross the threshold to a more degraded condition. Once this occurs, an enormous amount of energy, time, funding, and in some cases, materials are required to restore diverse plant communities because valuable resources (soil and native seed) are no longer

present. The ability to re-cross a threshold depends on many factors, including the type of disturbance taking place, the abiotic resources available on the site, plant propagule accessibility, and competition with other plant species (J. Wenick, USFWS, pers. comm., 2003).

It is important to note that most of the sites on the Project can be enhanced to meet wildlife habitat objectives. However, rest from livestock grazing, in of itself, will not facilitate a return to pre-settlement conditions. Active management is required to jumpstart ecosystem potential for this Project (J. Wenick, USFWS, pers. comm., 2003).

Discussion on the current condition of Project shrubsteppe habitat is based on two discreet Project zones: the north zone located north of State Route 20 (generally a southerly aspect), and the south zone on the opposite side of State Route 20 (generally a northerly aspect). An abbreviated list of predominant plant species that occur throughout the entire Project area is shown in Table 2. Dealy et al. (1981) developed a comprehensive plant species list for southeast Oregon shrubsteppe habitats. Shrubs and exotic herbaceous species documented on DSL lands are described on Table 3.

Table 2. General vegetation list for the Malheur Wildlife Mitigation Project (J. Wenick, USFWS, pers comm., 2004).

	Common Name	Scientific Name	Symbol
Shrubs	Mountain big sagebrush	*Artemisia tridentata ssp vaseyana*	ARTRV
	Wyoming big sagebrush	*Artemisia tridentata ssp wyomingensis*	ARTRW8
	Basin big sagebrush	*Artemisia tridentata ssp tridentata*	ARTRT
	Stiff sagebrush	*Artemisia rigida*	ARRI2
	Low sagebrush	*Artemisia arbuscula*	ARAR8
	Gray rabbitbrush	*Chrysothamnus nauseosus*	CHNA
	Green rabbitbrush	*Chrysothamnus viscidiflorus*	CHVI
	Bitterbrush	*Purshia tridentata*	PUTR2
	Wax current	*Ribes cereum*	RICE
Forbs	Tapertip hawksbeard	*Crepis accuminata*	CRAC2
	Largeflower hawsbeard	*Crepis occidentalis*	CROC
	Desert parsleys	*Lomatium*	LOMA
	Common yarrow	*Achillea millefolium*	ACMI2
	Low pussytoes	*Antennaria dimorpha*	ANDI2
	Arrowleaf balsamroot	*Balsamorhiza sagittata*	BASA3
	Fleabanes	*Erigeron*	ERIG
	Groundsels	*Senecio*	SENE
	Locoweeds	*Astragalus*	ASTRAG
	Lupines	*Lupinus*	LUPI
	Wild onions	*Allium*	ALLIUM
	Hood's phlox	*Phlox hoodii*	PHHO
	Long-leaf phlox	*Phlox longifolia*	PHLO2
	Buckwheats	*Eriogonum*	ERIOG
	Larkspurs	*Delphinium*	DELP

	Common Name	Scientific Name	Symbol
	Mulesears	*Wyethia amplexicaulis*	WYAM
Grasses	Bluebunch wheatgrass	*Agropyron spicatum*	AGSP
	Downy brome	*Bromus tectorum*	BRTE
	Idaho fescue	*Festuca idahoensis*	FEID
	Oniongrass	*Melica bulbosa*	MEBU
	Indian ricegrass	*Oryzopsis heymenoides*	ACHY
	Bulbous bluegrass	*Poa bulbosa*	POBU
	Kentucky bluegrass	*Poa pratensis*	POPR
	Sandberg's bluegrass	*Poa sandbergii*	POSA
	Bottlebrush squirreltail	*Sitanian hystrix*	SIHY
	Foxtail barley	*Hordeum jubatium*	HOJU
	Medusahead rye	*Taeniatherum asperum*	TAAS
	Needle-and-Thread	*Stipa comata*	STCO
	Thurber's needlegrass	*Stipa thurberiana*	STTH

Table 3. Percent cover of shrubs and herbaceous vegetation on lands leased from DSL (HEP data 2002).

Transect No.	11	4	9	19	12	20	21	22	23	24	25	28	7	14	Mean	Median
Shrub Species	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover		
Big Sagebrush	15.70	23.70	27.70	0.00	0.00	2.70	5.30	13.70	6.70	11.70	11.30	13.30	7.30	9.00	10.58	10.15
Gray Rabbitbrush	0.70	0.00	0.00	13.70	9.70	4.00	2.70	1.00	6.70	0.00	0.00	0.00	0.30	2.30	2.94	0.85
Green Rabbitbrush	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bitterbrush	1.30	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00
Horsebrush	0.70	0.00	0.00	0.00	0.00	0.00	12.70	0.00	0.00	0.00	0.00	0.00	0.00	0.70	1.01	0.00
Rigid Sagebrush	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	4.00	0.30	0.00	0.00	0.00	0.00	0.33	0.00
Spiney Hop Sagebrush	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00
Low Sagebrush	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.05	0.00
Average Shrub Height (Feet)	1.71	1.72	1.52	0.93	0.84	1.19	1.80	1.07	1.10	1.53	1.21	1.28	1.88	1.37	1.37	1.33

Transect No.	11	4	9	19	12	20	21	22	23	24	25	28	7	14	Mean	Median
Shrub Species	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover		
Shrub Age Distribution																
Seedling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Young	5.56	0.00	3.61	0.00	0.00	0.00	0.00	0.00	0.00	5.56	0.00	0.00	8.00	0.00	1.62	0.00
Mature	18.52	18.31	26.51	19.51	0.00	34.78	10.81	20.45	3.85	19.44	35.29	35.00	36.00	30.56	22.07	19.98
Decadent	59.26	56.34	34.94	34.15	37.93	26.09	54.05	40.91	38.46	58.23	41.18	30.00	36.00	41.67	42.09	39.69
Very Decadent	7.41	19.72	14.46	34.15	3.45	8.70	35.14	22.73	44.23	16.67	11.76	22.50	4.00	25.00	19.28	18.20
Dead	9.26	5.63	20.48	12.20	58.62	30.43	0.00	15.91	13.46	0.00	11.76	12.50	16.00	2.78	14.93	12.35
Herbaceous Cover																
% Total Herbaceous Cover	77.50	75.10	87.00	36.10	91.30	70.40	22.30	41.80	65.60	62.10	54.60	36.10	82.70	51.00	60.97	63.85
% Medusa Head	0.00	0.00	0.00	0.00	9.00	19.70	0.00	0.00	5.80	0.10	0.00	0.00	7.00	0.60	3.01	0.00
% Cheat Grass	67.30	68.00	82.60	27.20	82.30	45.90	16.40	29.30	57.90	54.70	37.20	13.10	73.50	47.30	50.19	51.00
% Herbaceous Cover Comprised of Intro. Spp.	86.84	90.55	94.94	75.35	100.00	93.18	73.54	70.10	97.10	88.24	68.13	36.29	97.34	93.92	87.27	89.40

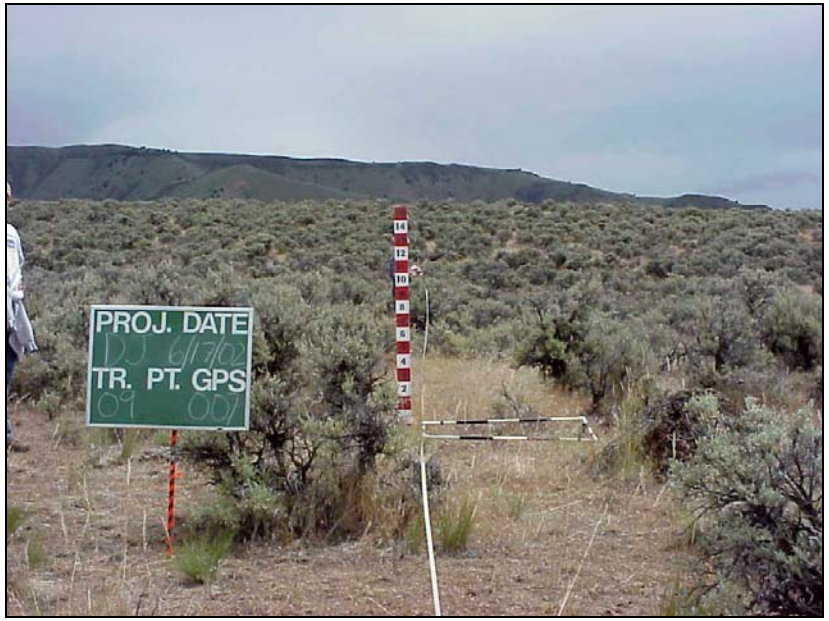

Figure 10. Shrubsteppe (big sagebrush) plant community on Project lands leased from DSL (HEP 2002).

Figure 11. Shrubsteppe plant community on sloped topography (HEP 2002).

North Project Zone

Shrubsteppe Habitat

Shrubsteppe habitat on Project lands leased from DSL is dominated by big sagebrush (mean ≈ 11% cover) and cheatgrass (mean ≈ 50% cover) (Table 3). Percent sagebrush cover ranges from 0% to nearly 28% (n=14).

The densest stands occur on deep soil benches and sloped micro-sites (Figure 10 and Figure 11 respectively). In the absence of sagebrush, gray rabbitbrush generally dominates the shrub layer (Figure 12), but may also occur on sites comprised predominantly of sagebrush.

Horsebrush, bitterbrush, hopsage, low sagebrush, and rigid sagebrush are also present in combination with other shrubs. The constancy rating for both big sagebrush and gray rabbitbrush is IV (78% and 64% respectively) while rigid sagebrush has a constancy rating of II (21%). The constancy rating for all other shrub species is I.

Shrub structure/age demographics fall primarily within the mature, decadent, and very decadent classes. Very little recruitment is taking place (Table 3). No seedling shrubs were detected on HEP surveys and young shrubs comprised less than 2% of the mean cover for all shrub species.

Figure 12. Gray rabbitbrush dominated shrubsteppe site on DSL property (HEP photo 2002).

The average percent herbaceous cover is almost 61% with just over 53% (or 87% of all herbaceous vegetation) consisting of introduced plants (50% cheatgrass, 3% medusahead). Native perennials (≈ 8% cover) are mainly scattered bluebunch wheatgrass culms, needle-and-thread, and Sandberg bluegrass.

Cheatgrass occurred in 100% of the plots (constancy rating V), while medusahead was present in 36% of the plots (constancy rating II). The minimum percent cover observed for cheatgrass was slightly more than 13% while the maximum percent detected was just under 83%. In contrast, percent cover for medusahead ranged from less than one percent to nearly 20% in plots where it occurred.

2.3.2 Grassland Habitat

Although minimal in area, grasslands (<5% shrub cover) are present on the Project site. Mean percent herbaceous cover is 54% for all species. Cheatgrass comprises 87% of all herbaceous cover present (47% actual cover) while medusahead comprises less than two percent of the total herbaceous cover. Similar to shrubsteppe habitats, native perennial plants contribute only approximately eight percent cover (Table 4). Grassland habitat located approximately one mile east of Project headquarters is illustrated in Figure 13, while grassland habitat, one-year post burn, is depicted in Figure 14.

Table 4. Grassland shrub and herbaceous cover (HEP 2002).

Shrub Species	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	Mean	Median	Min.	Max.
Big Sagebrush	0.00	0.00	0.70	0.00	0.00	0.00	**0.12**	**0.00**	**0.00**	**0.70**
Gray Rabbitbrush	4.70	3.30	0.00	0.00	0.00	0.00	**1.33**	**0.00**	**0.00**	**4.70**
Shrub Height (Feet)	1.60	1.30	1.60				**1.50**	**1.60**	**1.30**	**1.60**
Shrub Age Distribution										
Seedling	0.00	0.00					**0.00**	**0.00**	**0.00**	**0.00**
Young	0.00	0.00					**0.00**	**0.00**	**0.00**	**0.00**
Mature	28.57	80.00					**54.29**	**54.29**	**28.57**	**80.00**
Decadent	42.86	20.00					**31.43**	**31.43**	**20.00**	**42.86**
Very Decadent	0.00	0.00					**0.00**	**0.00**	**0.00**	**0.00**
Dead	28.57	0.00					**14.29**	**14.29**	**0.00**	**28.57**
Herbaceous Cover										
% Total Canopy Cover	80.30	96.30	16.80	21.20	96.80	15.50	**54.48**	**50.75**	**15.50**	**96.80**
% Medusa Head	0.00	3.30	1.90	0.30	0.00	0.00	**0.92**	**0.15**	**0.00**	**3.30**
% Cheat Grass	67.80	93.20	10.20	6.00	91.30	11.10	**46.60**	**39.45**	**6.00**	**93.20**

Figure 13. Grassland habitat comprised of cheatgrass and other introduced plant species (HEP photo 2002).

Figure 14. Grassland (burned area) located on shallow soils (HEP photo 2002).

2.3.3 Upland Riparian

Riparian vegetation, supported by springs, generally occurs at the head of upland draws (Figure 15) or within incised stream channels (Figure 16). Although infrequent, the upland riparian habitat type provides critical habitat for a multitude of wildlife species.

Five HEP transects were conducted in this habitat type during spring 2002. Willow and rose were present on most transects with a constancy rating of IV, while red-osier dogwood (*Cornus sericea*) occurred on three transects (constancy = III) (n=5). Other shrubs present included choke cherry (*Prunus virginiana L.*), mock orange (*Philadelphus lewisii*), and wax currant (*Ribes cereum*). Shrub cover varied from approximately 6% to just over 38%.

Juniper and cottonwood were present on one transect each. Percent canopy closure for cottonwood was nearly 64% with the shrub understory less than 6% cover (Figure 17). Individual upland riparian transect results are shown in Table 5 (in order to present meaningful transect results, mean and median statistics are based only on transects in which a species actually occurred).

Figure 15. Spring fed upland riparian vegetation (HEP 2002).

Figure 16. Riparian vegetation within incised stream channel (HEP 2002).

Figure 17. Upland riparian habitat cottonwood gallery (HEP 2002).

Table 5. Upland riparian transect results on lands owned by DSL (HEP 2002).

Upland Riparian Transects	Transect No.					Constancy	Mean	Median	Min.	Max.
	6	8	13	17	30					
Species	% Cover	% Cover	% Cover	% Cover	% Cover					
Juniper			12.00			I	12.00	12.00	12.00	12.00
Wax Currant	4.70					I	4.70	4.70	4.70	4.70
Mock Orange		1.30				I	1.30	1.30	1.30	1.30
Cottonwood					63.20	I	63.20	63.20	63.20	63.20
Choke Cherry		6.00			2.30	II	4.15	4.15	2.30	6.00
Dogwood	6.70			2.30	2.30	III	3.77	2.30	2.30	6.70
Willow	18.70	18.70	1.00	15.70		IV	13.53	17.20	1.00	18.70
Rose	7.30	12.00		1.00	1.30	IV	5.40	4.30	1.00	12.00

South Project Zone

The south project zone lies south of Highway 20 and includes three disjunct deeded parcels surrounded by land leased from the BLM (Figure 2). From south to north, deeded parcels include 1) Hunter Creek (2,038 acres); 2) South Trail Creek (960 acres); and 3) Malheur River/Black Canyon (3,388 acres).

The majority of the south zone is comprised of shrubsteppe habitat, which ranges from extremely poor condition in areas near water to almost pristine condition on upper slopes and ridges far from water. Years of disturbance primarily from livestock grazing and subsequent changes in native vegetation communities have significantly altered habitat quality (the availability of water is the major determinant regarding grazing intensity, or lack thereof in any given area).

Wet meadow grasslands and riparian/riverine habitats occur primarily on the Malheur River/Black Canyon parcel. In addition, wetlands that are dependent upon irrigation water runoff are also present.

Major habitat types for each deeded parcel, beginning with Hunter Creek followed by South Trail Creek and the Malheur River/Black Canyon parcels, are described in the following paragraphs. Vegetation descriptions are based primarily on the results of HEP surveys and associated observations conducted in spring 2001.

Hunter Creek

The Hunter Creek parcel is comprised almost entirely of shrubsteppe with limited amounts of riparian habitat adjacent to Hunter Creek and several small (< 5 acres) grassland plant communities. HEP transects were conducted only in shrubsteppe and grassland habitats in 2001 due to safety and access concerns relative to Hunter Creek's deeply incised stream channel.

Shrubsteppe

Seven shrub species were documented at Hunter Creek including big sagebrush, gray rabbitbrush, green rabbitbrush, low sagebrush, bitterbrush, wax currant, and rigid sagebrush (n=17). Mean shrub cover (all species) was slightly more than 16%. Shrub cover ranged from 6% to nearly 28% on individual transects while the average percent cover for herbaceous vegetation was 48% with approximately 7% comprised of cheatgrass.

Big sagebrush dominated the landscape with a constancy rating of V and an average 10.2% cover. Sagebrush was absent on one shrubsteppe transect. Percent cover ranged from 0% to 26.4% for this species (n=17). Gray rabbitbrush was less dominant than big sagebrush with a constancy rating of IV and a mean percent cover of 2.5%. Percent cover ranged from 0% to 8% on individual transects (rabbitbrush was absent on five transects). Green rabbitbrush and low sagebrush constancy was III with cover averaging 1% and 1.7% respectively. Mean percent cover for bitterbrush, wax current, and rigid sagebrush was less than 1% for each shrub species.

Shrub recruitment is minimal as no seedlings were detected on transects. The juvenile age class is represented; however, most shrubs fall within the mature and more decadent

structure/age classes (Figure 18 and Table 6). If shrub recruitment remains static, this may negatively affect obligate wildlife species in the future. As the shrub component becomes more

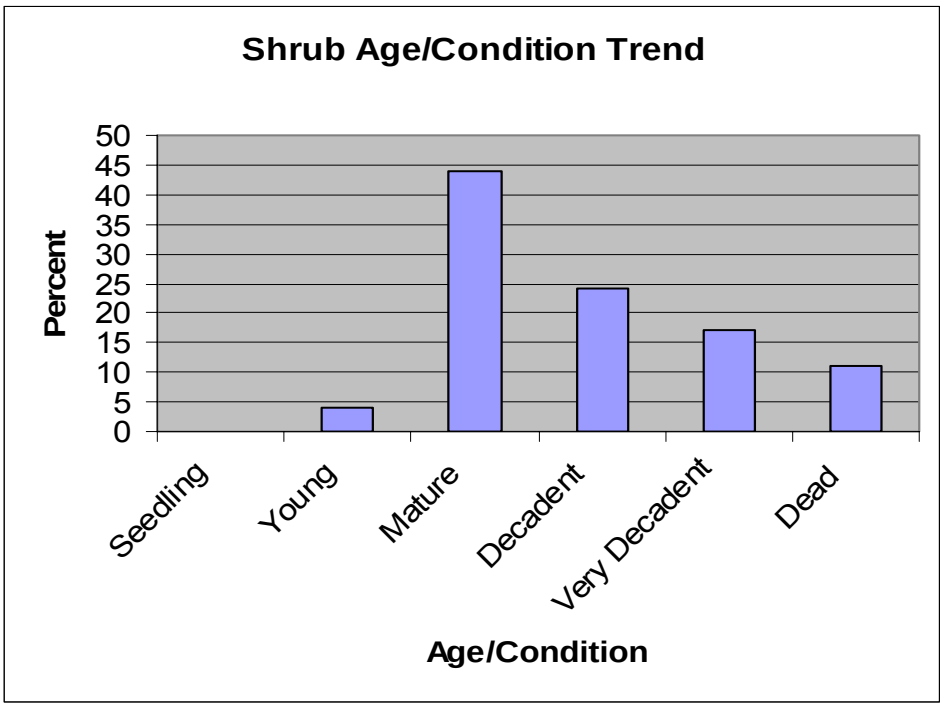

Figure 18. Hunter Creek shrub age/condition trend.

Table 6. Shrub age/condition descriptions.

Shrub Status	Description
Seedling	A single stem shrub generally ≤ two years of age
Juvenile	A multi-stem shrub not bearing seed/fruit or flowering
Mature	A seed/fruit bearing and/or flowering shrub
Decadent	A mature shrub with ≥25% and ≤50% of the foliage dead
Very Decadent	A mature shrub with >50% and <100% of the foliage dead
Dead	A shrub with no live foliage

decadent, nutritional value decreases and shrub structure changes, often to the detriment of wildlife.

Herbaceous vegetation is diverse and includes bluebunch wheatgrass, Sandberg bluegrass, needle-and-thread, ryegrass *(Elymus cinercus),* cheatgrass, lupine (*Lupinus* spp.), astragalus (*Astragalus* spp.), sasify (*Tragopogon* sp.), and allium (*allium* spp.) to name a few. Mean percent cover (all herbaceous vegetation) was 47.8%. Percent herbaceous cover ranged from 20% to nearly 95% on individual transects (n=17). Cheatgrass was detected on 16 out of 17 transects (constancy = V). Mean cheatgrass cover was 7.11%. Percent cover ranged from 0% to 29.8% on individual transects with ≤ 2% cover recorded on most transects. The Hunter Creek parcel appeared to be the least affected by invasive weedy vegetation (Table 7). Disturbance by livestock was minimal in many areas due to topography and limited access to water.

Table 7. Summarized Hunter Creek transect results (n=17).

Shrub Species	Percent		Rating	Percent	
	Mean	Median	Constancy	Min.	Max.
Rigid Sagebrush	0.06	0.00	I	0.00	1.00
Wax Currant	0.02	0.00	I	0.00	0.40
Bitterbrush	0.49	0.00	II	0.00	4.00
Low Sagebrush	1.79	0.80	III	0.00	11.30
Green Rabbitbrush	0.99	0.00	III	0.00	8.00
Gray Rabbitbrush	2.55	2.00	IV	0.00	8.00
Big Sagebrush	10.22	6.80	V	0.00	26.40
Total	**16.13**	**16.00**	**N/A**	**6.00**	**27.60**
Average Shrub Height (Ft.)	**1.15**	**1.01**	**N/A**	**0.57**	**2.45**
Shrub Age/Condition Distribution (% of Total)			N/A		
Seedling	0.00	0.00		0.00	0.00
Young	3.92	0.00		0.00	35.40
Mature	44.31	43.80		0.00	83.30
Decadent	24.40	21.40		5.80	46.20
Very Decadent	16.53	12.50		0.00	42.00
Dead	10.84	9.80		0.00	26.67
Herbaceous Vegetation			N/A		
% Herbaceous Cover	47.86	45.00		20.00	94.80
% Cheatgrass	7.11	2.00		0.00	29.80
Average Height (10s/Ft.)	0.36	0.20		0.02	1.40

Grassland habitat is not discussed separately because it is very limited and only one randomly placed transect occurred in this habitat type. Surveyors noted, however, that herbaceous cover was nearly 98% with no cheatgrass detected.

South Trail Creek

The South Trail Creek parcel, located between the Hunter Creek and Malheur River/Black Canyon parcels, is predominately shrubsteppe habitat.

Shrubsteppe

Five shrub species were documented on the South Trail Creek parcel including big sagebrush, gray rabbitbrush, low sagebrush, bitterbrush, and rigid sagebrush (n=12). Mean shrub cover (all species) was nearly 23%. Shrub cover ranged from approximately 9% to 39% on individual transects while the average percent cover for herbaceous vegetation was 69% with half of that comprised of cheatgrass.

Big sagebrush dominated the landscape with a constancy rating of V and an average 13.7% cover. Sagebrush was present on all transects with percent cover ranging from 2% to 34% on individual transects (n=12). Although gray rabbitbrush also had a constancy rating of V, it was less dominant than sagebrush with a mean percent cover of 5.3%. Percent cover ranged from 0% to 18.7% on individual transects (rabbitbrush was absent on one transect). Low sagebrush constancy was III with cover averaging 3.2%. Mean percent cover for bitterbrush and rigid sagebrush was less than 1% for each shrub species (Table 8).

Table 8. Summarized South Trail Creek HEP transect results (HEP 2001).

Shrub Species	Mean	Median	Constancy	Min.	Max.
Rigid Sagebrush	0.17	0.00	I	0.00	2.00
Bitterbrush	0.17	0.00	I	0.00	2.00
Low Sagebrush	3.22	0.00	III	0.00	23.30
Gray Rabbitbrush	5.34	2.70	V	0.00	18.70
Big Sagebrush	13.70	10.70	V	2.00	34.00
Total	**22.60**	**22.05**	**N/A**	**8.70**	**39.30**
Mean Shrub Height (Ft.)	**1.26**	**1.14**	**N/A**	**0.77**	**1.91**
Shrub Age/Condition Distribution			N/A		
Seedling	0.44	0.00		0.00	5.30
Young	1.89	0.00		0.00	11.80
Mature	40.77	41.55		9.40	75.90
Decadent	19.23	18.25		0.00	40.40
Very Decadent	26.12	27.00		0.00	56.30
Dead	11.55	10.80		0.00	23.70
Herbaceous Vegetation			N/A		
% Total Herbaceous Cover	69.35	71.50		32.00	89.00
% Cheat Grass	34.94	30.00		4.20	70.80
Average Height (10s/Ft.)	0.24	0.20		0.10	0.60

Shrub recruitment is minimal. Seedlings were detected on one transect while juvenile shrubs were observed on four transects. Most shrubs fall within the mature and very decadent structure/age classes as compared in Figure 19 and illustrated in Figure 20.

South Trail Creek herbaceous vegetation includes bluebunch wheatgrass, Sandberg bluegrass, needle-and-thread, cheatgrass, lupine, astragalus, spring draba, and yarrow (*Achillea millefolium*). Thistle (genus and species unknown) was also detected on one transect. Mean percent cover of all herbaceous vegetation was 69.3%. Percent herbaceous cover ranged from 32% to 89% on individual transects (n=12). Cheatgrass was detected on all transects (constancy = V). Mean cheatgrass cover was 34.9% and ranged from 4.2% to 70.8% on individual transects (Table 8).

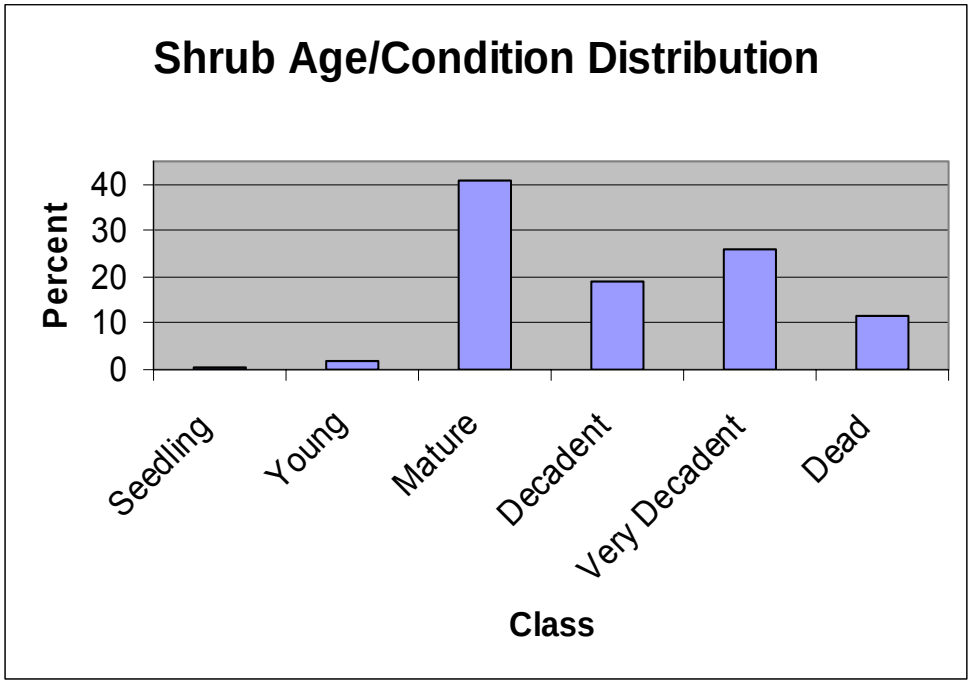

Figure 19. South Trail Creek shrub age/condition trend (HEP 2001).

Figure 20. Shrubsteppe plant community on the South Trail Creek parcel (HEP 2001).

Malheur River/Black Canyon

The Malheur River/ Black Canyon parcel, adjacent to Highway 20, includes the Malheur River floodplain and the Denny Jones Ranch. Native vegetation has been altered significantly on this tract. Floodplain meadow hydrology was changed to support introduced grass species that are harvested for livestock forage, while years of livestock grazing on the uplands has encouraged conversion of native bunchgrass plant communities to undesirable annual grasses. Wenick (USFWS, pers comm., 2001) reported that approximately 1,300 acres of dense medusahead now occupies upland sites.

HEP transects were randomly established on shrubsteppe, grassland (including wet meadow), and riparian shrub habitat types. Transect results are described below.

Shrubsteppe

Three shrub species were detected on the Malheur River/Black Canyon parcel including big sagebrush, gray rabbitbrush, and low sagebrush (n=16). Mean shrub cover for all species was nearly 20%. Shrub cover ranged from approximately 2% to 38% on individual transects while the average percent cover for herbaceous vegetation was 64% with 43% comprised of exotic species.

Big sagebrush is the dominate shrub with a constancy rating of V and an average 12.6% cover (n=16). Sagebrush occurred on 13 transects with percent cover ranging from <1.0% to 32.7% on individual transects. Gray rabbitbrush also had a constancy rating of V and was detected on 13 transects, but was less dominant than sagebrush with a mean percent cover of 4.0%. Percent cover ranged from <1% to 14.8%. Similarly, low sagebrush mean percent cover was 3.0% and ranged from<1% to 18.7% where present (Table 9).

Table 9. Summarized shrub and herbaceous HEP transect data.

Shrub Species	Percent		Rating	Percent	
	Mean	Median	Constancy	Min	Max
Low Sagebrush	3.03	0.00	II	0.00	18.70
Gray Rabbitbrush	4.08	2.35	V	0.00	14.80
Big Sagebrush	12.64	12.85	V	0.00	32.70
Total	**19.74**	**15.20**	**N/A**	**2.00**	**38.00**
Average Shrub Height (Feet)	**1.54**	**1.44**	**N/A**	**1.05**	**2.90**
Shrub Age/Condition Distribution (percent of total cover)					
Seedling	0.00	0.00	0.00	0.00	0.00
Young	1.18	0.00	0.00	0.00	9.40
Mature	53.96	57.50	0.00	9.80	100.00
Decadent	25.58	29.45	0.00	0.00	47.40
Very Decadent	10.57	9.55	0.00	0.00	29.50

Shrub Species	Percent		Rating	Percent	
	Mean	Median	Constancy	Min	Max
Dead	8.73	7.70	0.00	0.00	27.90
Herbaceous Vegetation					
% Total Canopy Cover	63.59	62.50	0.00	11.10	91.00
% Exotic Species	42.93	40.00	0.00	0.00	100.00
Avg.Vegetation Height (10s/Ft.)	0.28	0.16	0.00	0.01	1.50

Seedling shrubs were not detected while juvenile shrubs comprised 1.1% of all shrubs. In contrast, the majority of shrubs are either mature or decadent. As on other deeded parcels, shrub condition and age structure is moving from a robust mature stage towards decadent stages without adequate seedling recruitment (Figure 21).

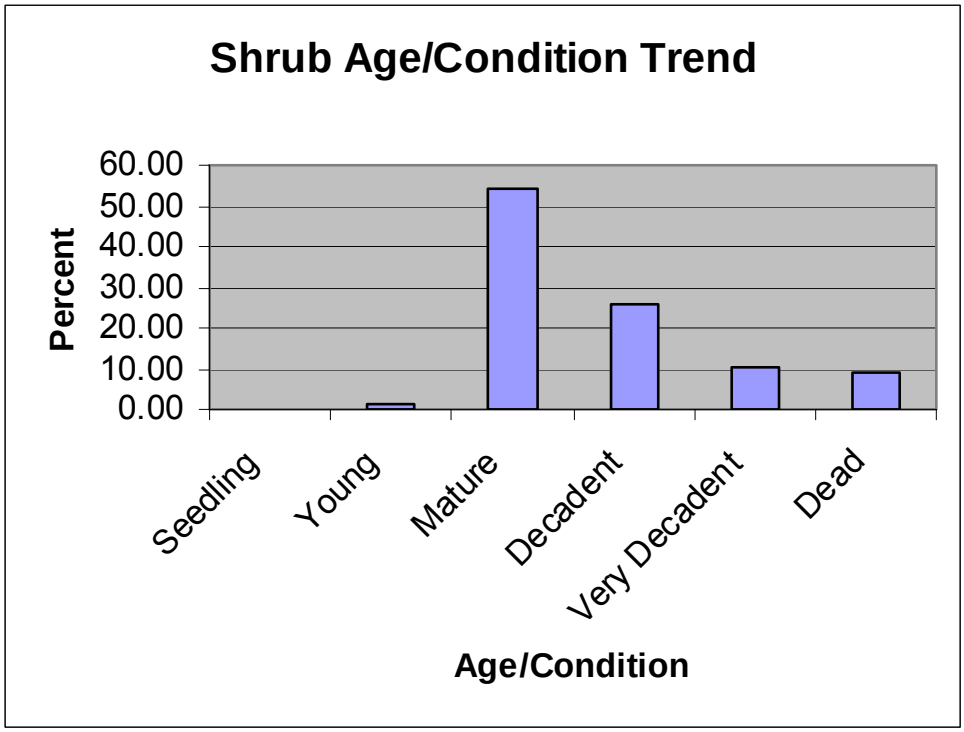

Figure 21. Malheur River/Black Canyon shrub/age condition trend.

In addition to the influence of livestock grazing in shrubsteppe communities, floristic composition in some areas is in an altered physiographic climax state (Figure 22). As a result, enhancement opportunities are likely limited, especially relating to control of introduced annuals.

Figure 22. Altered physiographic climax state of shrubsteppe habitat (HEP 2001).

Grassland (xeric uplands)

Upland grassland communities have been altered significantly with over half of all herbaceous vegetation comprised of invasive annuals including cheatgrass and medusahead. Mean herbaceous cover was 70.3% with bluebunch wheatgrass, Sandberg bluegrass, and wild onion (*Allium* sp.) present along with annual forbs and grass species (n=3). The average percent herbaceous cover on individual transects ranged from a minimum of 33% to a maximum of 92% (Table 10).

Table 10. Upland grassland herbaceous vegetation summary (HEP 2001).

Variable	Percent			
	Mean	Median	Minimum	Maximum
% Herbaceous Cover	70.33	86.00	33.00	92.00
% Exotic Species	38.93	40.00	25.00	51.80
Average Vegetation Height (10s/Ft.)	2.69	0.06	0.00	8.00

Wet Meadow Grassland

Meadow grasslands located on the Malheur River floodplain are managed as irrigated hay fields. Water diverted from the Malheur River floods irrigation canals and ditches that punctuate the floodplain and wet meadows (Figures 23-26). A water diversion dam (Figure 27) is located on the west side of the Project.

Water is dispersed through a series of gravity fed diversion structures and canals (Figures 28 and 29). At three sites, water is pumped into canals that are above grade. A pumping station is shown in Figure 30. All pumps need repair or replacement.

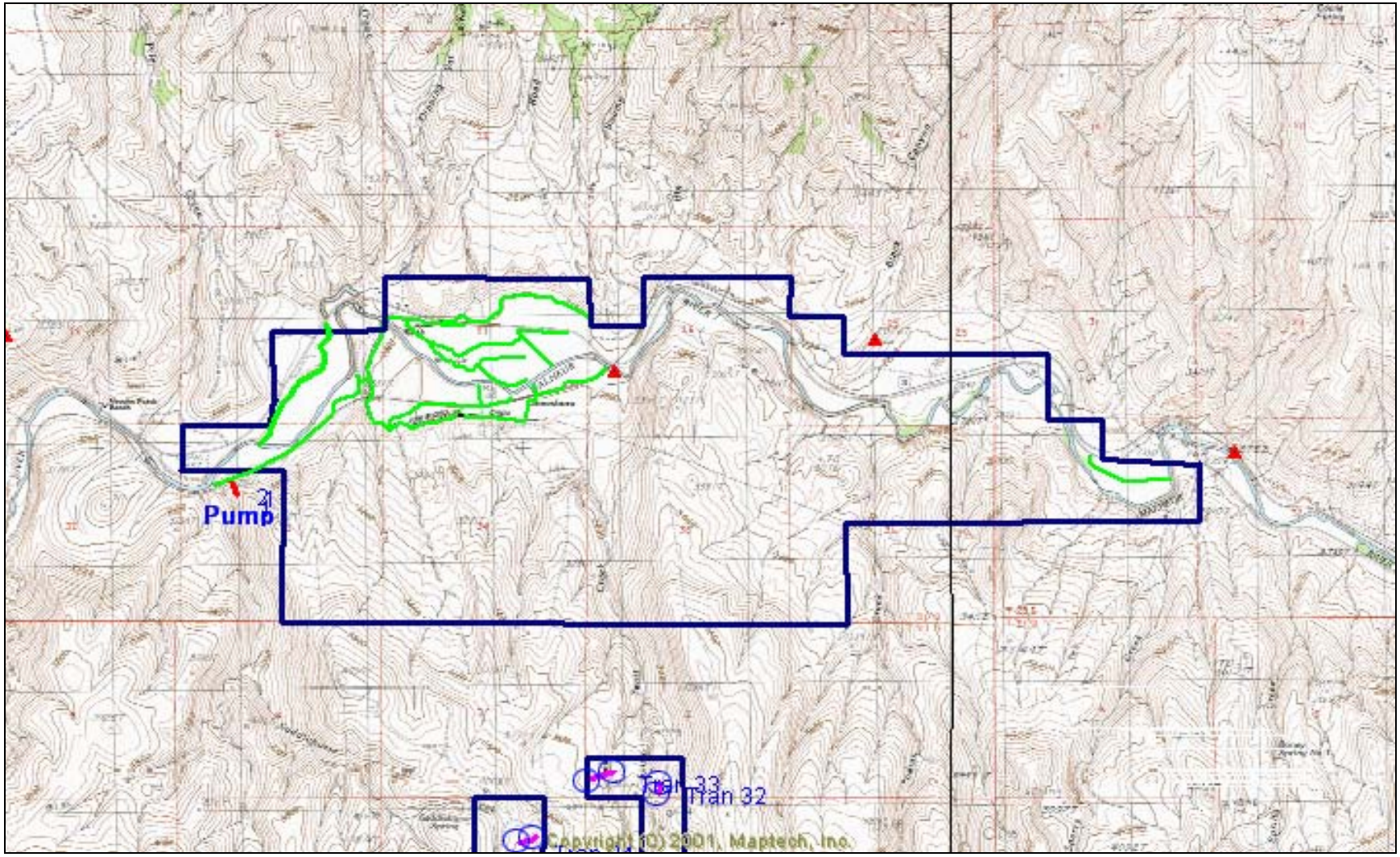

Figure 23. Irrigation canals and ditches (green lines) on Malheur River/Black Canyon Unit.

Figure 24. Irrigation canals and ditches (green lines) on west end of Malheur River/Black Canyon Unit.

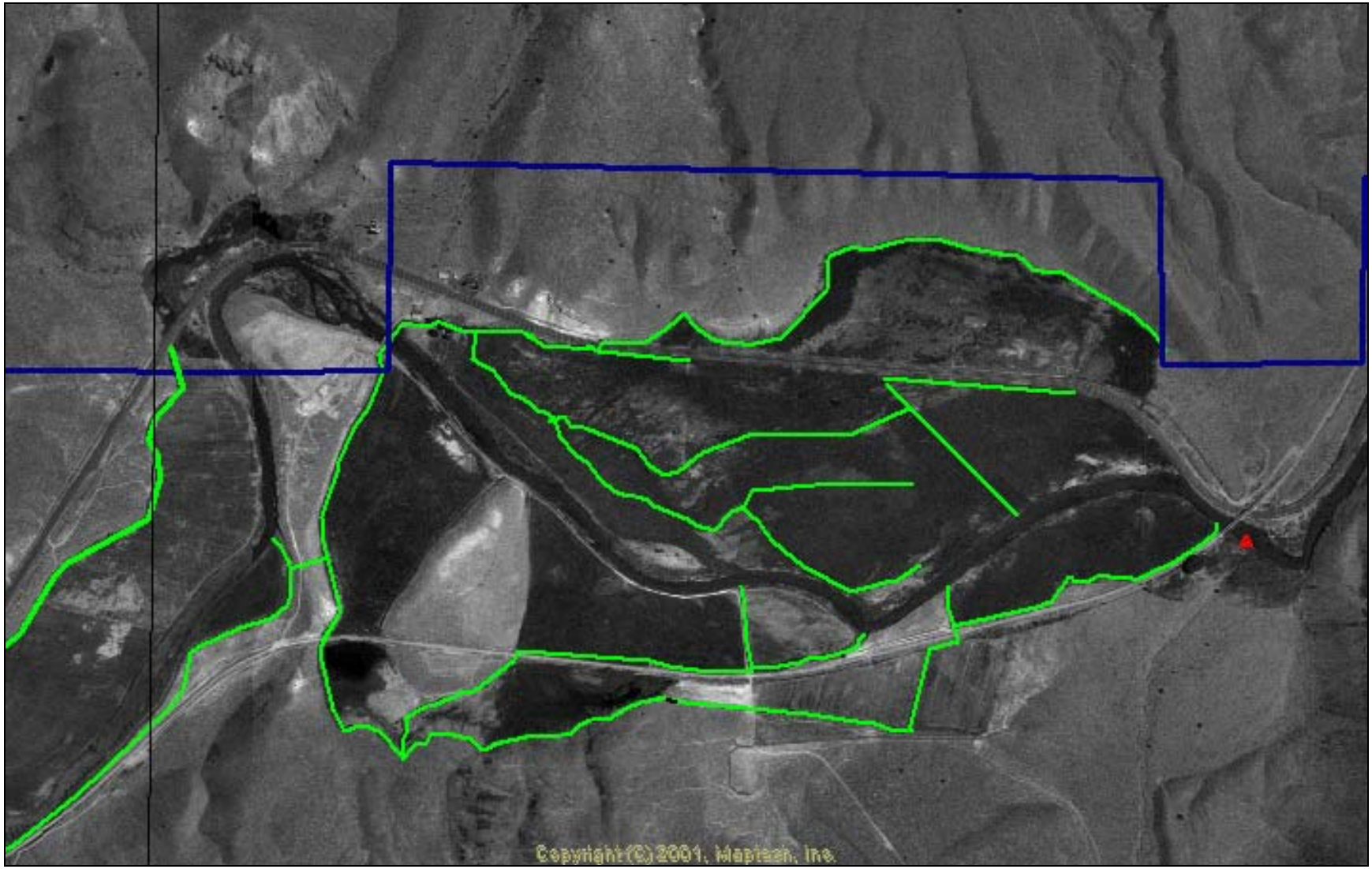

Figure 25. Irrigation canals and ditches (green lines) on middle section of Malheur River/Black Canyon Unit.

Figure 26. Irrigation canal (green line) on east end of Malheur River/Black Canyon Unit.

Figure 27. Irrigation dam structure on the Malheur River.

Figure 28. Diversion structure in irrigation canal.

Figure 29. Irrigation canal in grassland meadow.

Figure 30. Irrigation pump facility.

Although native sedge (*Carex* spp.), cattail (*Typha* spp.), rush (*Juncus* spp.), and willow are present in mesic areas, especially along irrigation ditches, the vast majority of the herbaceous plant community is comprised of introduced bromegrass (Figure 31). Irrigation ditches and intra-meadow weed patches are maintained each spring through controlled burns.

Figure 31. Wet meadow hay field with willow stand.

Meadow grassland mean percent herbaceous cover was nearly 92%, with introduced species (not including brome) averaging less than two percent of the total cover (n=4). Exotic vegetation was detected only on one meadow grassland transect. Weed species such as pepperweed (*Lepidium* spp.) are abundant in areas between field borders and the Malheur River. Transect results are summarized in Table 11.

Table 11. Meadow grassland vegetation summary (HEP 2001).

Variable	Percent			
	Mean	Median	Minimum	Maximum
% Herbaceous Cover	91.75	94.50	81.00	97.00
% Exotic Weed Species	1.88	0.00	0.00	7.50
Average Height (Feet)	1.08	1.15	0.50	1.50

Wet meadow plant communities and xeric shrubsteppe vegetation are in close proximity on some floodplain sites providing a diverse mosaic of habitat types and edge habitats beneficial to wildlife species. An example of this interspersion is illustrated in Figure 32.

Figure 32. A mosaic of wet meadow and shrubsteppe habitat types.

Riparian Shrub

Riparian shrub habitat is fragmented along the Malheur River with herbaceous vegetation dominated by introduced weed species in some areas (Figure 33). The shrub component is currently recovering through passive restoration and should continue to do so, excluding a catastrophic flood/fire event or encroachment by livestock (Figure 34). Active restoration of riparian trees such as cottonwoods, however, may be needed due to the lack of a seed source, limiting hydrologic factors, and to "jump start" the tree overstory component.

An unpublished report from the National Riparian Service (2001) describes the Malheur River as functioning "at risk" throughout the Project. The authors further state that, "tremendous improvement for some habitat features *(such as the shrub component)* can be achieved along the lower reaches but fish habitat will likely be severely limited under the best management" (*primarily because of off-site flow regulation, water withdrawals, and lack of in-stream structure).*

Willows are the dominant shrub within this habitat type and were present on all transects (n=5). Mean percent shrub cover was approximately 31% with individual transects varying from 12% to nearly 50% shrub cover. Up to three willow species were observed on individual transects. Rose and currant were also present on most transects with constancy ratings of IV and III respectively (Table 12).

Figure 33. Fragmented riparian shrub cover with herbaceous cover dominated by introduced weeds.

Figure 34. Passive restoration of willow species along the Malheur River.

Table 12. Riparian shrub habitat type summary (HEP 2001).

Shrub Species	Percent		Rate	Percent	
	Mean	Median	Constancy	Minimum	Maximum
Clematis	0.32	0.00	I	0.00	1.60
Mock Orange	0.32	0.00	I	0.00	1.60
Currant	0.64	0.40	III	0.00	2.40
Rose	6.20	5.00	IV	0.00	17.60
Salix	23.56	28.40	V	4.00	49.60
Total	**31.04**	**29.20**	**N/A**	**12.00**	**49.60**
Average Shrub Height (Feet)	4.88	4.82	N/A	3.08	7.40

Reed canarygrass (*Phalaris arundinacea*), cattail, spike-rush (*Eleocharis* spp.), rabbitsfoot grass (*Polypogon monspeliensis*), and common reedgrass (*Phragmites australis*) are interspersed within the riparian shrub habitat type as well as present in areas devoid of shrub cover. Wet meadow grasslands also extend to the river in some areas (Figure 35). Riparian shrub and riverine herbaceous vegetation interspersion are shown in Figures 33-35.

Figure 35. Fragmented riparian shrub habitat along the Malheur River.

2.3.4 Threatened and Endangered Plants

Threatened and endangered plants in Malheur and Harney Counties are listed in Tables 13 and 14, respectively. All listed plant species may be present on and/or near the Project.

Table 13. Threatened and endangered plant list for Malheur County, Oregon.

Common Name	Scientific Name
Wallowa ricegrass	*Achnatherum wallowaensis*
Malheur Valley fiddleneck	*Amsinckia carinata*
Mulford's milk-vetch	*Astragalus mulfordiae*
Sterile milk-vetch	*Astragalus sterilis*
Barren valley collomia	*Collomia renacta*
Golden buckwheat	*Eriogonum chrysops*
Grimy ivesia	*Ivesia rhypara* var. *rhypara*
Davis' pepper cress	*Lepidium davisii*
Smooth stickleaf	*Mentzelia mollis*
Packard's stickleaf	*Mentzelia packardiae*
Mackenzie's phacelia	*Phacelia lutea* var. *mackenzieorum*
Biennial stanleya	*Stanleya confertiflora*
Howell's spectacular thelypody	*Thelypodium howellii* ssp. *spectabilis*

Table 14. Threatened and endangered plants in Harney County, Oregon.

Common Name	Scientific Name
Wallowa ricegrass	*Achnatherum wallowaensis*
Crenulate grape-fern	*Botrychium crenulatum*
Cosby's buckwheat	*Eriogonum crosbyae*
Cusick's eriogonum	*Eriogonum cusickii*
Shelly's Venator Canyon ivesia	*Ivesia rhypara* var. *shellyi*
Disappearing monkeyflower	*Mimulus evanescens*
Playa phacelia	*Phacelia inundata*
Desert combleaf	*Polyctenium fremontii var. confertum*
Biennial Stanleya	*Stanleya confertiflora*
Leiberg's clover	*Trifolium leibergii*

2.3.5 Culturally Significant Plants

All native plants are important to the BPT. Some species, however, have cultural significance (Table 15). Not all of the plants occur on the Project, but they do occur within southeast Oregon on lands owned by the BPT. Harvesting and/or disturbance of culturally significant vegetation by non-tribal members are prohibited on the Project site without permission from tribal authorities.

Table 15. Culturally significant plant species.

Common Name	Scientific Name
Yarrow	*Archilea millefolium*
Tapertip onion	*Altium acuminatum*
Rock onion	*Allium macrum*
Swamp onion	*Allium madidum*
Pearly everlasting	*Anaphalis margaritacea*
Dogbane/Indian hemp	*Apocynum cannabium*
Kinnikinnick	*Arctostaphylos waursi*
Milkweed	*Asclepias syriaca*
Balsamroot	*Balsamorhiza spp.*
Oregon grape	*Berberis repens*
Mountain mahogany	*Cercoarpus ledifolius*
Thistle	*Cirsium edule*
Red-osier dogwood	*Cornus stolonifera*
Tansy-mustard	*Desurainia sophia*
Great Basin wild rye	*Elymus cinercus*
Larch	*Larix occidentalis*
Bitter root	*Lewsisia redivia*
Sweet biscuit root	*Lomatium canbyi*
Biscuit root	*Lomatium cous*
Desert parsley	*Lomatium gormanii*
Henderson lomatium	*Lomatium hendersonii*
Desert celery	*Lomatium nuducauli*
Indian mint	*Mentha arvensis*
Blazing star	*Mentzekia albicaulis*
Coyote tobacco	*Nicotiana altenuata*
Indian ricegrass	*Oryzopsis hymenoides*
Bolanders yampa	*Perideridia bolanderi*
Gairdneri yampa	*Perideridia gairdneri*
Reed grass	*Phragmites australis*
Ponderosa pine	*Pinus ponderosa*
Populus tremuloides	*Quaking aspen*
Wild plum	*Prunus americana*
Chokecherry	*Prunus virginiana*
Rosa spp.	*Rose hips*
Golden currant	*Ribes aureum*
Arrowhead/wapato	*Sagittaria latifolia*
Grey willow	*Salix exigua*
Coyote willow	*Salix exigua spp.*
Red willow	*Salix spp.*

Common Name	Scientific Name
Elderberry	*Sambucus canadensis*
Bullrush	*Scirpus validus*
Seepweed	*Suada depressa*
Cattail	*Typha latifolia*
Stinging nettle	*Urtica dioica spp.*
Huckleberry	*Vaccinium membranaceum*
Mules ear	*Wyethia amplexicaulis*
Death camus	*Zigadenus venenosus*

3.0 Wildlife and Fish Resources

3.1 Species Overview

Wildlife species that occur within the Malheur Subasin i.e., 10 amphibian species, 280 bird species, 90 mammal species, and 20 reptile species; many of which inhabit or seasonally frequent the Project are listed in the Malheur River Subbasin Plan (2004). Fisheries information is summarized in section 3.3.

3.1.1 Threatened, Endangered and Special Status Species

Federally listed and proposed endangered and threatened species, candidate species, and species of concern that occur in Malheur and Harney Counties and may be present on the Project are listed in Tables 16 and Table 17. The Oregon State list of special concern species is located in Appendix A.

Table 16. Threatened, endangered and special status species in Malheur County (D. Gonzalez, ODFW, pers comm. 2004).

Status	Common Name	Scientific Name (Status)
Listed Species[3]		
Birds	Bald eagle	*Haliaeetus leucocephalus* (T)
Fish	Lahontan cutthroat trout	*Oncorhynchus clarki henshawi* (T)
	Bull trout (Columbia Basin pop)[4]	*Salvelinus confluentus* (T)
Plants	Howell's spectacular thelypody[5]	*Thelypodium howellii* ssp. *Spectabilis* (T)
Proposed Species		
None	N/A	N/A

[3] U. S. Department of Interior, Fish and Wildlife Service, October 31, 1999, Endangered and Threatened Wildlife and Plants, 50 CFR 17.11 and 17.12.

[4] *Federal Register Vol. 63, No. 111, June 10, 1998, Final Rule-Columbia River and Klamath River Bull Trout*

[5] Federal Register Vol. 64, May 1999, Final Rule-Thelypodium howellii ssp. spectabilis

Status	Common Name	Scientific Name (Status)
Candidate Species		
Birds	Yellow-billed cuckoo	*Coccyzus americanus*
Amphibians and Reptiles	Columbia spotted frog[6]	*Rana luteiventris*
Species of Concern		
Mammals	Pygmy rabbit	*Brachylagus idahoensis*
	Pale western big-eared bat	*Corynorhinus (=Plecotus) townsendii pallescens*
	Pacific big-eared bat	*Corynorhinus (=Plecotus) townsendii townsendii*
	Silver-haired bat	*Lasionycteris noctivagans*
	Small-footed bat	*Myotis ciliolabrum*
	Long-eared bat	*Myotis evotis*
	Fringed bat	*Myotis thysanodes*
	Long-legged bat	*Myotis volans*
	Yuma bat	*Myotis yumanensis*
	California bighorn	*Ovis anadensis californiana*
Birds	Northern goshawk	*Accipiter gentilis*
	Western burrowing owl	*Athene cunicularia hypugea*
	Ferruginous hawk	*Buteo regalis*
	Greater sage grouse	*Centrocercus urophasianus*
	Black tern	*Chlidonias niger*
	Olive-sided flycatcher	*Contopus cooperi (=borealis)*
	Willow flycatcher	*Empidonax traillii adastus*
	Yellow-breasted chat	*Icteria virens*
	Lewis' woodpecker	*Melanerpes lewis*
	Mountain quail	*Oreortyx pictus*
	White-headed woodpecker	*Picoides albolarvatus*
	White-faced ibis	*Plegadis chihi*
Amphibians and Reptiles	Northern sagebrush lizard	*Sceloporus graciosus graciosus*
Fish	Interior redband trout	*Oncorhynchus mykiss gibbsi*
Invertebrates	Peaclam	*Pisidium ultramontanum*

E) Listed Endangered; (T) Listed Threatened; (CH) Critical Habitat has been designated for this species; (PE) Proposed Endangered; (PT) Proposed Threatened; (PCH) Critical Habitat has been proposed for this species.

Species of Concern – Taxa whose conservation status is of concern to the Service (many previously known as Category 2 candidates), but for which further information is still needed.

[6] Federal Register Vol. 66 , No. 210, October 30, 2001, Notice of Review-Candidate or Proposed Animals and Plants

Status	Common Name	Scientific Name (Status)

(CF) Candidate: National Marine Fisheries Service designation for any species being considered by the Secretary for listing for endangered or threatened species, but not yet the subject of a proposed rule.

** Consultation with National Marine Fisheries Service required.

Table 17. Threatened, endangered, and special status species in Harney County (D. Gonzalez, ODFW, pers comm., 2004).

Status/Class	Common Name	Scientific Name (Status)
Listed Species[7]		
Mammals	Canada lynx	*Lynx Canadensis* (T)
Birds	Bald eagle	*Haliaeetus leucocephalus* (T)
Fish	Borax Lake chub	*Gila boraxobius* (CH E)
	Lahontan cutthroat trout	*Oncorhynchus clarki henshawi* (T)
	Bull trout (Columbia Basin pop)[8]	*Salvelinus confluentus* (T)
Plants	Malheur wire-lettuce	*Stephanomeria malheurensis* (CHE)
Proposed Species		
None	N/A	N/A
Candidate Species		
Birds	Yellow-billed cuckoo	*Coccyzus americanus*
Amphibians and Reptiles	Columbia spotted frog[9]	*Rana luteiventris*
Species of Concern		
Mammals	Pygmy rabbit	*Brachylagus idahoensis*
	Pale western big-eared bat	*Corynorhinus (=Plecotus) townsendii pallescens*
	Pacific big-eared bat	*Corynorhinus (=Plecotus) townsendii townsendii*
	Spotted bat	*Euderma maculatum*
	Silver-haired bat	*Lasionycteris noctivagans*
	Small-footed bat	*Myotis ciliolabrum*
	Long-eared bat	*Myotis evotis*
	Fringed bat	*Myotis thysanodes*
	Long-legged bat	*Myotis volans*
	Yuma bat	*Myotis yumanensis*
	California bighorn	*Ovis anadensis californiana*

[7] U. S. Department of Interior, Fish and Wildlife Service, October 31, 1999, Endangered and Threatened Wildlife and Plants, 50 CFR 17.11 and 17.12.

[8] *Federal Register Vol. 63, No. 111, June 10, 1998, Final Rule-Columbia River and Klamath River Bull Trout*

[9] Federal Register Vol. 66 , No. 210, October 30, 2001, Notice of Review-Candidate or Proposed Animals and Plants

Status/Class	Common Name	Scientific Name (Status)
	Preble's shrew	*Sorex preblei*
	California wolverine	*Gulo gulo luteus*
Birds	Northern goshawk	*Accipiter gentilis*
	Western burrowing owl	*Athene cunicularia hypugea*
	Upland sandpiper	*Bartramia longicauda*
	Ferruginous hawk	*Buteo regalis*
	Black tern	*Chlidonias niger*
	Olive-sided flycatcher	*Contopus cooperi (=borealis)*
	Willow flycatcher	*Empidonax traillii adastus*
	Yellow-breasted chat	*Icteria virens*
	Lewis' woodpecker	*Melanerpes lewis*
	Western least bittern	*Ixobrychus exilis hesperis*
	Mountain quail	*Oreortyx pictus*
	White-headed woodpecker	*Picoides albolarvatus*
	White-faced ibis	*Plegadis chihi*
Amphibians and Reptiles	Northern sagebrush lizard	*Sceloporus graciosus graciosus*
Fish	Interior redband trout	*Oncorhynchus mykiss gibbsi*
	Catlow Valley redband trout	*Oncorhynchus mykiss* ssp.
	Alvord chub	*Gila alvordensis*
	Catlow tui chub	*Gila bicolor* ssp.
	Malheur mottled sculpin	*Cottus bairdi* ssp.
Invertebrates	California floater (mussel)	*Anodonta californiensis*
	Malheur pseudoscorpion	*Apochthonius malheuri*
	Planarian (no common name)	*Kenkia rhynchida*
	Malheur Cave amphipod	*Stygobromus hubbsi*

(E) Listed Endangered; (T) Listed Threatened; (CH) Critical Habitat has been designated for this species; (PE) Proposed Endangered; (PT) Proposed Threatened; (PCH) Critical Habitat has been proposed for this species.

Species of Concern – Taxa whose conservation status is of concern to the Service (many previously known as Category 2 candidates), but for which further information is still needed.

(CF) Candidate: National Marine Fisheries Service designation for any species being considered by the Secretary for listing for endangered or threatened species, but not yet the subject of a proposed rule.

** Consultation with National Marine Fisheries Service required.

3.2 Species Assemblages

All native fish and wildlife species are important to the BPT. Tribal members recognize that all species have intrinsic value and perform an ecological function. Rather than attempt to manage for all species on an individual basis, Project wildlife managers agree with Lambeck (1997), who proposed that habitat requirements of "key" wildlife species could guide ecosystem/Project management.

The main premise is that the requirements of a demanding species assemblage encapsulate those of many co-occurring, less demanding species. By directing management efforts toward the requirements of the most exigent species, the requirements of many cohabitants that use the same habitat type are met. Therefore, managing habitat conditions for a species assemblage should provide life requisite needs for most other habitat obligate species. Project planners also assumed that by focusing resources primarily on shrubsteppe, meadow grasslands, riparian shrub/riverine, and deciduous forest habitats, the needs of most terrestrial and aquatic species present on the Project would be addressed. Habitat requirements of species assemblages define "desired future habitat conditions" and guide management actions on the Project.

Based on this premise, Project planners selected sage grouse (*Centrocercus urophasianus*), mule deer[10] (*Odocoileus hemionus*), and western meadowlark[10] (*Sturnella neglecta*) as a species assemblage to represent shrubsteppe habitat attributes. In addition, bighorn sheep (*Ovis canadensis*), elk (*Cervus elaphus*), antelope (*Antilocapra americana*), and chukar (*Alectoris chukar*) were identified by the BPT, ODFW, and BLM as important managed species for this habitat type.

Western meadowlark and to a lesser extent mink[10, 11] (*Mustela vison*), habitat attributes were used to document baseline habitat conditions in meadow grassland habitats. This habitat type provides hay for livestock and forage for wild ungulate species.

Mink, yellow warbler[10] (*Dendroica petechia*), and beaver (*Castor canadensis*), form the riparian shrub habitat species assemblage. Because of its limited extent (< 10 acres, n = 1), upland deciduous forest site conditions were documented using only the black-capped chickadee[10] (*Parus atricapillus*) Habitat Evaluation Procedures (HEP) model.

Instream and riparian corridor habitat attributes (riverine habitat type) for redband trout (*Oncorhynchus mykiss*) and bull trout (*Salvelinus confluentus*) will be used to guide enhancement activities within riverine habitats. Project managers recognize that alteration of the hydrograph and river blockages associated with irrigation water needs coupled with reduced in-stream/riparian corridor habitat quality may preclude re-establishment of viable populations of these species in the near term; however, improving habitat quality will benefit other fish and terrestrial wildlife species as well as improve riparian function. Management species assemblages (focal species) are summarized in Table 18.

[10] These are Habitat Evaluation Procedures (HEP) species.

[11] Mink habitat attributes include a 100-meter "belt" paralleling the Malheur River and wetland habitats. The area within this belt includes some meadow grassland habitat.

Table 18. Habitat species assemblage by habitat type.

Common Name	Scientific Name	Habitat Type(s)
Sage grouse	*Centrocercus urophasianus*	Shrubsteppe
Western meadowlark	*Sturnella neglecta*	Shrubsteppe/grasslands
Mule deer	*Odocoileus hemionus*	Shrubsteppe
Beaver	*Castor canadensis*	Riparian shrub/riverine
Mink	*Mustela vison*	Riparian shrub/riverine
Yellow Warbler	*Dendroica petechia*	Riparian shrub/riverine
Redband trout	*Oncorhynchus mykiss*	Riverine
Bull trout	*Salvelinus confluentus*	Riverine

3.2.1 Wildlife Species Assemblages/Habitat Attributes

Species assemblages, habitat attributes (desired future conditions), conservation information, and species selection rationale for habitat types are captured in Table 19. General habitat attributes are summarized in the following paragraphs for each habitat type and species assemblage. Expanded species accounts for selected wildlife species assemblages and species of interest are included in Appendix A.

Table 19. Species assemblage/habitat type attribute summary.

Species	Habitat Type	Key Habitat Relationships		Comments	Life Requisite	Selection Rationale
		Conservation Focus	Habitat Attribute (Vegetation/Structure)			
Sage grouse (Danvir 2002)	Shrubsteppe	Diverse herbaceous understory, sagebrush cover	Sagebrush cover 10-35%	Area sensitive; needs large blocks	Reproduction	shrubsteppe obligate; State threatened, Federal Candidate species
			Sagebrush height 40 to 60 cm		Food - Reproduction	
			Forbs cover 10 to 20%	Combined %forbs/grass cover = 10 to 40%	Food/cover	
			Grass cover 10 to 40%			
			open ground cover > 10%			
			Mean visual obstruction readings (VOR) ≥ 1 dm	Horizontal cover metric	Reproduction	
		Habitat quality and diversity	Non-native herbaceous cover < 10% (excluding alfalfa, dandelion, burnet, etc.)	Includes knapweeds, cheatgrass, medusahead etc.		
Mule deer (Ashley 2001)	Shrubsteppe	Winter habitat	>20% canopy cover of preferred shrubs < 1.5 meters in height.		Food/cover	The mule deer is a management priority species and an indicator of healthy diverse shrub layer in shrubsteppe habitat.
		(diverse shrub component)	Number of preferred shrub species ≥ 3		Food	
		Forage	Palatable herbaceous forage ≥ 15% cover		Food	
			Presence of suitable agricultural crops e.g., winter wheat, standing grain, alfalfa etc., within 1.6 km of winter range	Supplemental forage		
		Disturbance	< 1 km of open road per km^2 of habitat	Winter use roads – includes disturbance by snowmobiles etc.		
Western meadowlark	Shrubsteppe	Grass/shrub cover	Percent herbaceous cover comprised of grass		Nesting cover	Western meadowlark are sensitive to changes in shrub cover and forbs/grass components

Species	Habitat Type	Key Habitat Relationships		Comments	Life Requisite	Selection Rationale
		Conservation Focus	Habitat Attribute (Vegetation/Structure)			
(Modified from Schroeder et al. 1982)			Percent shrub cover	Inverse relationship with habitat use-competition with grass component	Perch sites	
			Distance to perch site	Territorial display site	Breeding	
Yellow warbler (Schroeder 1982)	Riparian shrub/riverine habitat	Shrub composition, structure, and cover	Shrub canopy closure > 60%		Cover, reproduction	The yellow warbler is dependent upon deciduous/hydrophytic shrubs and an indicator of riparian shrub diversity/quality.
			Shrub height > 1 m tall	> 2 m tall is optimum		
		Habitat quality and diversity	> 60% of deciduous shrubs comprised of hydrophytic shrubs			
Mink (Allen 1984)	Riparian shrub/riverine habitat	Perennial water and woody riparian cover	Water present more than nine months/year	Permanent water is optimum	Food, den site locations	Mink are sensitive to temporal changes in the presence of water and associated food sources. Mink seldom search farther than 100 m from water to find prey. Prey species are most abundant where adequate cover exists.
			% shrub and tree cover within 100 m of water's edge > 60%	≥75% cover is optimum	Food, cover	
Beaver (Allen 1983)	Riparian shrub/riverine habitat	Canopy closure	40-60% tree/shrub canopy closure		Food	The beaver is an indicator of healthy regenerating cottonwood/hardwood stands and an important habitat manipulator.
			trees < 6" dbh; shrub height ≥ 6.6 ft.			In addition beaver are sensitive to water fluctuations and temporal changes in water availability.
		Permanent water	stream channel gradient ≤ 6% with little to no fluctuation		Water-cover for food and reproductive requirements	
		shoreline development	woody vegetation ≤ 328 ft. from water		Food	
B. C. Chickadee	Deciduous Forest	Tree canopy closure and snags	Optimum tree canopy cover: 50% to 75%	Canopy cover > 75% reduces habitat suitability	Food and cover	Black-capped chickadee were selected because optimum habitat includes snags and substantial tree canopy closure which can

Species	Habitat Type	Key Habitat Relationships		Comments	Life Requisite	Selection Rationale
		Conservation Focus	Habitat Attribute (Vegetation/Structure)			
						include evergreen and/or deciduous trees.
(Schroeder 1983)			Optimum tree height ≥15 m			
			> 2 snags 10 cm to 25 cm dbh per 0.4 ha is optimum		Reproduction	
Redband Trout	Riverine	Water temperature and quality	Cold water: 4.5° – 21°C (40°-70°F)	Requires clean water	All life stages	Selected because of its status, cultural significance, and habitat requirements
		Instream structural conditions	High levels of shade, undercut banks, pools, and woody debris in streams; high levels of gravel in riffles and low levels of fine sediments; stable, complex stream channels; and connectivity among and between drainages.			
Bull Trout	Riverine	Water temperature and quality	Cold water: 2°C (36°F) to 8°C (46°F)	Requires clean water	Spawning/fry rearing	Selected because of its status, cultural significance, and habitat requirements
(Source: Montana Bull Trout Restoration Team)		Instream structural conditions	High levels of shade, undercut banks, pools, and woody debris in streams; high levels of gravel in riffles and low levels of fine sediments; stable, complex stream channels; and connectivity among and between drainages.		All life stages	

3.2.1.1 Shrubsteppe Species Assemblage

Sage grouse, mule deer, and western meadowlark represent shrubsteppe habitat attributes. Species accounts and status, described briefly in the following paragraphs, are further documented in Appendix A.

3.2.1.1.1 Sage Grouse

Sage grouse are a shrubsteppe obligate species and have the most exigent habitat requirements within this assemblage. This species is dependent upon sagebrush and native herbaceous plant communities and is culturally significant to the BPT. Bureau of Land Management data confirms the presence of sage grouse strutting grounds (leks) near the Hunter Creek parcel (Figure 36).

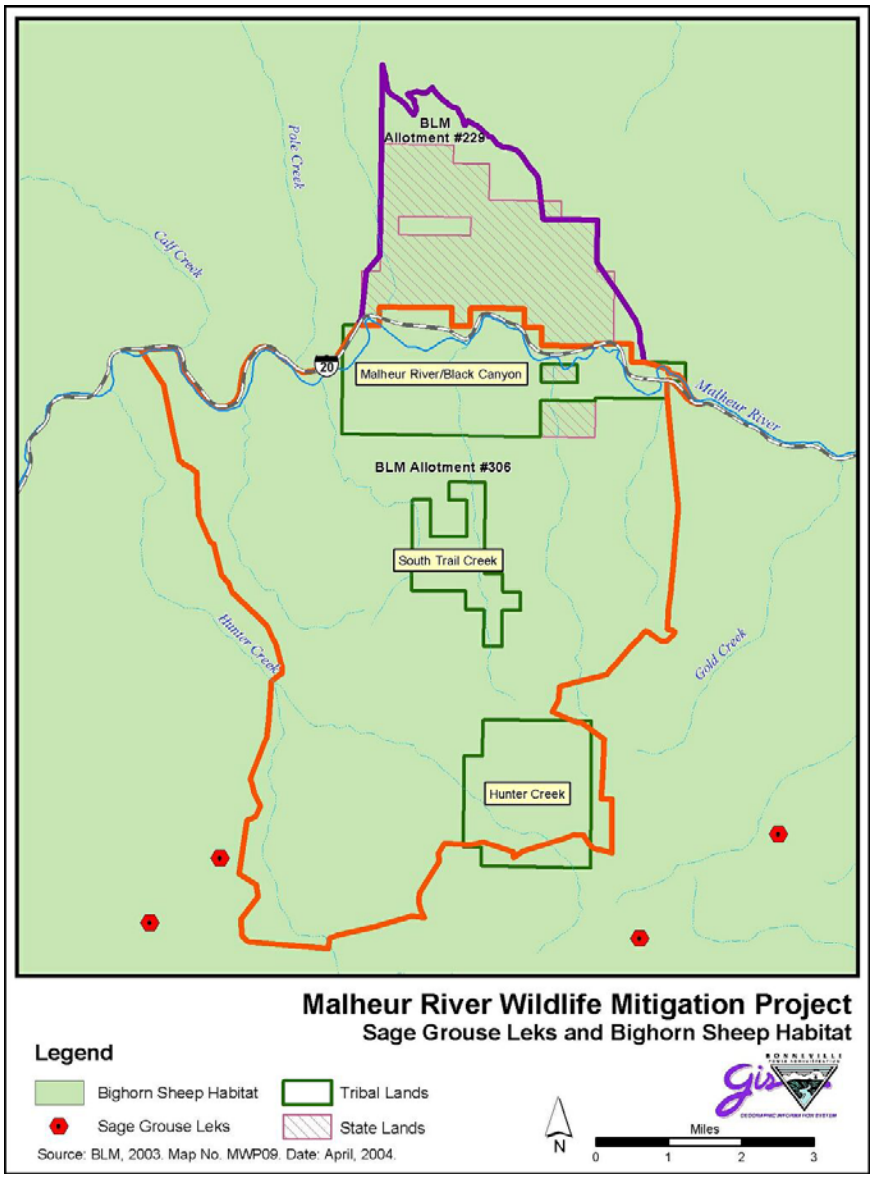

Figure 36. Sage grouse lek sites and bighorn sheep habitat on/near the Project.

Sage grouse were observed on the Hunter Creek parcel in spring 2002 in wet meadow draws (P. Ashley, WDFW, pers comm., 2002). Sage grouse use of the Project may be limited due to topographic factors. Danvir (2002) reported that 87% of winter sage grouse observations in Utah were on slopes <5 % (n = 297), while all nest sites (n = 36) were located on upland flat areas or ridges; none occurred in draw bottoms. This supports conclusions from studies in Washington State and elsewhere (M. Schroeder, WDFW, pers comm., 2001). Although limited, the Project does provide potential wintering and nesting sites on ridges and relatively flat basins dispersed throughout the Project. Managing shrubsteppe habitat based on sage grouse habitat attributes should improve habitat function and benefit other shrubsteppe dependent wildlife species.

3.2.1.1.2 Mule Deer

Mule deer are a “generalist” shrubsteppe species selected to represent shrub diversity and palatable herbaceous vegetation. The ODFW and the BLM have designated portions of the Project as critical winter range for this species (Figure 37). Mule deer are both an important subsistence species for BPT members and are a significant species for non-tribal members throughout Oregon and the West.

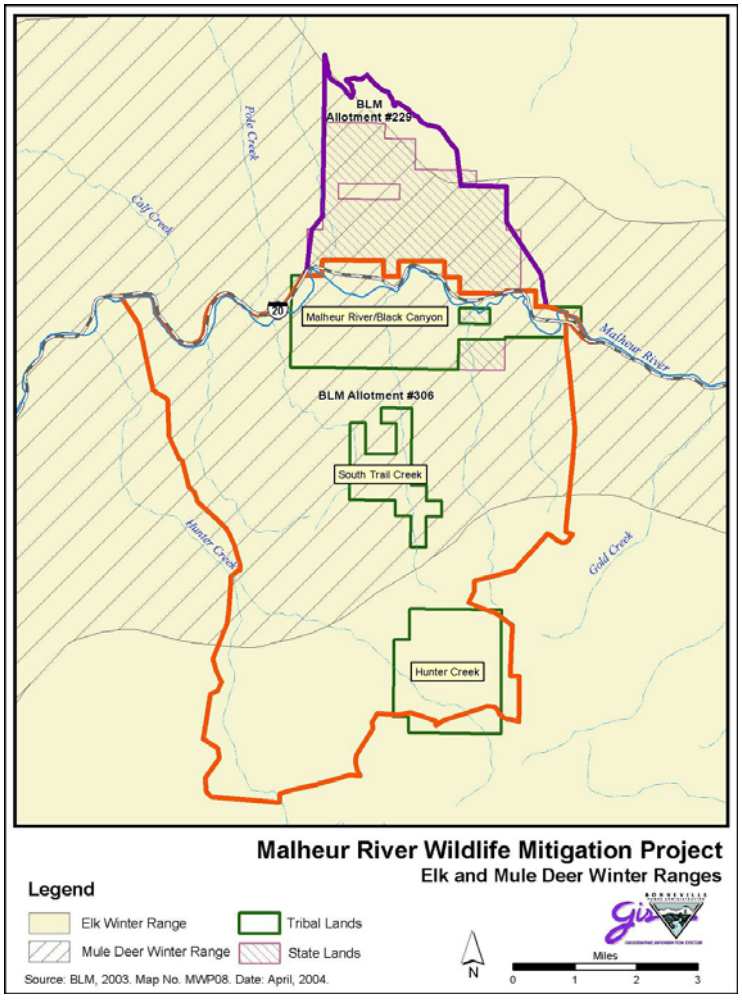

Figure 37. Mule deer and elk winter range.

3.2.1.1.3 Western Meadowlark

Western meadowlarks are present throughout the Project and are an indicator species for changes in herbaceous and shrub communities. Roseberry and Klimstra (1970) reported that meadowlarks nest in rangeland pasture, followed in descending order by hayfields, soil-bank fields, winter wheat fields, idle areas, and fallow areas. The density of nesting meadowlarks in pastures is inversely related to the intensity of grazing. Highest nesting densities occur when pastures are not grazed, and numerous dead grass stems and vigorous stands of grass (fescue) are present. Nesting densities in hay lands are highest in mixed grass hayfields. Use of alfalfa fields, wheat fields, and fallow areas for nesting is low because these areas lack sufficient grassy cover to provide suitable nesting habitat. Idle areas are not preferred when shrubs and trees become abundant. The average height of nesting cover was 38 cm (15 inches), with the majority of nests located in cover 25 to 50 cm (10 to 20 inches) high. The presence of dead grass stems at ground level and the absence of woody vegetation or numerous shrubs in the immediate vicinity of the nest site appears necessary for nesting.

3.2.1.1.3 Shrubsteppe Species of Interest

3.2.1.1.3.1 California Bighorn Sheep

California bighorn sheep are associated with rugged high elevation shrubsteppe habitats and range across the Project (Figure 36). Bighorn sheep prefer rocky mountainous terrain and forage on open high altitude meadows. California bighorn sheep are a Federal species of concern and an Oregon Natural Heritage Program List 4 species, indicating taxa that are “of conservation concern but are not currently threatened or endangered” (ONHP 2001). Bighorns are also culturally significant to the BPT and other Native American tribes throughout the West.

3.2.1.1.3.2 Rocky Mountain Elk

Rocky mountain elk occur in eastern Oregon with major populations in the Blue Mountains and south central Oregon (ODFW 2003). Rocky Mountain elk are an important subsistence species and culturally significant to the BPT. Elk are intensely monitored and managed by ODFW. The *Oregon Elk Management Plan* (ODFW 2003) provides specific elk management objectives for winter population size and post-season bull ratios for each Wildlife Management Unit (WMU).

Elk summer forage consists of a combination of lush forbs, grasses, and shrubs high in nutrients that are easily digestible. Generally, elk populations within the Malheur River subbasin move from higher elevation areas in the summer, to lower elevation winter grounds beginning in September or October. During mild winters, elk may not move far from summer range. Elk may use intermediate areas called transition range. Transition range is typically used in the late fall or early spring as migratory elk move between summer and winter ranges. Occasionally, Rocky Mountain elk will reside year-round in the same locale. The entire Project is elk winter range (Figure 37).

3.2.1.1.3.3 Pronghorn Antelope

This wide-ranging herd species is typically associated with arid sagebrush habitat and open rangeland and occurs throughout eastern Oregon and the Great Plains of North America. Pronghorn are game species managed by ODFW and species populations hold no formal State or Federal protected status in Oregon (ONHP 2003). Antelope are culturally significant to the BPT and are present on the Project south of Highway 20.

Pronghorn herds require large areas with suitable shrub and grass/herb forage. Degradation of shrubsteppe habitat has forced pronghorn herds to winter in areas where conflicts with landowners are common. Within the Malheur River subbasin, gap analysis shows a change in distribution of pronghorn habitat away from developed areas in the eastern portion of the subbasin, concentrating populations in remaining suitable shrubsteppe habitat and open rangeland.

3.2.1.1.3.4 Chukar Partridge

Chukars, an introduced game bird species present throughout the Project, have adapted well to cheatgrass plant communities. This species provides hunting and recreational opportunities from early fall throughout much of the winter. The Project area is a popular destination for chukar hunters.

3.2.1.2 Riparian Shrub Species Assemblage

Yellow warbler, mink, and beaver represent riparian shrub habitat attributes. Species accounts and status are described briefly in the following paragraphs and further documented in Appendix A.

3.2.1.2.1 Yellow Warbler

Optimal nesting habitat for the yellow warbler in wet areas includes dense, moderately tall stands of hydrophytic deciduous shrubs. Upland shrub habitats on dry sites will provide only marginal suitability. This species is a good indicator of riparian shrub habitat quality and is protected throughout its range.

Allen (1984) assumed that optimal yellow warbler habitats contain 100% hydrophytic deciduous shrubs and that habitats with no hydrophytic shrubs will provide marginal habitat suitability. Shrub densities between 60 and 80% crown cover are assumed optimal. As shrub densities approach zero cover, suitability also approaches zero. Totally closed shrub canopies appear to be of only moderate suitability, due to the probable restrictions on movement of the warblers in those conditions. Shrub heights of 2 m (6.6 feet) or greater are assumed to be optimal, and suitability will decrease as heights decrease to zero.

3.2.1.2.2 Beaver

Beaver are classified as furbearers in Oregon and are culturally significant to the BPT. ODFW has established trapping seasons for harvesting this species. Beaver are currently scarce on the Project, but do occasionally dam irrigation canals away from the river. Beaver are sensitive to water fluctuations and changes in availability of suitable woody forage species adjacent to rivers, streams, lakes, and wetlands.

Potential beaver habitat must contain a permanent source of surface water. Lakes and reservoirs that have extreme annual or seasonal fluctuations in the water level will be unsuitable habitat for beaver. Similarly, intermittent streams, or streams that have major fluctuations in discharge (e.g., high spring runoff) or a stream channel gradient of 15% or more, will have little year-round value as beaver habitat.

The food value in a cover type is a function of the density, size class, and species composition of woody vegetation. Optimum conditions are a stand of preferred tree and/or shrub species, of

medium density, less than 15.2 cm (6 inches) dbh with shrubs at least 2 m (6.6 feet) tall. An adequate food source includes some trees, or shrubs, or both. Several tree and shrub species including willow, aspen, cottonwood, and alder have been reported to be preferred foods; however, highly preferred species may vary in different geographic regions.

Allen (1983) assumed that a tree and/or shrub canopy closure between 40 and 60% is an indication of optimum food availability. Tree or shrub crown closure exceeding 60% are less suitable due to the decreased accessibility of food. Extremely dense stands result in decreased mobility and the increased likelihood of cut trees hanging up in adjacent trees.

Although beavers forage at distances up to 200 m (656 feet) from water, the majority of foraging occurs within 100 m (328 feet) of the water's edge. Even though woody vegetation may be within the optimum density and size classes, potential food sources farther than 100 m (328 feet) from water will be of less value than woody vegetation within 100 m (328 feet). Woody vegetation in excess of 200 m (656 feet) from water is thought to have no value as a potential food source.

3.2.1.2.3 Mink

Mink are classified as furbearers in Oregon and are culturally significant to the BPT. ODFW has established trapping seasons for harvesting this species. Mink are present at the project site, but population data is unavailable for this species. Similar to beaver, mink are best suited to permanent water conditions and sensitive to water fluctuations and changes in availability of prey species adjacent to and within rivers, streams, lakes, and wetlands.

Although not totally restricted to wetland/riparian habitats, mink are dependent upon aquatic food sources for a significant portion of the year. Terrestrial prey plays an important role in the mink's diet during late fall and winter. The majority of mink activity occurs adjacent to water, which requires sufficient cover to protect mink as well as provide suitable habitat for prey species. Dense woody vegetation within 100 m (328 feet) of permanent water provides mink with potential den sites, foraging cover, and escape cover. Persistent herbaceous cover may also provide mink with sufficient cover for foraging and shelter.

3.2.1.3 Deciduous Forest Species Assemblage

Deciduous forest comprises less than 10 acres of habitat on the Project. Black-capped chickadee habitat variables were used to evaluate habitat conditions and guide future management actions within this habitat type.

3.2.1.3.1 Black-capped Chickadee

Black-capped chickadees are protected throughout their range and are insectivorous. Insect food is gleaned from tree bark on twigs, branches, and boles; or from the foliage, fruits, and flowers of trees. Insect and spider eggs make up a large portion of the winter diet and, although the use of plant material for food is low during much of the year, seeds of trees and shrubs may account for about half of the winter diet.

The majority of the year-round food supply of the black-capped chickadee is associated with trees. Food is provided by either 1) tree canopy closure and the average height of overstory trees; or 2) canopy volume of trees per area of ground surface. Optimum canopy closures occur between 50% and 75%. A completely closed canopy will have less than optimum value due to

an assumed lack of foliage in the middle and lower canopy layers. Schroeder (1983) assumed that optimum habitats contain overstory trees 15 m (49.2 feet) or more in height. Habitats with a low canopy closure can provide moderate suitability for black-capped chickadees if tree heights are optimum. Habitats with short trees may have moderate suitability if canopy closures are optimum.

Black-capped chickadees nest primarily in small dead or hollow trees and can only excavate a cavity in soft or rotten wood. Therefore, reproduction suitability is related to the abundance of small snags. Schroeder (1983) stated that snags between 10 and 25 cm (4 and 10 inches) dbh are required. Assuming a territory size of 2.4 ha (6.0 acres) and a need for one cavity per year per chickadee pair, the method of Thomas et al. (1979) estimates that optimum habitats provide 5.9 snags/ha (2.4/acre) are needed per ha (1.67/acre) to provide optimum conditions. Because of its sensitivity to changes in suitable snag density, tree height, and canopy closure, black-capped chickadees habitat attributes and population responses are good indicators of deciduous forest habitat quality.

3.2.1.4 Meadow Grasslands Species Assemblage

Meadow grasslands produce hay for livestock and will likely continue to do so with some modification to herbaceous species as fields are rehabilitated. Meadows will be evaluated based on how well they contribute towards forage for mule deer, elk, and antelope and habitat for western meadowlark, sage grouse, mink, waterfowl, and other wildlife species.

3.2.1.5 Wildlife Species Assemblage Habitat Management Recommendations

Desired future habitat conditions are compared with existing habitat conditions in Tables 20-22 for the Malheur River, South Creek Trail, and Hunter Creek parcels, respectively. Management recommendations are included within the tables. Separating management actions and needs by unit is a planning tool that allows managers flexibility in scheduling and implementing treatments based on available funding, weather and temporal constraints, and management priority.

Management recommendations and current conditions for the Malheur River Unit encompass shrubsteppe, riparian shrub/riverine, deciduous forest, and meadow grassland habitat types (Table 20). The South Creek Trail Unit is predominately shrubsteppe habitat. Therefore, management recommendations are described only for shrubsteppe habitat (Table 21). Habitat management recommendations for the Hunter Creek parcel include only shrubsteppe and riparian shrub habitat types (Table 22). Current habitat/vegetation conditions for all units were documented in conjunction with HEP surveys conducted in 2001 and 2002.

Table 20. Wildlife species assemblage habitat management recommendations for the Malheur River/Black Canyon Unit.

Species	Habitat Type	Desired Future Conditions Habitat Attribute (Management Objective)	Current Conditions Malheur River – Black Canyon Unit	Management Task(s) - Comments
Sage grouse (Danvir 2002)	Shrubsteppe	Sagebrush cover 10-35%	Mean sagebrush cover: ≈ 16% (≈ 13% big sage, 3% low sage) range: min-1%, max-33%	None required
		Sagebrush height 40 to 60 cm	Mean ≈ 47 cm, range: min-32 cm, max – 88cm	None required
		Forbs cover 10 to 20%	Total herbaceous cover ≈ 63% (≈ 20% native vegetation)	Increase native forbs and bunchgrasses
		Grass cover 10 to 40%		
		open ground cover > 10%	unknown	Determine percent bare ground and amount of cryptogamic crust
		Non-native herbaceous cover < 10% (excluding alfalfa, dandelion, burnet, etc.)	43% non-native vegetation	Reduce non-native vegetation
Mule deer (Ashley 2001)	Shrubsteppe	>20% canopy cover of preferred shrubs < 1.5 meters in height.	Mean ≈ 16% Sagebrush cover (≈ 13% big sage, 3% low sage) range: min-1%, max-33%	Increase mean palatable shrub cover ≈ 5%
		Number of preferred shrub species ≥ 3	2 preferred shrub species	Increase palatable shrub component by ≥ 1 species
		Palatable herbaceous forage ≥ 15% cover	Estimated 50% (includes exotic spp.)	None required
		Presence of suitable agricultural crops e.g., winter wheat, standing grain, alfalfa etc., within 1.6 km of winter range	Alfalfa within 3.2 km	Increase and disperse alfalfa plantings
		< 1 km of open road per km^2 of habitat	< 1 km of open road (winter period)	Maintain restricted access during winter
Western Meadowlark (Modified Schroeder et al. 1982)	Shrubsteppe	Percent herbaceous cover > 50%	Total herbaceous cover ≈ 63% (≈ 20% native vegetation)	

Species	Habitat Type	Desired Future Conditions Habitat Attribute (Management Objective)	Current Conditions Malheur River – Black Canyon Unit	Management Task(s) - Comments
Western Meadowlark	Shrubsteppe	≥ 80% of herbaceous cover comprised of grass	86% of herbaceous cover comprised of grass	Although current conditions meet model variable requirements, there is a need to increase native perennial bunchgrass component
		Height of herbaceous cover ≥ 14 cm (5 inches)	< 2.5 cm (1 inch)	Increase height of herbaceous cover to ≥ 13 cm (5 inches); note: see comment above.
		Percent shrub cover < 30%	Total shrub cover ≈ 20%	None required
		Distance to perch site < 50 meters (150 feet)	Mean distance to perch site ≈ 1.2 m (4 feet)	None required
Yellow warbler (Schroeder 1982)	Riparian shrub/riverine habitat	Shrub canopy closure > 60%	Mean shrub canopy closure is 31% (min – 0%, max ≈ 50% canopy closure)	Increase shrub closure to meet 60% minimum and plant shrubs where absent
	(Malheur River)	Mean shrub height > 1 m tall	Mean shrub height is 1.5 m	Shrubs should attain optimum height through passive restoration (also note previous comment)
		> 60% of deciduous shrubs comprised of hydrophytic shrubs	74% of deciduous shrubs comprised of hydrophytic shrub species	No action required on existing shrubs; however, new shrub plantings should include riparian obligate species where practical (willow spp. are currently colonizing new areas through passive restoration)
Mink (Allen 1984)	Riparian shrub/riverine habitat	Water present more than nine months/year	The Malheur River is a perennial stream	None required
	(Malheur River)	% shrub and tree cover within 100 m of water's edge > 60%	Riparian shrub and tree width rarely exceeds 30 m throughout the project site, or is limited by topoedaphic features	Increase shrub and tree corridor width to ≥ 30 m along both sides of Malheur River where practical through passive and active restoration; control noxious weeds
Beaver (Allen 1983)	Riparian shrub/riverine habitat	40-60% tree/shrub canopy closure	Mean shrub canopy closure is 31% (min – 0%, max ≈ 50% canopy closure); Hardwood trees are absent	Increase shrub component to a minimum of 40% cover and increase tree component to 45% to 60% cover

Species	Habitat Type	Desired Future Conditions Habitat Attribute (Management Objective)	Current Conditions Malheur River – Black Canyon Unit	Management Task(s) - Comments
	(Malheur River)	trees < 6" dbh; shrub height ≥ 6.6 ft.	Trace amount along the Malheur River	Encourage/plant deciduous hardwood trees (willow, cottonwood, alder etc.); note: previous comment
		stream channel gradient ≤ 6% with little to no fluctuation	Stream gradient is 1% to 1.5%; water levels fluctuate based on irrigation needs	May not be possible to alter river water fluctuations
		woody vegetation within 100 m from water	Riparian shrub and tree width rarely exceeds 30 m throughout the project site, or is limited by topoedaphic features	Increase shrub and tree corridor width to ≥ 30 m along both sides of Malheur River where practical through passive and active restoration; control noxious weeds
Yellow warbler (Schroeder 1982)	Riparian shrub (Upland sites)	Shrub canopy closure > 60%	Mean shrub closure ≈ 23%; minimum = 13%, maximum = 38%	Increase shrub canopy closure to ≥ 60%
	(Shrubsteppe)	Mean shrub height > 1 m tall	Mean shrub height ≈ 2 m (≈ 7 feet); range = 1 m (3.3 feet) to 4 m (13 feet)	None required
		> 60% of deciduous shrubs comprised of hydrophytic shrubs	≈ 50% of deciduous shrubs comprised of hydrophytic shrubs; range = 0.07% to 100%	Increase percent of deciduous shrub component to > 60% hydrophytic shrubs at all sites; note: may be limited by livestock encroachment and/or topoedphic features
B. C. Chickadee (Schroeder 1983)	Deciduous Forest	Optimum tree canopy cover: 50% to 75%	Tree canopy cover ≈ 72%	None required based on model variable output; however, habitat type is lacking shrub understory - cottonwood regeneration is occurring on the site
		Optimum tree height ≥15 m (49 feet)	Mean height ≈ 15.2 m (50 feet)	None required; meets minimum height requirements – tree height may be limited by topoedaphic features
		> 2 snags 10 cm to 25 cm dbh per 0.4 ha (1 acre) is optimum	No (0) snags were detected	Increase snag density to > 0.4 ha (1 per acre) through passive restoration
Western Meadowlark (Modified Schroeder et	Meadow grasslands	Percent herbaceous cover > 50%	Percent herbaceous cover = 92%	None required based on model variable; note: field rehab should include native perennial grasses

Species	Habitat Type	Desired Future Conditions	Current Conditions	Management Task(s) - Comments
		Habitat Attribute (Management Objective)	Malheur River – Black Canyon Unit	
al. 1982)				
		≥ 80% of herbaceous cover comprised of grass	≈ 79% of herbaceous cover comprised of grass; fields also support sedge communities	Increase perennial bunchgrass component by ≥ 1% (some areas may be too wet to support meadowlark nesting)
		Height of herbaceous cover ≥ 14 cm (5 inches)	Height of herbaceous cover ≈ 29 cm (11.5 inches)	None required
		Percent shrub cover < 30%	Percent shrub cover = 0%	None required
		Distance to perch site < 50 meters (150 feet)	Distance to perch site ≈ 34 m (≈ 113 feet)	None required

Table 21. Wildlife species assemblage habitat management recommendations for the South Trail Creek Unit.

Species	Habitat Type	Desired Future Conditions Habitat Attribute (Management Objective)	Current Conditions South Trail Creek Unit	Management Task(s) - Comments
Sage grouse (Danvir 2002)	Shrubsteppe	Sagebrush cover 10-35%	Mean sagebrush cover ≈ 17% (big sagebrush ≈ 14%, low sagebrush ≈ 3%); range: 2% to 34%	None required
		Sagebrush height 40 to 60 cm (1.25 to 2 feet)	Mean height ≈ 40 cm (1.25 feet); range: 23 cm (0.77 feet) to 58 cm (1.9 feet)	None required
		Forbs cover 10 to 20%	Mean herbaceous cover ≈ 69% with half (35% of total herbaceous cover) comprised of cheatgrass	Yes, increase native forbs and bunchgrasses; reduce cheatgrass
		Grass cover 10 to 40%		
		open ground cover > 10%	unknown	Yes, determine percent bare ground and amount of cryptogamic crust
		Non-native herbaceous cover < 10% (excluding alfalfa, dandelion, burnet, etc.)	Non-native herbaceous cover (cheatgrass) = 35%	Yes, reduce non-native vegetation
Mule deer (Ashley 2001)	Shrubsteppe	>20% canopy cover of preferred shrubs < 1.5 meters (5 feet) in height.	Preferred shrub cover ≈ 18%	Yes, increase mean palatable shrub cover (bitterbrush) ≈ 10% (bitterbrush comprises 0.17% of current shrub cover)
		Number of preferred shrub species ≥ 3	Number of preferred shrub species = 2 (bitterbrush and rigid sage do not meet 10% test criteria)[12]	Yes, increase palatable shrub component by ≥ 1 species
		Palatable herbaceous forage ≥ 15% cover	Palatable herbaceous forage ≈ 60% (includes cheatgrass)	None required
		Presence of suitable agricultural crops e.g., winter wheat, standing grain, alfalfa etc., within 1.6 km (1 mile) of winter range	Nearest suitable agricultural crops ≥ 3.2 km (2 miles)	None required. Not practical nor cost effective within this Unit

[12] Shrub species must comprise at least 10% of the total shrub cover, i.e. 2.2% at this unit, for inclusion in this category. Bitterbrush and rigid sage are both 0.17% of the total shrub cover.

Species	Habitat Type	Desired Future Conditions Habitat Attribute (Management Objective)	Current Conditions South Trail Creek Unit	Management Task(s) - Comments
		< 1 km of open road per km^2 of habitat	No open public road during winter periods	None required - maintain restricted access during winter
Western Meadowlark (Modified Schroeder et al. 1982)	Shrubsteppe	Percent herbaceous cover > 50%	Percent herbaceous cover ≈ 69%	Reduce cheatgrass to ≤ 20% and increase native perennial bunchgrasses by ≥ 10% (current conditions meet model variable requirements)
		≥ 80% of herbaceous cover comprised of grass	88% of herbaceous cover is comprised of grass	Although current conditions meet model variable requirements, there is a need to increase native perennial bunchgrass component
		Height of herbaceous cover ≥ 14 cm (5 inches)	Mean height of herbaceous vegetation is ≈ 7 cm (0.23 feet)	Increase height of herbaceous cover to ≥ 13 cm (5 inches); note: see comment above.
		Percent shrub cover < 30%	Mean shrub cover is ≈ 22%	None required
		Distance to perch site < 50 meters (150 feet)	Mean distance to perch site ≈ 1.2 m (4 feet)	None required

Table 22. Wildlife species assemblage habitat management recommendations for the Hunter Creek Unit.

Species	Habitat Type	Desired Future Conditions Habitat Attribute (Management Objective)	Current Conditions Hunter Creek Unit	Management Task(s) - Comments
Sage grouse (Danvir 2002)	Shrubsteppe	Sagebrush cover 10-35%	Mean sagebrush cover ≈ 12%; range: <1% to ≈ 26%	Increase mean percent cover of big sagebrush by ≥ 5% (recommend passive restoration/grazing management)
		Sagebrush height 40 to 60 cm (1.25 to 2 feet)	Mean height ≈ 35 cm (1.15 feet)	Increase mean height of sagebrush ≥ 5cm (2 inches) through passive restoration/livestock management
		Forbs cover 10 to 20%	Mean herbaceous cover ≈ 48% (≈ 7% cheatgrass)	None required
		Grass cover 10 to 40%		
		open ground cover > 10%	unknown	Determine percent bare ground and amount of cryptogamic crust
		Non-native herbaceous cover < 10% (excluding alfalfa, dandelion, burnet, etc.)	Non-native herbaceous cover (cheatgrass) is ≈ 7%	None required
Mule deer (Ashley 2001)	Shrubsteppe	>20% canopy cover of preferred shrubs < 1.5 meters (5 feet) in height.	Preferred shrub cover ≈ 12%	Increase mean palatable shrub cover (bitterbrush) ≥ 5% (bitterbrush comprises 0.5% of current shrub cover); may be limited by topoedaphic features
		Number of preferred shrub species ≥ 3	Number of preferred shrub species = 2 (bitterbrush does not exceed 10% test)	Increase palatable shrub component by ≥ 1 species
		Palatable herbaceous forage ≥ 15% cover	Palatable herbaceous forage ≈ 48% cover	None required
		Presence of suitable agricultural crops e.g., winter wheat, standing grain, alfalfa etc., within 1.6 km (1 mile) of winter range	Nearest suitable agricultural crops ≥ 4.8 km (3 miles)	Not practical nor cost effective within this Unit
		< 1 km of open road per km^2 of habitat	No open public road during winter periods	Maintain restricted access during winter
Western Meadowlark (Modified Schroeder et	Shrubsteppe	Percent herbaceous cover > 50%	Percent herbaceous cover ≈ 48%	Increase native perennial bunchgrasses by ≥ 5% through passive restoration and livestock grazing management (may be limited at the landscape scale by

Species	Habitat Type	Desired Future Conditions Habitat Attribute (Management Objective)	Current Conditions Hunter Creek Unit	Management Task(s) - Comments
al. 1982)				topoedaphic features)
		≥ 80% of herbaceous cover comprised of grass	85% of herbaceous cover is comprised of grass	None required
		Height of herbaceous cover ≥ 14 cm (5 inches)	Mean height of herbaceous vegetation is ≈	Increase height of herbaceous cover to ≥ 13 cm (5 inches); note: see comment above.
		Percent shrub cover < 30%	Mean shrub cover is ≈ 16%	None required
		Distance to perch site < 50 meters (150 feet)	Mean distance to perch site ≈ 1.4 m (4.7 feet)	None required
Yellow warbler (Schroeder 1982)	Riparian shrub/riverine habitat	Shrub canopy closure > 60%	Shrub canopy closure ≈ 1% (ocular estimate due to deep, unstable creek channel incising)	Increase shrub component to ≥ 60% cover where possible within incised stream channel through active restoration
	(Hunter Creek)	Mean shrub height > 1 m tall	Not available	See previous comment
		> 60% of deciduous shrubs comprised of hydrophytic shrubs	< 1% (ocular estimate)	Ensure that ≥ 60% of deciduous shrub cover is comprised of hydrophytic species through active restoration
Beaver (Allen 1983)	Riparian shrub/riverine habitat	40-60% tree/shrub canopy closure	Tree canopy closure <1% ; shrub closure ≈ 1% (ocular estimate)	Plant hardwood tree species (cottonwood, willow, aspen, box elder etc) in incised stream channel where possible
	(Malheur River)	trees < 6” dbh; shrub height ≥ 6.6 ft.	unknown	See previous comment
		stream channel gradient ≤ 6% with little to no fluctuation		None required
		woody vegetation within 100 m from water	Predominantly sagebrush; no hardwood trees or deciduous/hydrophytic shrub species present on or beyond green-line	Increase hardwood tree and deciduous/hydrophytic shrub cover (this is currently impractical because of incised stream channel and low water table)

3.3 Fisheries Resources

General riparian condition trends near the Project are either static or improving (BLM ROD 2003) (Figure 6). Fish distribution on and near the Project is illustrated in Figure 38.

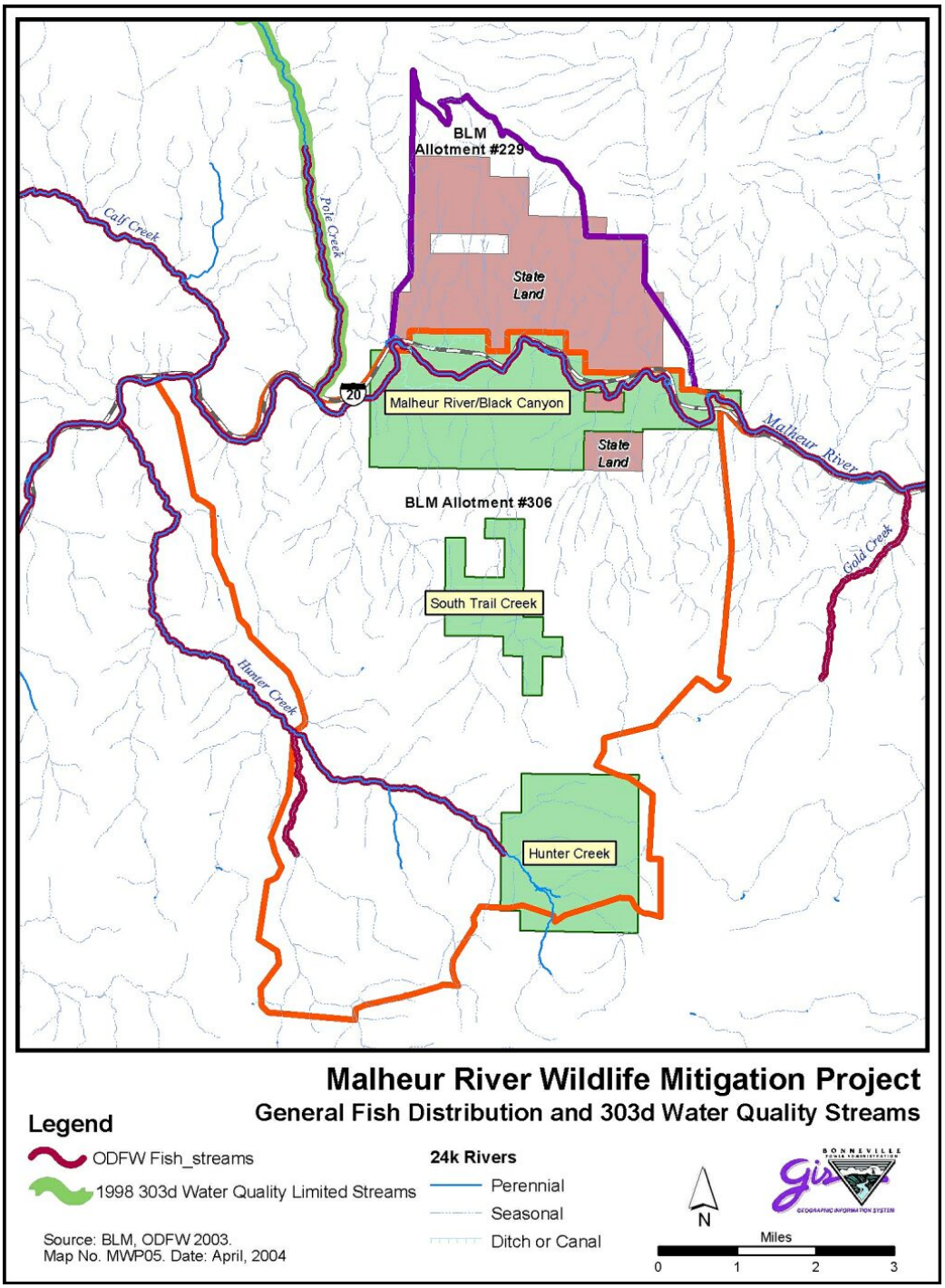

Figure 38. Fish distribution and stream water quality near the Malheur Wildlife Mitigation Project.

3.3.1 Fish Surveys

Nine presence/absence surveys (Figure 39) conducted with a raft electro-fisher in August 2002 confirmed that bridge-lip sucker (*Catostomus columbianus*) and coarse-scale sucker (*Catostomus occidentalis*) are the dominant fish species inhabiting the Malheur River at the project site; collectively representing approximately 53% of total fish detected, while the relative abundance of northern pike minnow (*Ptychocheilus oregonensis*) was less than 5% . In May 2003, presence/absence surveys conducted with a drift boat electro-shocker determined the relative abundance of bridge-lip and coarse-scale sucker was less than 33% and the relative abundance of northern pike minnow was approximately 22%. The variation in relative abundance is likely the result of different sampling methods conducted in 2002 and 2003. Survey results for 2002 and 2003 are summarized in Table 23 and Table 24, respectively.

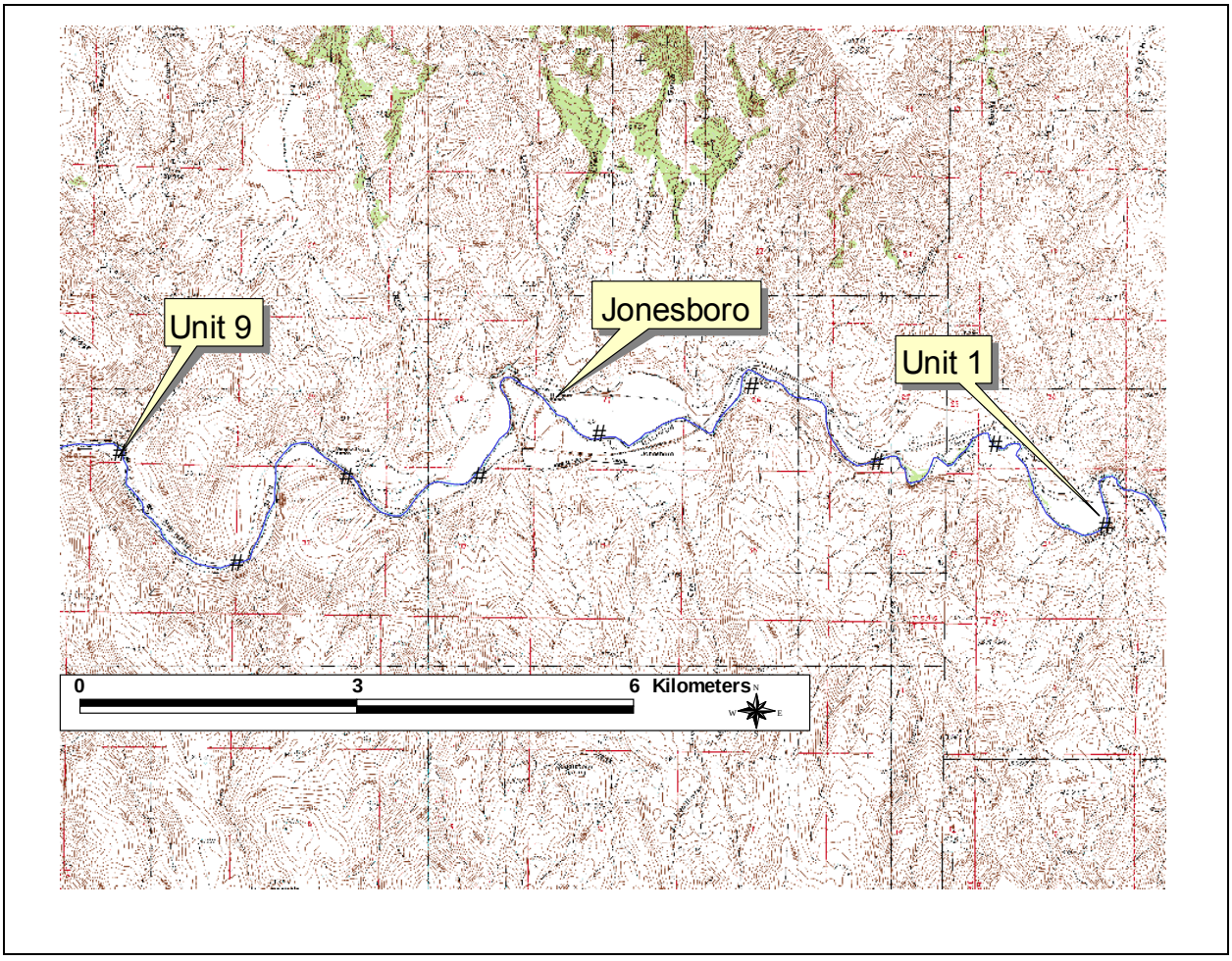

Figure 39. Locations of presence/absence surveys.

Table 23. Fish species survey results on the Malheur River within Project boundaries, 2002.

Unit	Bridge Lip Sucker	Coarse Scale Sucker	Northern Pike Minnow	Red Side Shiner	Speckled Dace	Long Nose Dace	White Crappie	Chisel Mouth Chub	Rainbow Trout
1	18	29	3	12	18	2	0	5	1
2	34	7	1	6	4	0	0	5	1
3	27	15	1	22	1	2	0	0	3
4	78	16	10	43	12	0	1	27	7
5	79	21	2	2	6	3	0	8	1
6	7	27	12	8	19	0	0	7	0
7	4	20	8	5	31	8	1	2	0
8	55	2	1	5	36	7	0	1	0
9	18	30	3	33	19	7	0	4	2
Total	**320**	**167**	**41**	**136**	**146**	**29**	**2**	**59**	**15**

Table 24. Number and species of fish detected on the Project, 2003.

Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Total
Bridgelip Sucker	5	2	6	3	4	6	9	**35**
Channel Catfish	0	0	0	0	0	1	0	**1**
Chiselmouth Chub	2	1	4	5	5	5	8	**30**
Coarsescale Sucker	6	2	3	5	8	6	9	**39**
Northern Pike Minnow	7	2	11	10	2	3	13	**48**
Redside Shiner	0	4	8	1	3	0	7	**17**
Speckled Dace	3	1	11	13	6	5	5	**44**
Long Nose Dace	1	2	0	0	3	0	6	**13**
Total	**24**	**14**	**43**	**37**	**31**	**26**	**57**	**227**

Detection of fish species varied between the 2002 and 2003 surveys. Species collected in 2002 and not in 2003 include white crappie (*Pomoxis annularis*) and rainbow trout (*Oncorhynchus mykiss*). Similarly, channel catfish (*Ictalurus punctatus*) were present in 2003, but not in 2002. Survey locations for both 2002 and 2003 are included in Appendix B.

Fish species that can tolerate higher water temperatures and utilize less complex instream habitats currently dominate this portion of the river. Although bull trout historically utilized the entire North Fork Malheur and Malheur Rivers as over-wintering habitat, past and current creel data collected below Agency Valley Dam, project presence/absence surveys, and extant habitat conditions all suggest that it is unlikely that bull trout currently occupy the river below the dam. Furthermore, bull trout have not been surveyed since 2000 and were not detected in the two years that presence/absence surveys were conducted. Additional fish survey information is included in Appendix B.

3.3.2 Fish Species Assemblages/Habitat Attributes

Historically, redband trout (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), and anadromous salmonids inhabited the Malheur River within the Project; however, with the construction of the Columbia, Snake River, and Malheur River dams, anadromous salmonids no longer have access to the Malheur River. Moreover, Beulah Reservoir and Warm Springs Reservoir, located upstream from the Project, have no fish passage facilities, blocking both upstream and downstream migration of resident fish species (Figure 40).

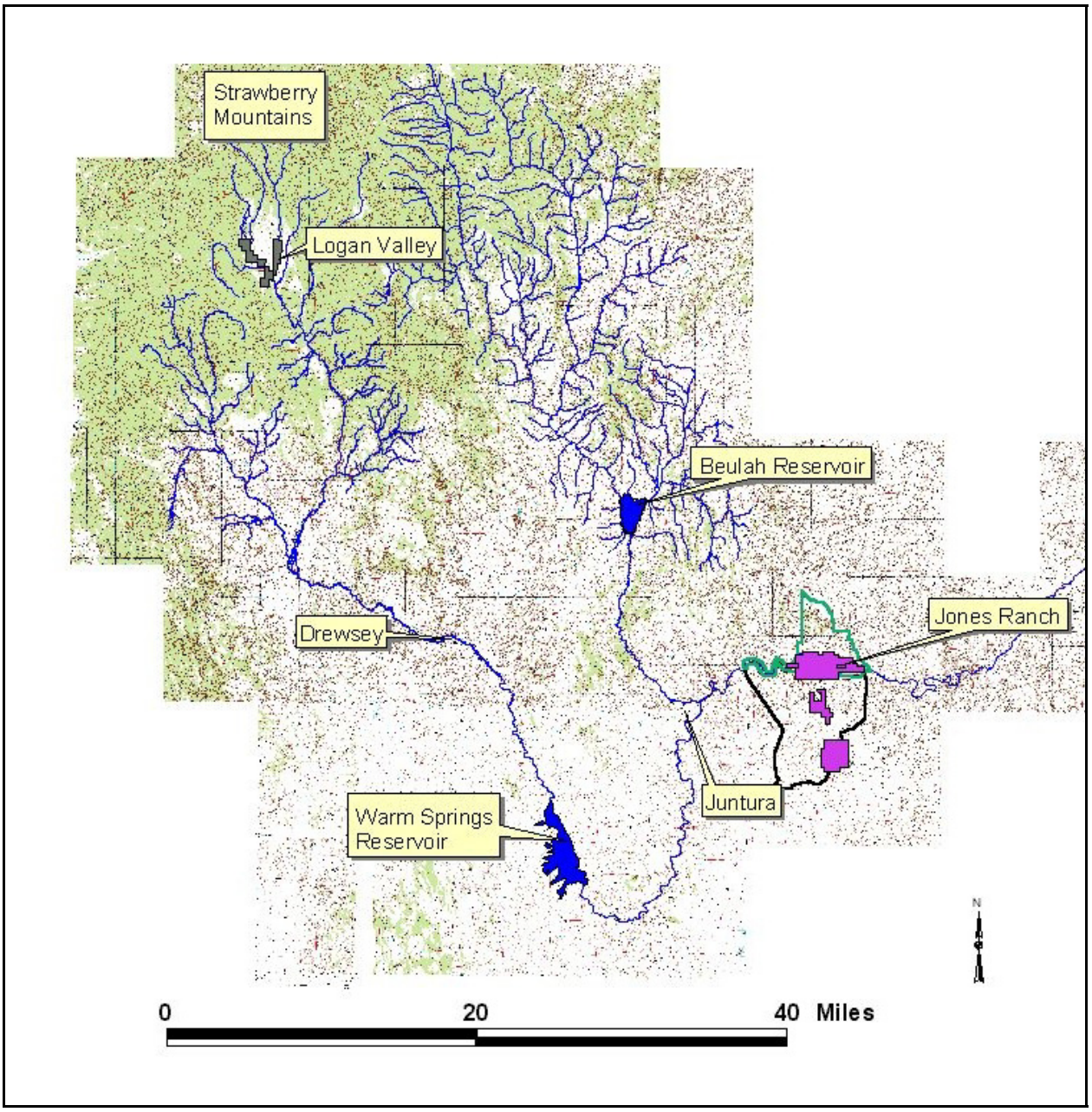

Figure 40. Reservoirs on the Malheur River near the project site.

In 1999 and 2000, Schwabe (2000) documented bull trout entrainment over the spillway at Agency Valley Dam, and in 2001 and 2002, bull trout were absent below the dam. This is likely the result of changing to flow valves to release water in 2000 rather than releasing water over the spillway (J. Fenton, BPT, pers comm., 2002). Bull trout are also limited on the Project by water temperatures that can exceed 73º F (23º C) in August. Nevertheless, the Malheur River upstream of Narmorf Dam, which includes the Malheur River within the Project, has been identified as core habitat needed to fully recover bull trout populations in the subbasin (USFWS 2002).

Riverine/aquatic species assemblage life history information is summarized below. Desired future habitat conditions and enhancement measures are described in Table 25. Current riverine/aquatic habitat conditions are largely unknown and constitute a data gap. Addressing this data gap is a high management priority and need.

3.3.2.1 Redband Trout

Redband trout are the most prevalent indigenous salmonid in the Malheur River subbasin. The ODFW confirms this species occurs in 76 streams within the subbasin (Hanson et al. 1990).

Redband trout require high levels of habitat complexity. Good trout stream habitat is complex, consisting of an array of riffles and pools, submerged wood, boulders, undercut banks, and aquatic vegetation" (NRCS 2000). Trout need cover for protection from predators. Deep pools, vegetation, or submerged wood are a few examples of suitable cover for redband trout.

Redband trout prefer cool temperatures and clean, clear water and require different habitat during different seasons of the year. During the summer, water temperatures in the Malheur River increase significantly. Though trout prefer temperatures between 4.5º – 21º C (40º-70º F), redband can tolerate temperatures of 27º C (80º F) if streams are capable of cooling in the evening (Hanson et al. 1990). Redband trout seek deep pools for thermal refugia during both hot summer months and in the fall/winter when ambient air temperatures fall below freezing. Deep pools that have extensive amounts of cover provide suitable over-wintering habitat for redband trout (Muhlfeld and Bennett 2000a).

3.3.2.2 Bull Trout

Bull trout life history stages are closely associated with complex riverine structures including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjounn 1989; Sedell and Everest 1991; Pratt 1992; Thomas 1992; Rich 1996; Sexauer and James 1997; Watson and Hillman 1997).

Bull trout prefer cold streams. Water temperatures exceeding 15º C (59º F) limit bull trout distribution (Fraley and Shepard 1989; Rieman and McIntyre 1995). Goetz (1989) suggested optimum water temperatures for rearing bull trout are 7º C (45º F) or 8º C (46º F) and 2º C (36º F) to 4º C (39º F) for egg incubation. Individual bull trout, however, have been detected in larger, warmer river systems throughout the Columbia River basin (Fraley and Shepard 1989; Rieman and McIntyre 1993; Rieman and McIntyre 1995; Buchanan et al. 1997). Locally, bull trout were collected from the Malheur River in stream temperatures exceeding 23º C (73º F) (Schwabe et al. 2003).

Table 25. Fish species assemblage habitat management recommendations.

Species	Habitat Type	Desired Future Conditions Habitat Attribute (Management Objective)	Current Conditions	Management Required - Comments
Redband Trout	Riverine	Cold water: 4.5° – 21° C (40°-70° F)	Unknown	Unknown
		High levels of shade, undercut banks, pools, and woody debris in streams; high levels of gravel in riffles and low levels of fine sediments; stable, complex stream channels; and connectivity among and between drainages.	Unknown	Unknown
Bull Trout	Riverine	Cold water: 2° C (36° F) to 8° C (46° F)	Unknown	Unknown
(Source: Montana Bull Trout Restoration Team)		High levels of shade, undercut banks, pools, and woody debris in streams; high levels of gravel in riffles and low levels of fine sediments; stable, complex stream channels; and connectivity among and between drainages.	Unknown	Unknown

4.0 Objectives and Tasks

This plan provides guidance for restoration and protection measures from fiscal year 2005 through 2010. Funding and budgets, however, are subject to and limited by three-year subbasin "rolling review" cycles, budget allocations, subbasin priorities, and availability of alternative funding sources and cooperative efforts. As a result, the completion of the tasks outlined in this plan is directly linked to subbasin planning budgets/priorities and availability of alternative funding sources and partnerships.

Objectives and tasks are identified by habitat type for each unit and are based on focal species habitat attributes described in Tables 20-22 and Table 25. Passive restoration and protection measures will be employed whenever feasible. Annual funding allocations, stochastic weather events, topoedaphic features, seed/plant resource availability, and unforeseen access limitations may limit implementation of planned enhancement and protection activities in any given year. Furthermore, all planned activities are subject to modification through adaptive management based on monitoring and evaluation results.

Habitat restoration and protection measures are described and, where possible, delineated for each unit in the following sections. Specific sites are identified, while further site reconnaissance may be necessary prior to implementation of a number of planned enhancements and protection measures.

4.1 Malheur River Unit

The Malheur River/Black Canyon Unit is the most complex landscape within the Project. Restoration and protection activities are associated with wet meadow grasslands, riparian/riverine, and shrubsteppe habitat types owned by the BPT, or leased from the DSL. Livestock grazing regimens, designed to minimize negative impacts to wildlife and improve range conditions, will be applied on all upland sites.

4.1.1 Wet Meadow Grassland Enhancements

Habitat enhancement and protection measures include the following primary activities:

1. Reseeding wet meadow grasslands
2. Repair/replacement of water delivery system components
3. Wetland enhancements
4. Fence removal/reconstruction
5. Weed control

4.1.1.1 Reseedings

Wet meadow grassland reseedings fall into two general categories: grass and alfalfa. Grass seedings include planting native and introduced herbaceous species that provide wildlife nesting and forage habitat and hay for livestock. Similarly, 93 acres of existing grasslands will be converted to alfalfa over the next five years to provide mule deer and elk forage and sage grouse nesting/brood rearing habitat.

Alfalfa fields are located on the south side of the Malheur River to reduce potential vehicle/wildlife conflicts. Tribal wildlife managers and ODFW staff will monitor vehicle/deer-elk collision rates on State Route 20 within five miles (8 km) of the Project over the next five years to determine if field enhancements are an attractive nuisance. A minimum of one additional five-mile (8 km) route along State Route 20 will be monitored as a replicate survey. A covariate analysis should be conducted on at least the following variables:

1. Number of collisions
2. Snow cover/depth
3. Temperature
4. Adjacent habitat type(s)

Fields on the west end of the Malheur River Unit not scheduled for reseeding may be reseeded if recent rehabilitation efforts fail to produce desired results. In addition, two fields are set aside for BPT members to engage in “community plantings” (CP1, CP2) of culturally significant vegetation. Specific field locations and tentative reseeding schedules are depicted in Figures 41 through 43.

Figure 41. Wet meadow grassland field locations on the west end of the Malheur River Unit.

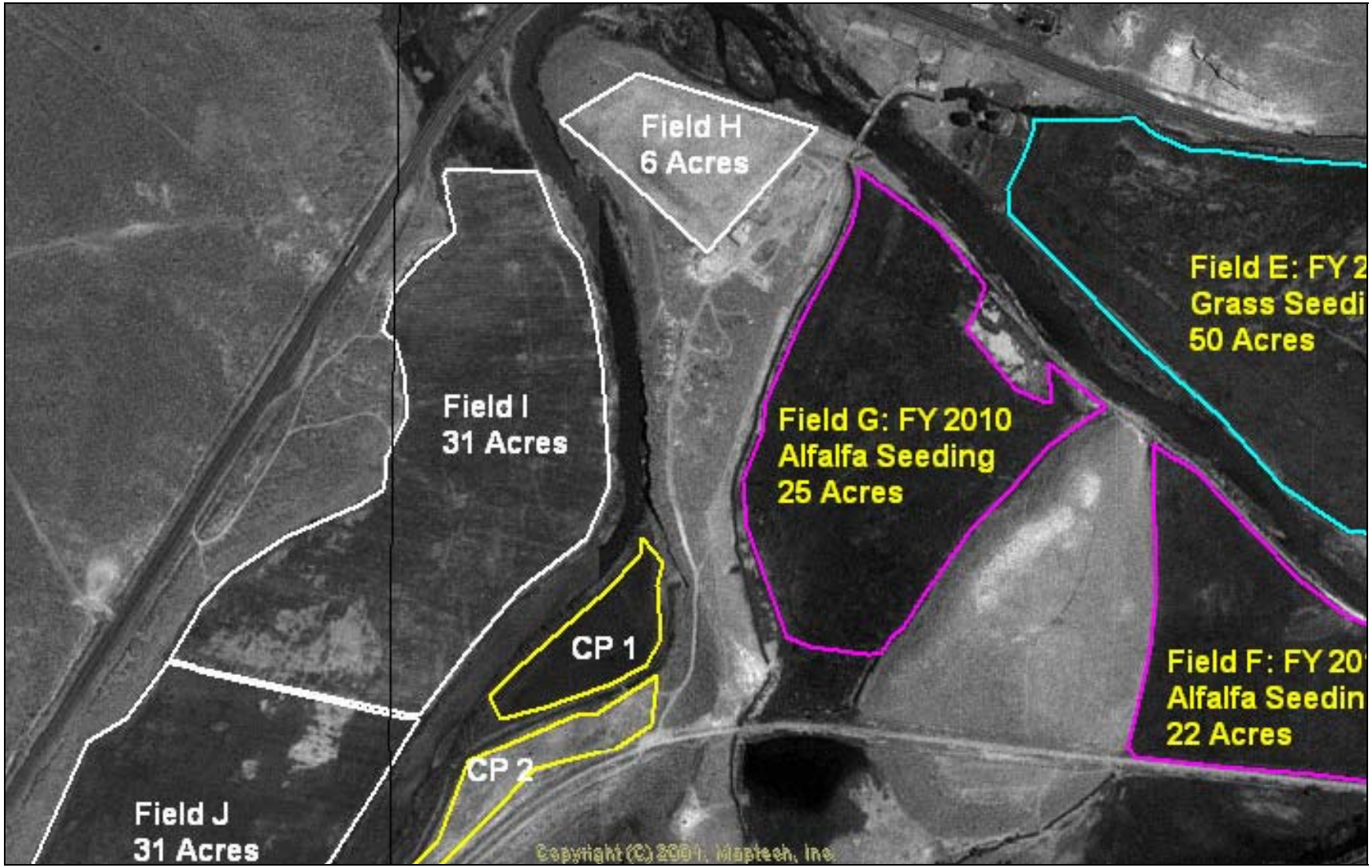

Figure 42. Wet meadow grassland field locations-mid section of the Malheur River Unit.

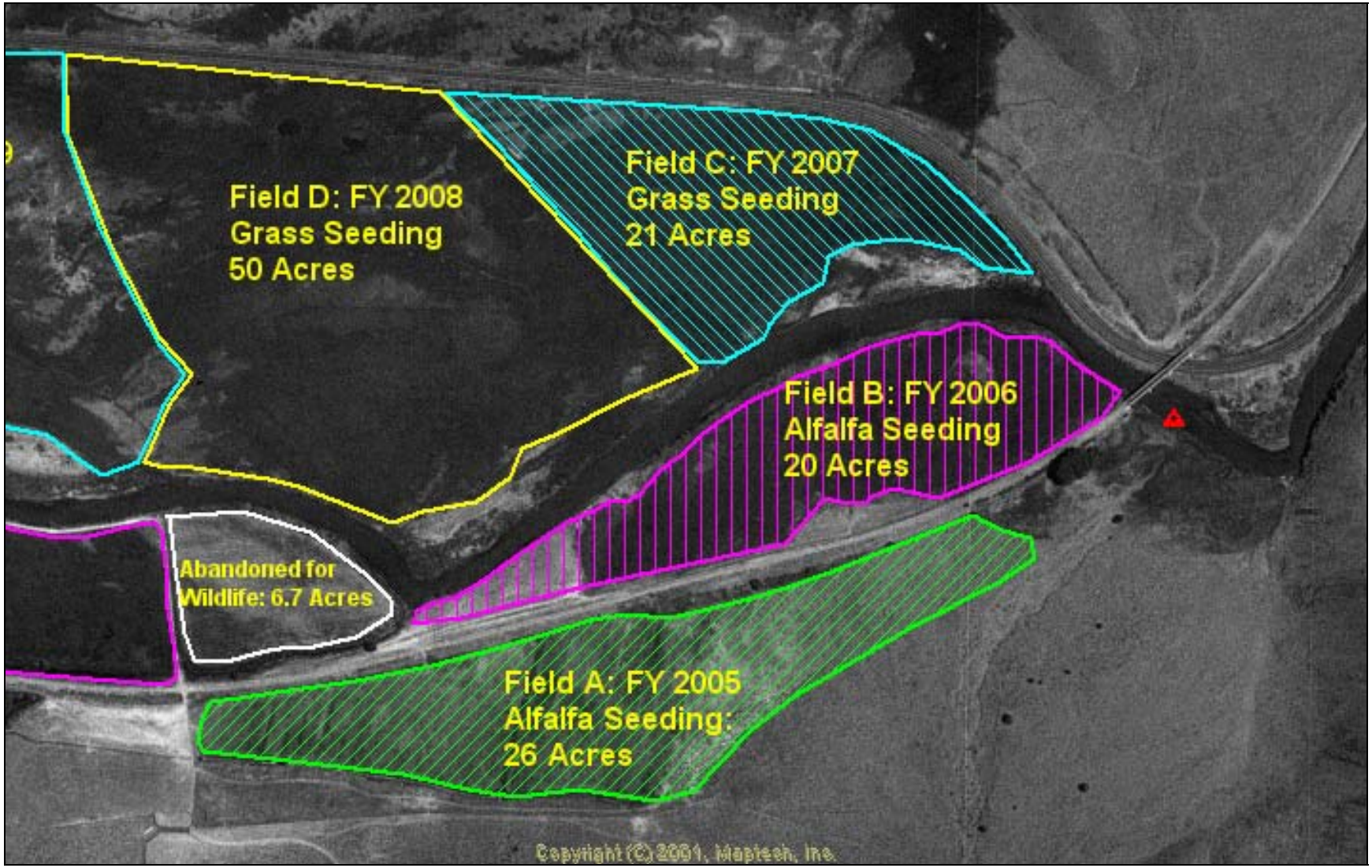

Figure 43. Wet meadow grassland field locations on the east end of the middle section of the Malheur River Unit.

4.1.1.2 Water Delivery System Repair

Wet meadow grasslands are irrigated through a network of ditches and pumps. The location of irrigation ditches are summarized in Figure 44 and further depicted, from west to east, in Figures 45 through 47 Three pumps are required to move water as elevation changes throughout the floodplain. Pumps need extensive repair and/or replacement. Likewise, approximately 3,000 feet (1 km) of irrigation ditch needs repair in order to supply water to Fields A and B (Figure 43) and to maintain water levels in wetlands. *The BPT must continue to irrigate in order to maintain water rights purchased with project lands.*

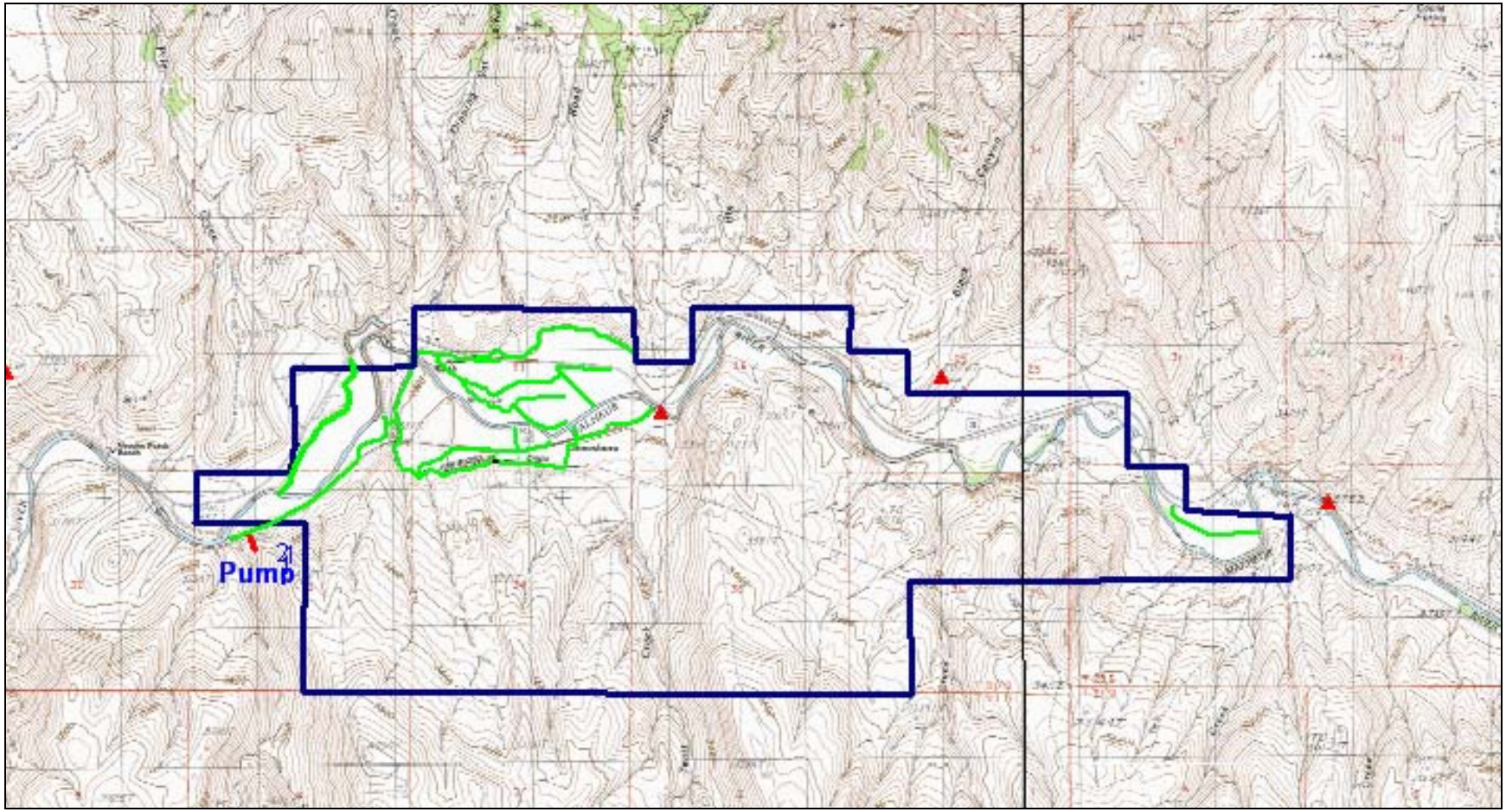

Figure 44. General location of irrigation ditches on the Malheur River Unit.

Figure 45. Location of pump and irrigation ditches on west end of Malheur River Unit.

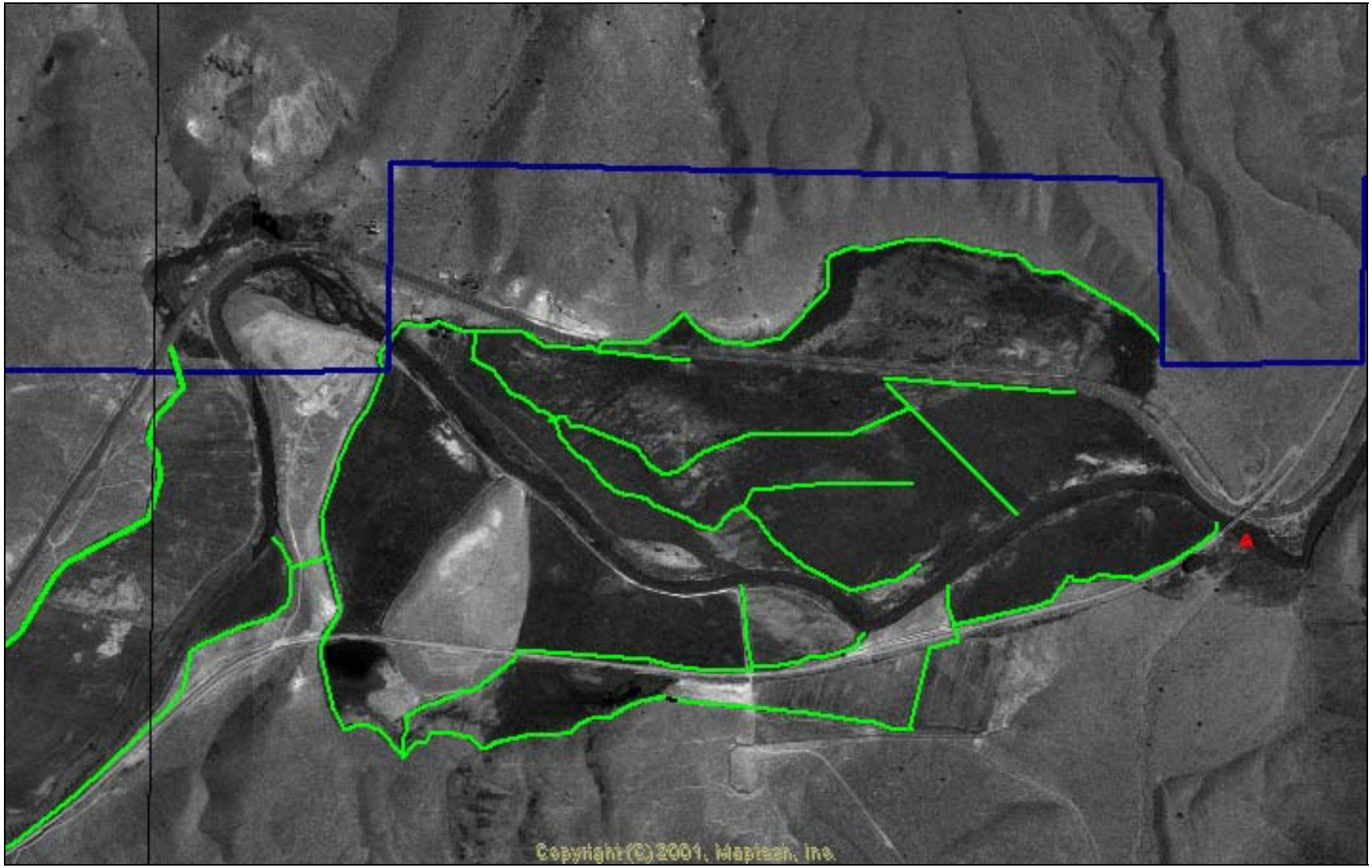

Figure 46. Location of irrigation ditches in middle section of the Malheur River Unit.

Figure 47. Location of irrigation ditch on east end of the Malheur Unit.

4.1.1.3 Wetland Enhancements

Wetland enhancements are comprised of maintaining water levels in wetlands A and B (Figure 48) from March through October each year by routing field irrigation water through the wetlands. Repair and/or modification of existing irrigation ditches are required to accomplish this task.

Although this enhancement will do little to replace floodplain function/riverine habitats, the wetlands will provide waterfowl/shorebird nesting and brood rearing habitat and habitat for a host of other birds, mammals, and amphibians.

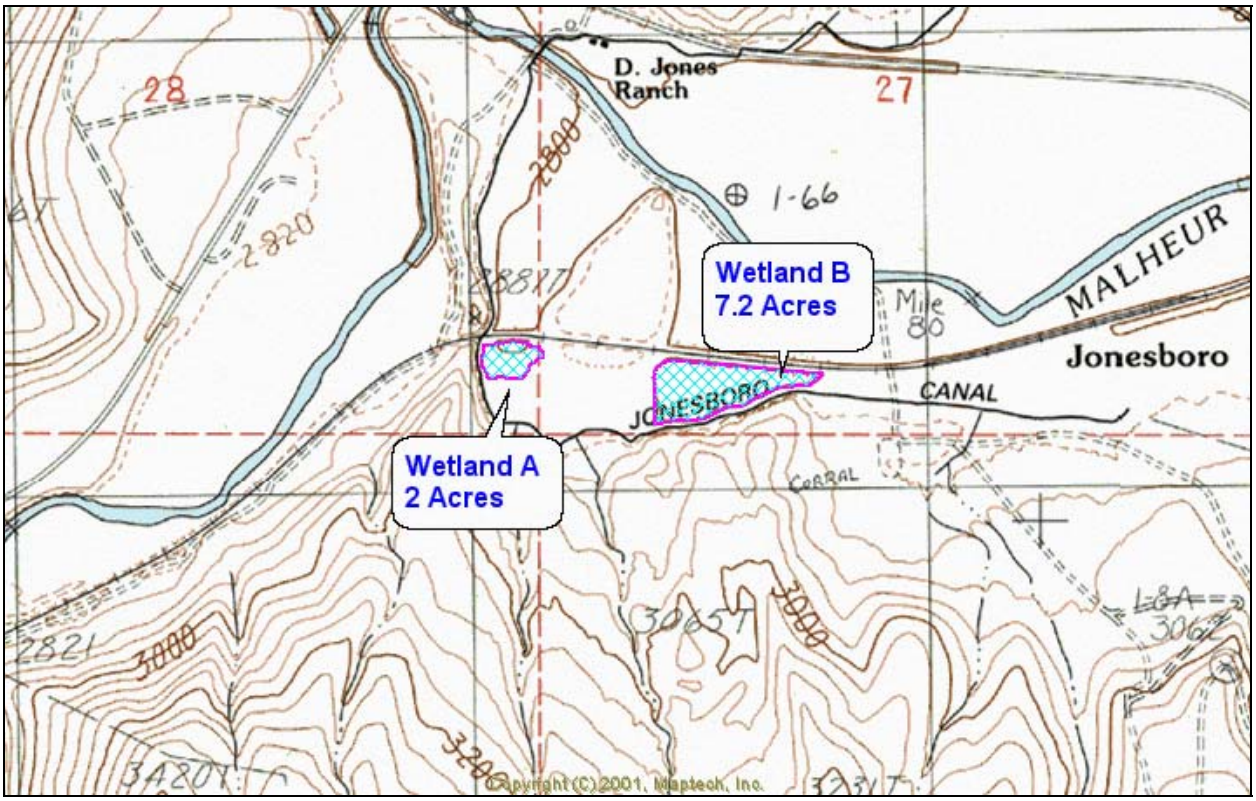

Figure 48. Wetland enhancement locations.

4.1.1.4 Fence Removal and Reconstruction

Approximately 2,300 feet of fence, which impedes deer and elk use of a grassland area, will be removed while an additional 1.5 miles of fence will be rebuilt or modified to accommodate passage of wild ungulates and exclude livestock (Figure 49). Fence construction and modifications will follow BLM fence construction guidelines for wildlife. All other boundary and grazing unit fences must be maintained on an annual basis.

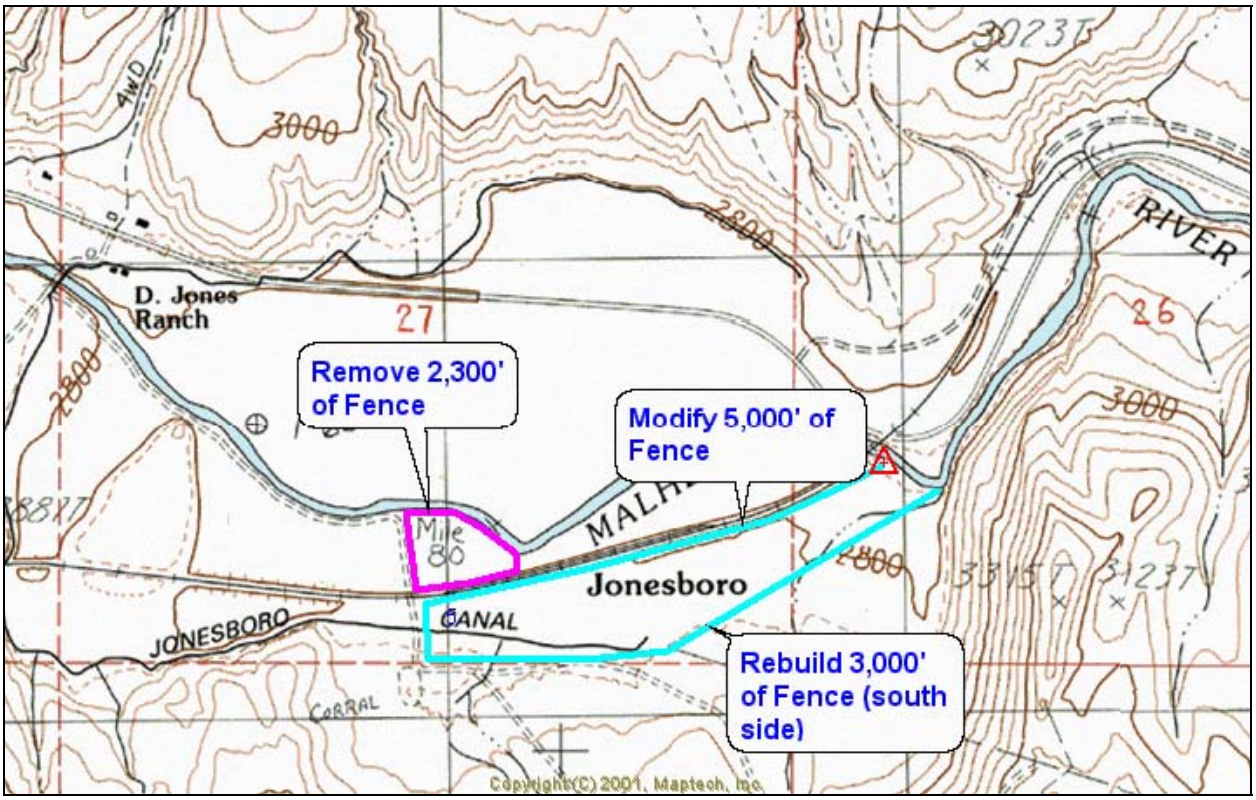

Figure 49. Fence removal and modification locations.

4.1.1.5 Weed Control

Weeds will be controlled in wet meadow grasslands as necessary through chemical, mechanical, and biological means. Herbicides will be applied in accordance with label instructions, and federal, state, and county regulations. Mechanical methods consist of mowing, hand pulling, burning, and moist soils management while biological controls may include competitive seedings and insect releases.

4.1.2 Riparian/Riverine Enhancements

Riparian/riverine restoration/protection measures fall within two general categories: riparian shrub/tree enhancements (terrestrial) and instream improvements (aquatic). Riparian shrub/tree enhancements consist primarily of planting trees and shrubs (active restoration) and passive measures such as protecting self-generating stands of willows. In contrast, in-stream restoration efforts focus largely on modifying stream structure and complexity through boulder and root wad placements and similar activities. Terrestrial protection/restoration efforts compliment aquatic enhancement activities to improve habitat effectiveness for fish species and aquatic invertebrates by reducing sedimentation and in-stream temperatures.

4.1.2.1 Riparian Shrub/Tree Enhancements

The primary goal is to reestablish riparian woody vegetation along the Malheur River corridor wherever topoedaphic conditions permit. This entails planting shrubs and trees in areas currently devoid of riparian woody vegetation as well as increasing structural diversity of extant

shrub-scrub willow stands through establishment of cottonwood trees and other hardwood species.

Passive restoration of shrubs and trees can reduce restoration costs and labor inputs significantly. Willow species, in particular, have invaded a number of areas adjacent to the Malheur River since the BPT acquired the property and will likely continue to flourish if protected from livestock encroachment. As a result, project managers will initially plant trees only within extant riparian shrub patches while monitoring natural shrub regeneration along the river.

As described in Table 22, the objective is to establish a minimum 100 feet (30 m) wide woody riparian buffer, which is approximately 24 acres (10 ha) per linear river mile, along the entire length of the Malheur River (may require reducing the amount of acreage currently in hay production in some areas). Planting preparation and/or maintenance activities will vary by site and include all or part of the following tasks and considerations:

1. Site identification/layout
2. Soil testing (including depth)
3. Weed control (pre and post planting)
4. Removal of existing (pre-planting) and/or competitive vegetation (post planting)
5. Tree and shrub selection and planting protocols:
    a. Trees: cottonwood, willow, box elder, water birch, etc
    b. Shrubs: willow, dogwood, alder, elderberry, rose, currant, serviceberry, hawthorn, chokecherry, etc (plant phreatophytes and hydrophytes where possible)
    c. Purchase trees and shrubs grown from local seed/stock
    d. Intersperse trees in “clumps” within willow stands and other extant shrubs (≥15 trees per “clump” at 200-foot (65 m) intervals
    e. Plant 1,000 shrubs/trees per acre (0.4 ha), or 24,000 stems per linear mile (approximately 6.5 feet [2 m] average spacing)
    f. Irrigate, if needed, until established
    g. Protect shrubs and trees with “rodent guards” and/or temporary fencing (beaver and deer/elk depredation) and suppress competitive vegetation with plastic mulch

Tree and shrub enhancement activities and timelines are described in Table 26 by river mile (RM) (Figure 50 and Figure 51). Timelines and restoration activities may be modified as circumstances warrant. Shrub enhancements are not planned between RM 80 and RM 83 due to passive restoration of shrubs, restricted equipment access, and/or limiting topoedaphic features.

Table 26. Tree and shrub restoration activities and schedule.

Activity	Year/River Mile (RM)					
	2005	2006	2007	2008	2009	2010
Inter-plant Trees	All Areas		*Continue as Required*			
Site Preparation		RM 78-80	RM 83-84	RM 84-85	RM 85-86	
Plant Trees and Shrubs			RM 78-79	RM 83-84	RM 84-85	RM 85-86

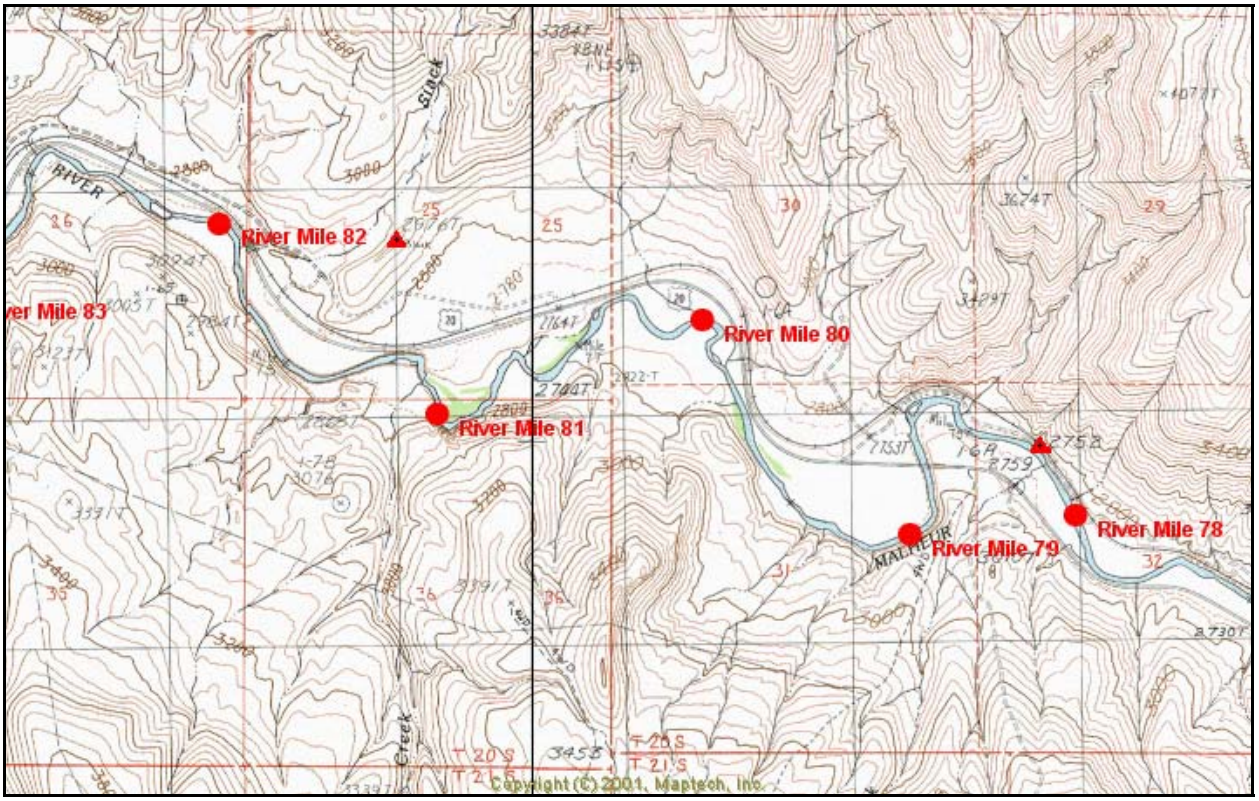

Figure 50. River mile designations on the east side of the Malheur River Unit.

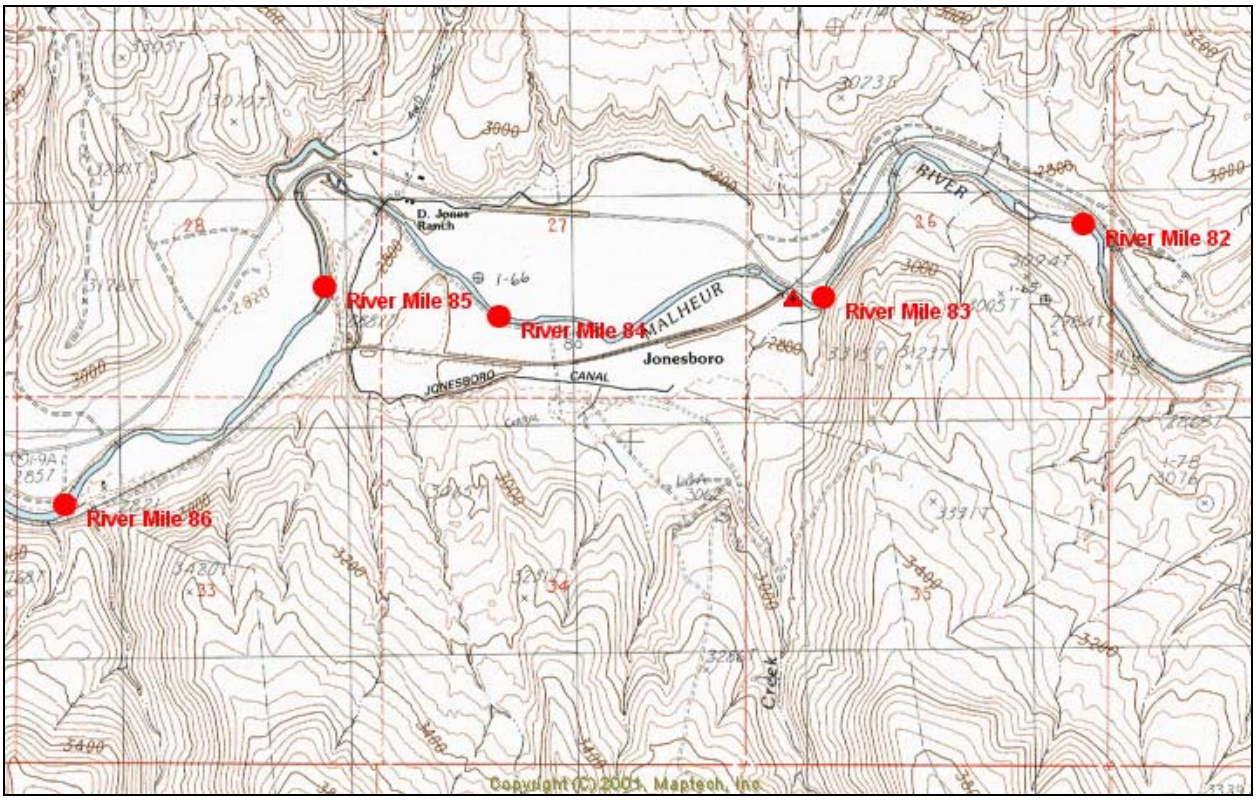

Figure 51. River mile designations on the west side of the Malheur River Unit.

4.1.2.2 Instream Enhancements

As described in numerous studies, salmonids benefit significantly from complex in-stream structure, reduced water temperatures, low turbidity, and a normal functioning hydrograph. Tribal fisheries biologists propose that these same factors, or lack thereof, affect Malheur River salmonid populations both within and beyond project boundaries.

Although fisheries staff have conducted presence/absence fish surveys through electro-shocking and creel checks, time and funding constraints have prevented biologists from achieving in-stream habitat surveys needed to identify, map, and prioritize specific aquatic habitat improvement actions. As a result, comprehensive in-stream habitat surveys are the highest priority and will be initiated in fiscal year 2005 to determine:

1. Type of protection/restoration measure needed and implementation priorities
2. Site specific locations and implementation timelines
3. Protection/restoration funding, equipment, materials, and labor needs
4. Research, monitoring, and evaluation needs (RM&E)

Implementation of instream planning and enhancement activities is summarized in Table 27. The summary table is a planning tool that provides only general guidance while recognizing that specific activities and sites have not been identified. Implementation timelines and locations are subject to change through adaptive management.

Table 27. In-stream habitat planning/implementation schedule.

Activity	Year/River Mile (RM)					
	2005	2006	2007	2008	2009	2010
Conduct Surveys	All Areas	*Continue as Required*				
Plan/Prioritize Actions	All Areas		*Continue as Required*			
Implement Strategies and Activities	N/A	N/A	RM 79-81	RM 82-84	RM 85-87	RM 88-89

4.1.3 Shrubsteppe/Upland Enhancements

Shrubsteppe/upland enhancements encompass restoration and protection measures on shrub dominated, juniper, and upland riparian cover types. Shrubland enhancement measures include planting shrubs and native grass plugs, seeding native perennial grasses, and controlling weeds. Past grazing practices have also been modified to improve range conditions for wild ungulates and other wildlife species.

Juniper density will be reduced within upland riparian areas to increase water flow. In addition, springs and associated riparian/*macrophyllus* shrub draws will be protected from livestock through fencing and/or curtailment of livestock grazing in those areas.

All enhancement/protection activities suggested for DSL property and BLM allotments will occur only after consultation/agreement with appropriate DSL/BLM officials. Wildlife managers will seek joint/alternative funding sources and encourage use of cooperative projects to accomplish enhancement tasks whenever possible.

4.1.3.1 Shrub and Grass Plug Plantings

Shrubsteppe habitat will be enhanced by hand-planting bitterbrush seedlings and fescue/bluebunch wheatgrass grass plugs, produced from local seed sources, on suitable sites within the priority areas depicted in Figure 52. Both shrubs and plugs will be planted in the fall, after livestock removal, on areas devoid of native perennial bunchgrasses including sites dominated by medusahead and cheatgrass.

The extent and scope of plantings are dependent upon funding, and availability of suitable sites, plant resources, and labor. Post planting maintenance of plantings may be necessary to ensure plant survival.

4.1.3.2 Grass Seedings

Livestock will be used on a limited, experimental basis to increase native perennial bunchgrass density on property owned by DSL and/or the BPT (Figure 52). To prepare selected sites for seed dispersal, livestock will graze and remove current year growth of introduced annuals and break down residual vegetation. Fescue and/or bluebunch wheatgrass seed will be dispersed manually or through aerial seeding while cattle “hoof action” will aid “seed to ground” contact. If successful, sowing grass seed and planting grass plugs will increase herbaceous cover diversity on many sites currently dominated by annuals.

Pre-seeding bunchgrass /introduced vegetation conditions will be estimated with baseline “nested” frequency/cover surveys (USDA 1997) followed by post seeding annual monitoring of

sites for a minimum of three years. Statistically analyzing pre and post planting frequency and percent cover data will determine if this seeding methodology is a viable option.

4.1.3.3 Weed Control

Weed control will occur as much as practical on upland sites through chemical, mechanical, and biological means. Chemical control includes application of herbicides while mechanical methods consist of mowing, hand pulling, and in some cases fire. Biological controls may include livestock grazing, competitive seedings, and insect releases.

The primary goal of weed control measures on upland sites is to reduce noxious weeds while increasing native plant density, diversity, and interspersion. Realistically, however, the prevalence of cheatgrass and medusahead on many areas in this unit, regardless of cause, has likely resulted in plant communities succeeding towards a new steady state (Sutherland 1974).

Prolonged heavy livestock grazing, altered fire regimens, variable climatic conditions, current CO^2 levels, introduction of exotic plant species, and other perturbations have contributed towards changing the composition and structure of vegetation resulting in new steady states currently dominated by medusahead and cheatgrass. Walker et al. (1981) noted that many plant communities remain in the new steady state long after cessation of livestock grazing and that as woody plants increase, resilience declines while stability of the new steady state increases.

Removal of livestock from plant communities dominated by Eurasian annuals usually does not lead towards the reintroduction of native perennial species and the decline of the introduced species (Billings 1990; Young and Tipton 1990). Hanley (1979) suggests that these relatively new annual plant communities have created their own new equilibrium. Plant communities dominated by cheatgrass (Rickard and Sauer 1982) *and now medusahead* resist the reestablishment of native species. Such is likely the case on areas within the Malheur River Unit currently dominated by introduced annuals.

As a result, weed control measures will focus largely on stopping the spread and proliferation of weeds along roadways, containment of isolated patches of weeds, and reducing weed “seed bank” through modifying grazing regimens. In addition, wildlife managers may implement experimental weed control strategies.

J. Benson (WDFW, pers comm., 2003) has successfully demonstrated in Washington that cheatgrass and medusahead can be reduced on rangelands, with minimal collateral damage to shrubs and other native plants by timing herbicide applications to correspond to the early growth cycle of annuals. In any event, the magnitude of introduced annuals, coupled with steep topography make implementation of large-scale weed control efforts difficult, expensive, and labor intensive within this unit.

4.1.3.4 Juniper Reduction

Juniper trees will be selectively removed from upland spring sites on lands owned by DSL and the BPT to increase water flow (volume and temporal presence) and encourage reestablishment of native deciduous shrubs and trees (concurrence from DSL is required). Initially, only trees within the “wet zone” will be culled with consideration given to wildlife cover/protection needs.

Trees will be removed by cutting, or "girdled" and left standing (wildlife managers intend to implement both methods to determine efficacy). Pre and post removal water flows will be monitored. Juniper removal areas are illustrated on Figure 52.

4.1.3.5 Upland Spring/*Macrophyllus* Draw Protection Measures

Free flowing water and associated riparian habitats within xeric shrubsteppe uplands are used by wildlife species disproportionately to its availability. Project managers propose to limit livestock grazing on DSL lands located north of State Route 20 in order to protect upland spring sites and associated *macrophyllus* shrub draws from livestock encroachment (this reduces fencing needs). Unlike past grazing practices, livestock would be wintered and fed on a pasture located east of the Project headquarters (Figure 52).

If implemented, livestock use constraints on DSL lands north of State Route 20 will take effect in 2006. Livestock grazing on property owned by DSL would only be allowed to accomplish shrubsteppe habitat enhancement objectives.

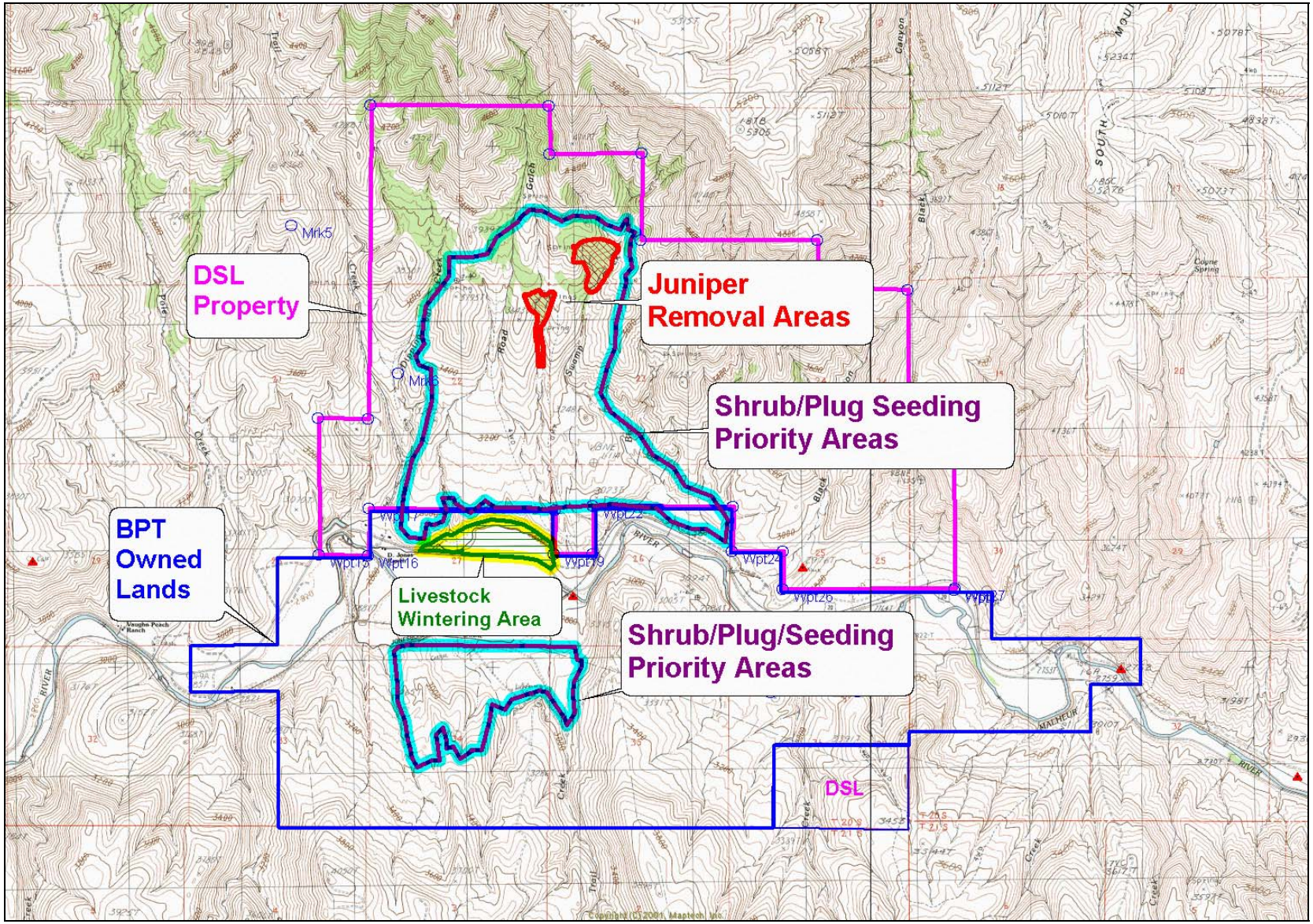

Figure 52. Priority enhancement areas and livestock wintering pasture on the Malheur River Unit.

Selection of planting sites will commence in 2005 and continue as needed. Shrub and plug plantings will occur on DSL property in 2006 (with concurrence from DSL) and on deeded lands in 2008. Experimental grass seedings are scheduled for implementation in 2006 while juniper reduction activities are not time sensitive and can be accomplished as time permits. Weed control is an on-going habitat maintenance activity. Shrubsteppe enhancement activities and timelines are summarized in Table 28.

Table 28. Malheur River Unit shrubsteppe enhancement schedule.

Activity	Year/Area					
	2005	2006	2007	2008	2009	2010
Select Shrub/Plug Sites	All Areas (*Continue as Required*)					
Plant Shrubs and Plugs		DSL Lands		BPT Lands		
Grass Seedings		BPT Lands		DSL Lands		
Juniper Reduction	All Areas (*Continue as Required*)					
Weed Control	All Areas					

4.2 South Trail Creek Unit

Restoration and protection activities on the South Trail Creek Unit focus exclusively on shrubsteppe and upland habitat types. Although springs are present, perennial streams are conspicuously absent. Spring sites will be fenced and alternative water sources developed for livestock.

4.2.1 Shrubsteppe/Upland Enhancements

Shrubsteppe/upland enhancements encompass restoration and protection measures on shrubsteppe habitat. A mix of active and passive restoration/measures is planned for this unit including shrub/grass plug plantings and modification of current grazing practices to minimize impacts on wildlife and improve range conditions. Actively monitoring and herding livestock through and within the unit will also reduce damage to *macrophyllus* shrub draws.

4.2.1.1 Shrub and Grass Plug Plantings

Hand-planting bitterbrush seedlings and fescue/bluebunch wheatgrass grass plugs, produced from local seed sources, will enhance shrubsteppe habitat on suitable sites within the priority areas depicted in Figure 53 (other sites may be selected). Both shrubs and plugs will be planted in the fall after livestock removal.

The extent and scope of plantings are dependent upon funding, and availability of suitable sites, plant resources, and labor. Post planting maintenance of plantings may be necessary to ensure shrub survival.

4.2.1.2 Weed Control

Weed control will occur as much as practical on upland sites through chemical, mechanical, and biological means. Chemical control includes application of herbicides while mechanical methods consist of mowing, hand pulling, and in some cases fire. Biological controls may include livestock grazing, competitive seedings, and insect releases.

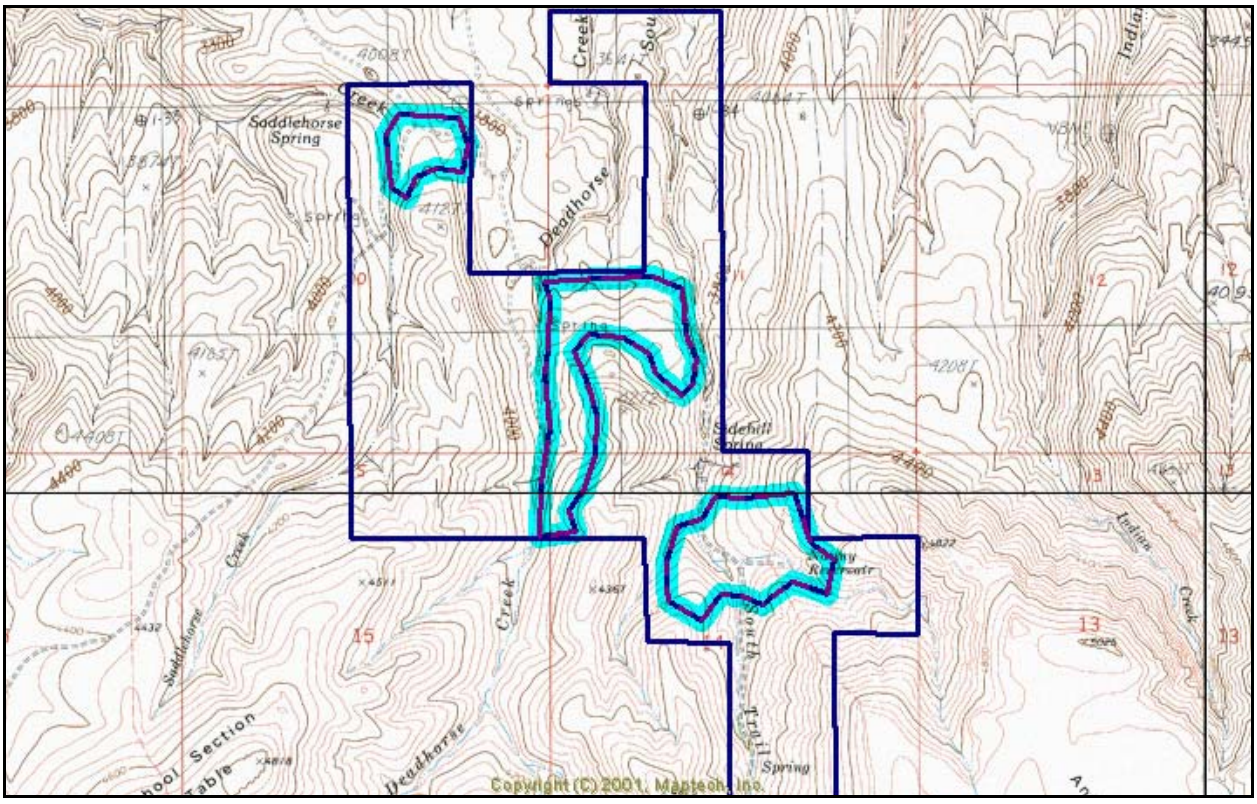

Figure 53. South Trail Creek shrub/grass plug planting priority areas.

Project managers will select planting sites in 2007 and continue as needed. Shrubs and grass plugs will be spot planted on selected sites starting in 2008 and continue through 2010. Weed control measures, especially along roads, are an on-going maintenance requirement. Habitat enhancement activities and implementation schedule are summarized in Table 29.

Table 29. South Trail Creek Unit habitat enhancement timeline.

Activity	Year/Area					
	2005	2006	2007	2008	2009	2010
Select Shrub/Plug Sites			All Areas			
Plant Shrubs and Plugs				All Areas		
Weed Control	All Areas					

4.3 Hunter Creek Unit

Shrubsteppe habitat on the Hunter Creek Unit is currently in good condition with relatively little introduced vegetation. Limited livestock watering facilities and the remoteness of the area have resulted in less overall site disturbance compared to other Units. In contrast, deciduous riparian shrubs and trees along Hunter Creek have largely disappeared. Moreover, the stream channel has incised more than 20 feet deep in some areas, restricting restoration potential. Spring sites are currently unprotected and will be fenced to exclude cattle and to encourage passive restoration of riparian vegetation (water will be piped to troughs for livestock).

4.3.1 Shrubsteppe/Upland Enhancements

Passive restoration measures, comprised of manipulating livestock use, will be employed to maintain shrubsteppe habitat quality and range conditions. No other enhancements are planned for this habitat type at this juncture. Wildlife managers will monitor habitat quality and adjust management actions accordingly (adaptive management).

4.3.1.1 Weed Control

Weed control efforts will focus on road right-of-ways and will occur as needed on upland sites. Chemical, mechanical, and/or biological weed controls methods will be used based on a "best fit" analysis.

4.3.2 Riparian/Riverine Enhancements

Although conspicuously absent, anecdotal evidence suggests that cottonwood trees were historically present along Hunter Creek. Planned riparian/riverine restoration and protection measures consist of planting trees/shrubs and protecting extant riparian vegetation within the Hunter Creek corridor (Figure 54).

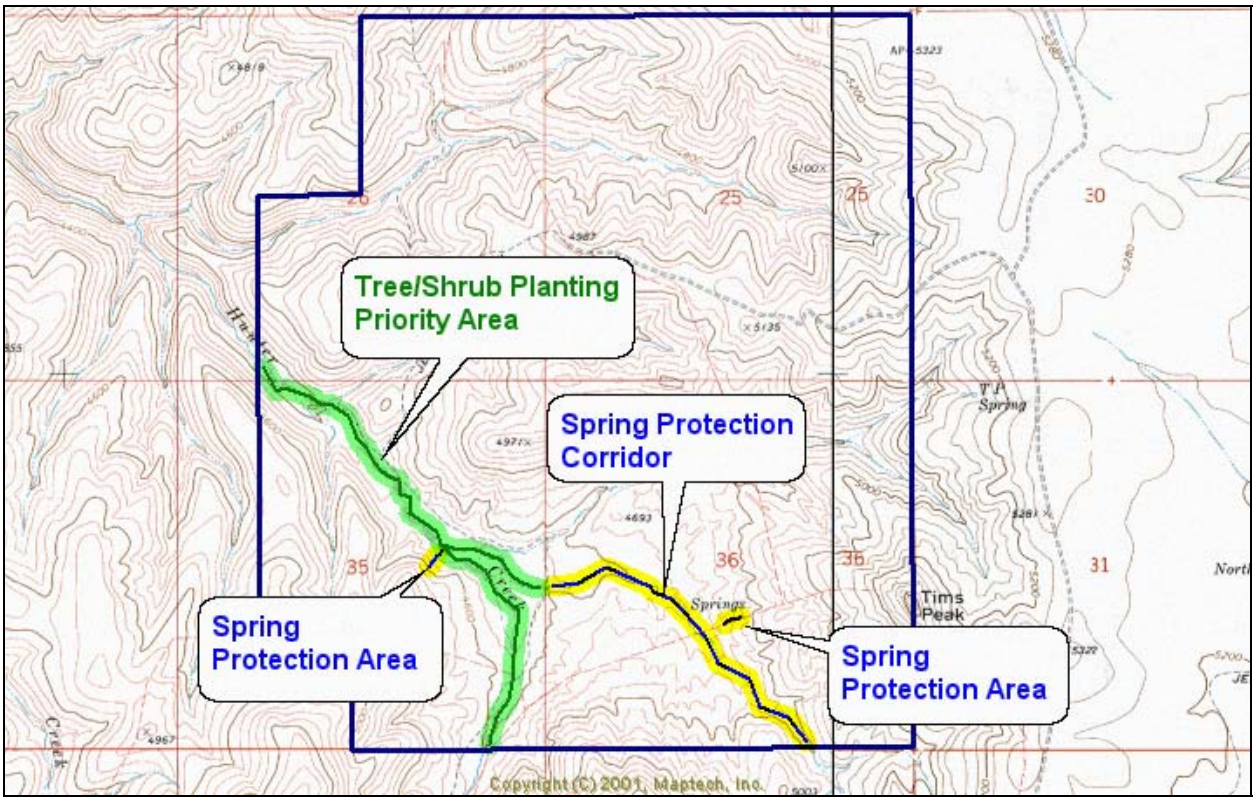

Figure 54. Hunter Creek Unit enhancement/protection areas.

Current information on instream structure and water quality is limited on privately owned reaches of Hunter Creek. Additional stream surveys are needed to fill data gaps, identify specific factors limiting salmonid populations, and to determine what actions are necessary to improve instream habitat and structural conditions.

4.3.2.1 Riparian Shrub/Tree Enhancements

The primary goal is to reestablish riparian woody vegetation along Hunter Creek on lands owned by the BPT. In the future, this initial effort may be expanded to downstream reaches owned by the BLM under a cooperative/partnership agreement.

Cottonwood and other hydrophytic hardwood species will be spot planted on suitable sites within the incised stream channel to increase structural and plant community diversity. Trees and shrubs will be maintained as necessary to ensure survival.

Riparian tree and shrubs will be planted in 2005 and continue through 2006. Replanting will occur on suitable sites as necessary beginning in 2007. Tree and shrub maintenance and weed control are on-going activities (Table 30).

Table 30. Hunter Creek Unit enhancement implementation timelines.

Activity	Year/Area					
	2005	2006	2007	2008	2009	2010
Select Planting Sites	Hunter Creek – *Continue as Needed*					
Plant Trees and Shrubs	Hunter Creek					
Replant Trees and Shrubs			Hunter Creek			
Weed Control	All Areas					

5.0 Livestock Grazing

Grazing information is a product of the International Center for the Advancement of Pastoral Systems (ICAPS) developed specifically for the Malheur River Wildlife Mitigation Project. Michael B. Hale, Erin Melville, Dennis P. Sheehy, Joe McCormack, and Mark Porter are the principle authors. The grazing section is edited in context and to a lesser degree content in order to meet mitigation project objectives.

Along with deeded lands, the Project includes a BLM grazing allotment on an additional 35,000 acres of federal lands (the Vale District BLM office administers the grazing lease). In order for the BPT to retain the grazing permit and management control over these federal lands, the BLM requires the BPT to continue livestock grazing. At present, the stocking rate is 225 animal units per month (AUMs). A private rancher owns the livestock.

Working with cattle can provide learning opportunities for BPT members, and grazing strategies can be used to reduce invasive weeds, improve forage quality and quantity for wild herbivores, and promote restoration of degraded sites. On public rangeland, the absence of livestock grazing on bunchgrass seasonal rangeland reduces the quality of forage available to wild ungulates on limited winter and spring ranges (Anderson and Scherzinger 1975). Livestock grazing has been used to condition native bunchgrasses and introduced wheatgrasses by removing previous year's growth and maximizing availability of new growth for wild herbivores, especially Rocky Mountain elk and mule deer (Vavra and Sheehy 1996).

Native flora and fauna are of significant importance to the BPT. Protecting culturally sensitive sites and providing opportunities for tribal members to gather traditional foods on the Project are prioritized. Biscuitroot, bitterroot, and camas root (*Cammasii quamash*) are present in the plant community and remain traditionally important foods. Hunting deer and elk is a tribal value also. All livestock grazing management must be sensitive to habitat requirements of important plant and animal species.

5.1 Grazing Allotment Descriptions and Pasture Arrangement

Grazing lands are divided into ten BLM upland pastures south of the Malheur River, and one DSL pasture to the north of Highway 20. Upland pastures range in size from 900 to 6000 acres (Table 31).

Table 31. Project pasture condition/trend and combined management objectives.

Pasture	Acres/Owner	Upland Condition	Upland Trend	Combined Objectives (BPT and BLM)
Road Gulch	4,937 BLM, DSL & private	Unknown	Unknown	Improve ecological condition and deer, elk, antelope winter range
Sperry Creek	2,020 BLM	Middle/Native	Down	Improve ecological condition and deer, elk, antelope winter range/sage grouse habitat
Indian Creek	2,715 BLM	Middle/Native	Unknown	Improve ecological condition and deer, elk, antelope winter range/sage grouse habitat
Trail Creek	5,611 BLM	Middle/Native	Static	Improve ecological condition and deer, elk, antelope winter range/sage grouse habitat
Saddle Horse	5,381 BLM	Middle/Native	Up	Improve ecological condition and deer, elk, antelope winter range/sage grouse habitat
East Horse Camp	900 BLM	Early/Native	Static	Improve ecological condition and deer, elk, antelope winter range/sage grouse habitat
West Horse Camp	1,184 BLM	Early/Native	Static	Improve ecological condition of plant communities and manage riparian restoration of Hunter Creek - Improve sage grouse habitat
Antelope Swales	911 BLM	Middle/Native	Static	Improve ecological condition and deer, elk, antelope winter range/sage grouse habitat
Dinner Creek	3,903 BLM	Early/Native	Up	Improve ecological condition of plant communities and sage grouse habitat
Tim's Peak	1,078 BLM	Middle/Native	Unknown	Improve ecological condition and deer, elk, antelope winter range/sage grouse habitat

The land north of the Malheur River is on a south facing aspect consisting of basalt rimrock, steep gradient streams with cottonwood galleries and juniper groves extending from ridge-tops. Annual grasses, rabbitbrush, and sagebrush dominate lower slopes with frequency of native grasses and forbs increasing with elevation. Thurber needlegrass is the dominant native grass with Sandberg bluegrass and bluebunch wheatgrass lesser components of the grass community. Ownership includes 1,174 acres of BLM land, 3,751 acres of DSL land, and 12 privately owned acres. Management objectives for this pasture allotment include maintenance and improvement of deer and elk winter range/fawning grounds and protection and enhancement of springs and associated plant communities.

To the south of the Malheur River, the topography rises along a north-south gradient with ridges bisected by several perennial and ephemeral streams. An east-west ridgeline divides the Hunter and Dinner Creek watersheds. The shrubsteppe plant community supports an understory of bluebunch wheatgrass, needle and thread, Thurber needle grass, Sandberg bluegrass, Idaho fescue, bottlebrush squirreltail, and giant wildrye. Associated forbs species include phlox, lupine, hawksbeard (*Crepis* spp.), biscuitroot, bighead clover (*Trifolium macrocephalum*), bitterroot, penstemon (*Penstemon* spp.), and arrow-leaf balsamroot. Upland riparian vegetation, supported by springs, occurs at the heads of draws and includes aspen, willow, red-osier dogwood, mock orange, choke cherry, and currant. Annual grasses are the dominant understory at the lower elevations adjacent to the Malheur River and rabbitbrush is a component of the shrub layer. Bur buttercup (*Ranunculus testiculatus*) is a pervasive annual weed present throughout the site and common in disturbed areas such as roads and water improvements.

The BLM has primary ownership distributed over ten individual pastures (Figure 55). Principal wildlife management concerns south of the valley floor are for sage grouse breeding/nesting grounds and red-band trout habitat in Dinner and Canyon Creeks. Part of the area has been excluded from cattle grazing (Table 32).

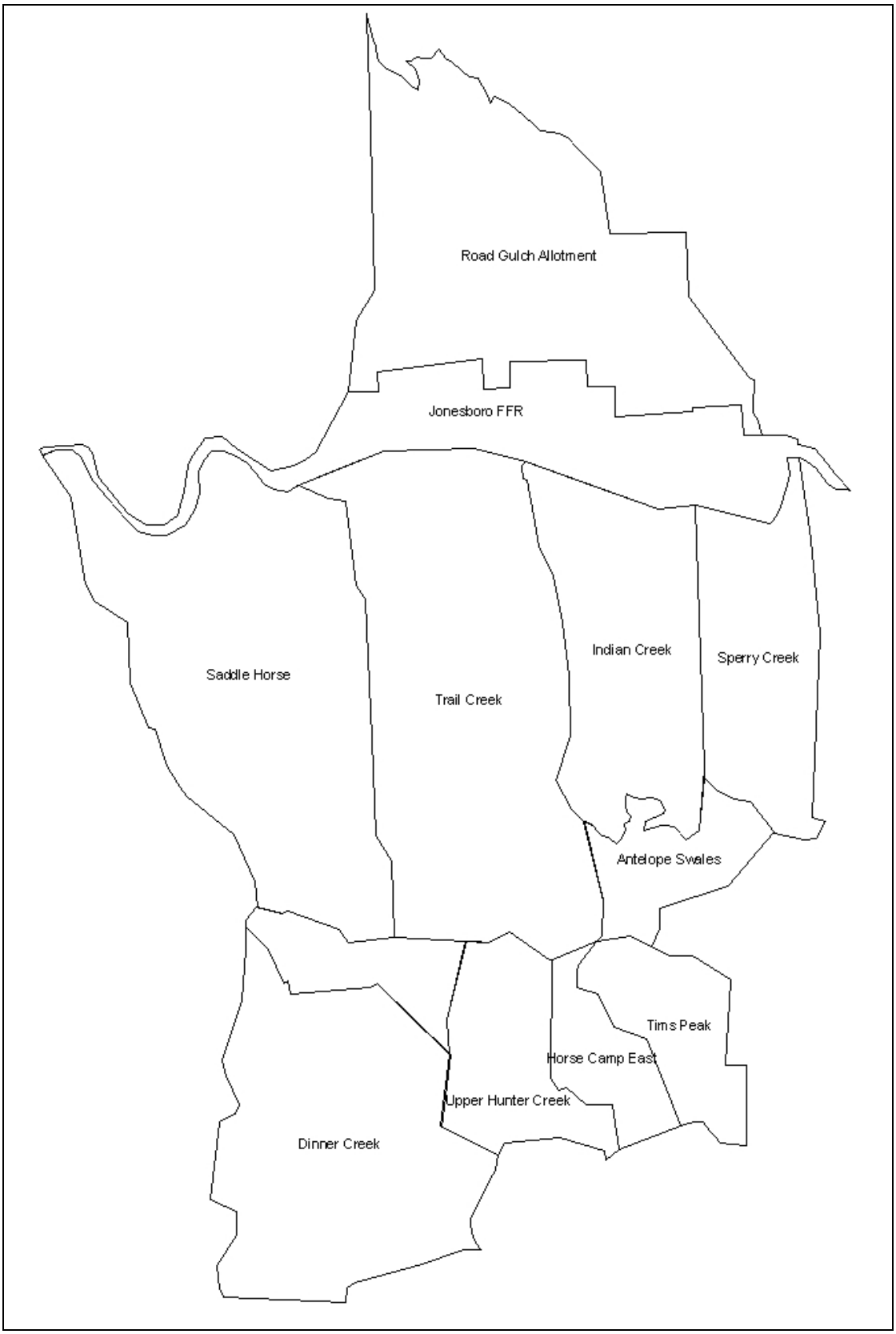

Figure 55. Grazing pasture juxtaposition on the Malheur River Wildlife Mitigation Project.

Table 32. Areas excluded from livestock grazing, condition/trend, and management objectives.

Area	Acreage	Upland Condition	Upland Trend	Objectives
Canyon Creek Stream Exclosure	90	Early/Native	Up	Maintain/improve wildlife habitat/range condition or protect facilities
Canyon Creek Stream Exclosure	3	Early/Native	Up	Maintain/improve wildlife habitat/range condition or protect facilities
Hunter Creek Reservoir Exclosure	760	Early/Native	Up	Maintain/improve wildlife habitat/range condition or protect facilities
Jonesboro FFR	2,595	Middle/Native	Unknown	Private land with custodial management

5.2 Seasonal Rangeland Overview

In the northern Intermountain Region of the Pacific Northwest, several kinds of seasonal rangeland are common. Seasonal rangelands are a complex of vegetation and terrain features providing forage, nutrients, and habitat for herbivores and other wildlife species. Malheur River Wildlife Mitigation Project lies within spring/fall and winter seasonal rangeland. The topography of the Project, with a 3,000-foot elevation gradient, provides opportunities for seasonal migration of livestock through existing pastures with minimal trailing impacts. Although most livestock use seasonal rangelands during similar seasons as large wild herbivores, other factors besides weather influence use including land tenure and capacity to access the proper resources at the proper time (Table 33).

Table 33. Rangeland plant communities, seasonal use range, and habitat value rating for deer, elk, pronghorn, bighorn sheep, and sage grouse.

Plant Community and Key Species	Elevation (ft.)	Seasonal Use Range	Habitat Value and Rating
Tall sagebrush			
Mountain big sage	>3,500	Year long	Good hiding & thermal cover; fair fawning, calving and lambing; good nesting and rearing; fair forage
Wyoming big sage	< 6,500	Winter	Poor hiding & thermal cover; fair forage
Basin big sage	< 7,000	Winter	Good hiding & thermal cover; poor forage
Silver sage	> 4,000	Summer & Winter	Fair to poor hiding & thermal cover; good forage
Short sagebrush			
Low sage	< 9,000	Year long	Poor hiding & thermal cover; good forage; good nesting
Stiff sage	< 7,000	Year long	Poor hiding & thermal cover; fair forage
Black sage	< 9,000	Summer & Winter	Poor hiding & thermal cover; poor forage
Other shrubs			
Bitterbrush	4,000-7,000	Year long	Good hiding & thermal cover; poor forage
Greasewood	< 5,000	Winter	Poor hiding & thermal cover; poor forage

Plant Community and Key Species	Elevation (ft.)	Seasonal Use Range	Habitat Value and Rating
Snowberry	5,000-8,000	Summer, Spring & Fall	Good hiding & thermal cover; good fawning, calving and lambing; good nesting and rearing; good forage
Willow	all elevations	Summer	Good hiding & thermal cover; good fawning, calving, lambing and rearing; good forage
Trees			
Quaking aspen	5,000-9,000	Summer, Spring & Fall	Good hiding & thermal cover; good fawning, calving, lambing and rearing; good forage
Western Juniper	< 6,000	Year long	Good hiding & thermal cover; fair fawning and rearing; fair forage
Cottonwood	2,500-4,000	Summer	Good hiding & thermal cover; good fawning, calving, lambing and rearing; good forage
Special Communities			
Riparian	all (limited)	Year long	Good hiding & thermal cover; good fawning, calving and lambing; good nesting and rearing; good forage
Grassland	all (common)	Year long	Good forage (esp. in fall & spring green-up)
Bluebunch wheatgrass	all (common)	Winter, Spring & Fall	Good forage (esp. after livestock conditioning)
Idaho fescue	all (common)	Winter, Spring & Fall	Good forage (esp. after livestock conditioning)
Cheatgrass	all (common)	Winter, Spring & Fall	Good forage when available
Crested wheatgrass	all (common)	Winter, Spring & Fall	Good forage (esp. after livestock conditioning)
Sandberg bluegrass	all (common)	Winter, Spring & Fall	Good forage when available
Kentucky bluegrass	all (common)	Winter	Good forage
Bottlebrush squirreltail	all (common)	Winter, Spring & Fall	Good forage (esp. after livestock conditioning)

Concurrent with livestock use, Rocky Mountain elk, mule deer, and bighorn sheep graze spring-fall seasonal rangeland in late autumn, winter and early spring, with actual use dependent on weather severity. Forest and mountain steppe is generally grazed by large wild herbivores during summer and early fall seasons. Winter seasonal rangeland is used during winter with utilization dependent on weather factors. In a natural system, large herbivores will graze seasonally following an elevation gradient that provides nutrition coinciding with plant phenology (Burkhardt 1996).

Seasonal rangelands are also a critical resource that significantly influences the economic viability of livestock enterprises as well as the viability of many populations of wild herbivores (Vavra 1992; Cole 1971). To be considered successful, livestock grazing/range management must provide for the needs of wildlife and cattle alike.

5.2.1 Current Range Conditions

Project winter and spring-fall seasonal rangelands have limited availability compared to summer rangeland. Winter cattle management has severely affected historic hay feeding grounds and

adjacent low elevation toe slopes and river terraces. Previous ranch owner, Denny Jones, worked with the Ontario Natural Resource Conservation Service (NRCS) from 1982 to 1990 on conservation cropping systems, streambank protection and stabilization, and had a conservation agreement with the Malheur Soil Conservation District. Current management includes seeding sites to native and introduced grasses and alfalfa, fertilizing grass pastures, and controlling invasive weeds with herbicides. Depending on flexibility of management, these activities can increase availability and choice of seasonal foraging areas for wild and domestic herbivores.

Private lands adjacent to the Malheur River and extending up slope for approximately ¼ mile (0.4 km) have experienced severe grazing impacts. Historically similar lands have been managed as “sacrifice areas.” However, management has been intensified on these degraded sites to limit the influx of invasive weeds. Timing and frequency of cattle grazing on lower slopes need adjustment to limit negative impacts of selective grazing and loafing behavior.

There are established populations of invasive weeds along the Malheur River and on upland range sites in Malheur County. Medusahead has infested approximately 1,300 acres south of the Malheur River (Figure 56). The area is designated a Medusahead Study Area by wildlife area managers. Along the river valley, approximately 340 acres is infested with whitetop (*Lepidium draba*), perennial pepperweed (*Lepidium latifolium*), Scotch thistle (*Onopordum acanthium*), and poison hemlock (*Conium maculatum*). Broadleaf weeds were treated with herbicides in 2003, and field improvements including disking and reseeding were implemented as added weed control.

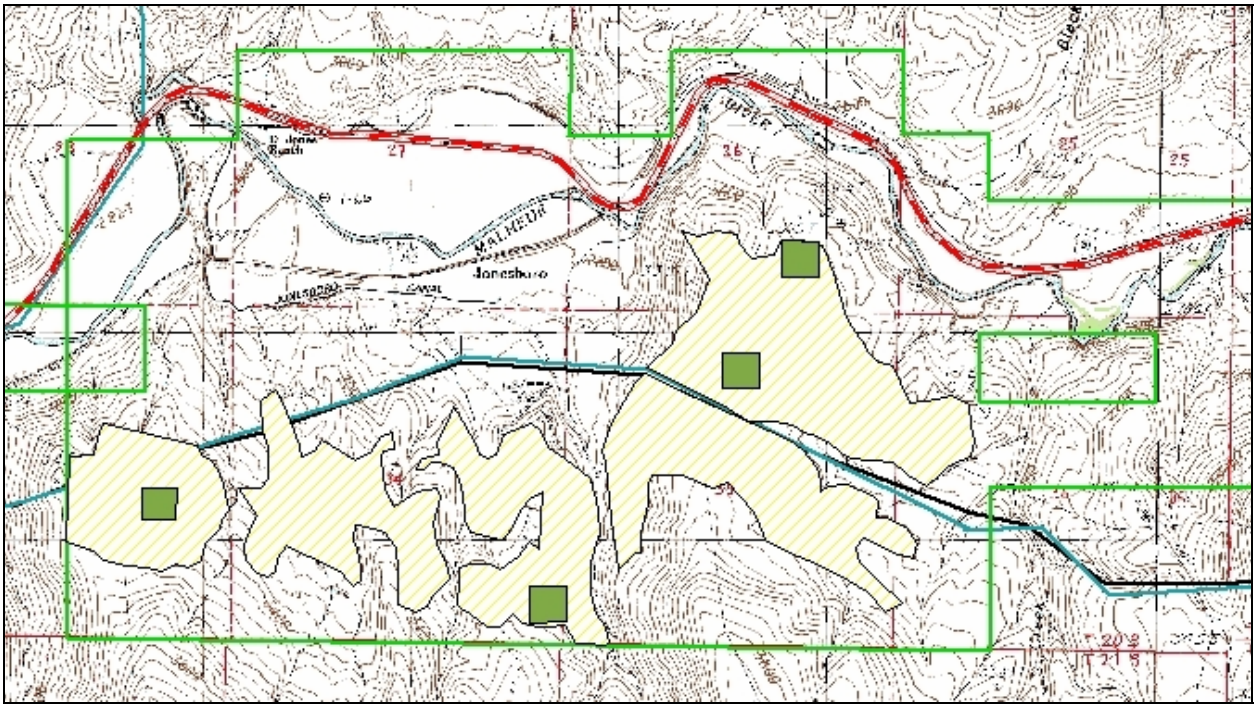

Figure 56. Areas heavily infested with medusahead south of the Malheur River.

5.3 Grazing Strategies

Diverse shrubsteppe plant communities in Malheur County, Oregon provide forage opportunities for both wildlife and livestock. Biomass production varies with soil type, location and precipitation. Loamy soils on north aspect sites average 1,800 pounds per acre, while mahogany rock-land may average 900 pounds per acre (NRCS 1996).

Nutritional quality of forage decreases with season and by July grasses are senescing and preparing for dormancy. As fiber content increases in grasses, digestibility and protein levels decrease (Van Soest 1994). Cows nursing calves have high nutritional requirements affecting diet selection and grazing patterns. Decreasing nutrient requirements of the mother cows by weaning in early fall can facilitate distribution of a “dry cow” herd on dormant upland forage. Protein supplements improve nutritional status of a cowherd and improve herd distribution across the landscape (Bailey 2003).

5.4 Stocking Rate and Carrying Capacity

Stocking rate is defined by the Society for Range Management (1974) as the amount of land allocated to each animal unit for the entire grazing period of the year. Stocking rate is typically expressed as animal unit months per acre of land (AUM). Adult cows require approximately two percent of body weight in daily dry matter (DM) intake. For example, a 1,000-pound cow requires 20 lbs of forage per day, 600 lbs per month, and 7,300 lbs per year (NRCS 1984). Using conservative shrubsteppe biomass estimates (i.e., 1,000 lbs/acre) and an average 50 percent allowable utilization of available forage species, an example stocking rate calculation for the Sperry Creek pasture is derived as:

Forage production:

1,000 lbs/acre x 50% allowable use x 2,020 acres = 1,010,000 lbs total available forage.

Forage demand:

225 cows x 20 lbs = 4,500 lbs/day

Stocking rate:

1,101,000 lbs total available forage/4,500 lbs/day
forage demand = 224.4 total days in the pasture.

Consequently, even with reducing forage availability by another 50% due to topographical constraints, the current stocking rate is well below carrying capacity of available forage in the Sperry Creek pasture. Herbivore stocking rate affects the direction, magnitude and rate of vegetation change in a grazed ecosystem (Heitschmidt and Taylor 1991).

Livestock forage utilization standards should be based on plant phenology, climate and plant response to grazing. Three basic periods must be considered:

1. Fall/winter
2. Early spring
3. Late spring/summer.

Fall/Winter: Dormant grasses can sustain higher percent utilization as long as grazing does not cause plants to be pulled up or cause excessive soil damage to occur.

Early spring: During this period, early cool season grasses initiate growth with the length of the growing period determined by the persistence of soil moisture. Early spring grazing should end prior to the time that soil moisture becomes limiting to the extent that full re-growth of a grazed plant cannot be ensured. Plants can sustain high levels of utilization at this time if livestock are prohibited from re-grazing individual plants, and are removed from the area while adequate soil moisture still exists to allow for full re-growth of the plant.

Late spring/summer: Cool season grass growth is still occurring at this time but soil moisture becomes limiting as grasses enter a dormant phase by early July. Allowable utilization standards are addressed on a per species basis in Tables 34 and 35.

Table 34. Upland plant height/weight utilization reference chart on a per species basis.

Species	Stubble height (inches)/Utilization			
	2”	4”	6”	8”
Bluebunch wheatgrass (*Pssp*)	70%	45%	20%	5%
Idaho fescue (*Feid*)	55%	25%	5%	0%
Sandberg bluegrass (*Posa*)	50%	25%	15%	0%
Thurber’s needlegrass (*Sith*)	50%	10%	15%	5%

Table 35. Riparian plant height/weight utilization reference chart on a site and per species basis.

Site/Vegetation Type	Stubble height (inches)/Utilization			
	1 “	2”	4”	6”
Dry and moist meadow riparian species of palatable forbs and grasses (ungrazed height = 8”)	70%	55%	40%	10%
Moist meadow sedge (ungrazed height = 8”)	70%	45%	20%	5%
Dry meadow sedge (ungrazed height = 8”)	64%	45%	25%	5%

Fluctuations in the degree of forage use during the grazing season can be accommodated, provided a rotational system is in place and the physiological needs of the plant species are met (L.A. Volland 1990). Obtaining an optimal herbivore stocking rate that will maintain or enhance ecological condition of vegetation is dependent on the number, kinds and classes of herbivores; the spatial and temporal distribution of herbivores; dietary preferences; productivity and availability of forage, and nutritional quality of forage.

In addition to forage quality and productivity, the class and type of livestock must also be considered as part of the any overall management strategy because different classes and types of livestock have different management implications. Cattle breeds and age class considerations are described in Tables 36 and 37, respectively.

Table 36. Comparison of cattle breeds based on six measurement standards.

	English	Spanish	Continental
Mobility	+	+++	+++
Adaptability	++	+++	+
Profitability	+++	+	++
Competition	++	+++	+
Availability	+++	+	++
Handling	++	+++	+
+ = relative attractiveness in			

Table 37. Cattle age class considerations.

Age Class	Consideration
Cow-calf system	• Natural vs. artificial breeding (i.e. bulls vs. AI facilities) • Matching fluctuating nutritional requirements of dams with available resources • Replacement heifers (i.e. buy or raise)
Yearlings	• Trailing • Flexibility in rotating/resting pastures

5.5 Wildlife/Livestock Competitive Interactions

Elk and cattle interactions may result in competition for resources and dietary overlap. Mule deer and cattle inhabiting grass and forest steppe rangelands have approximately 50 percent dietary overlap while cattle and elk on the same range type have approximately 75 percent dietary overlap (Sheehy 1987). Livestock condition forage for elk by removing dry standing grass. This improves forage quality for elk, which re-graze pastures that cattle have moved through (Sheehy 1995). Nutritional parameters of available forage are dependent on seasonal change and accumulation of old growth fibrous material in plants. Forage nutrition dynamics are illustrated on Figure 57.

Competition potential between livestock and wildlife can be minimized through strategic timing of grazing and controlling utilization levels of livestock. Shrub components, especially bitterbrush, are important winter browse for deer and elk and will be maintained or increased under any grazing regimen. As a result, close monitoring of livestock utilization of bitterbrush is essential. Pastures providing bitterbrush habitat for mule deer may be incorporated into a deferred grazing schedule. An alternative strategy is to allow grazing only when browsing potential is decreased through protein supplementation or season of use. Livestock/wildlife rangeland “best use” practices are described in Table 38.

Moving cattle using low stress livestock handling techniques (Appendix D) improve herd distribution and increase the likely hood that they will stay in a new location with less chance of trailing back to an undesired location. This also gives managers opportunities to monitor resource impacts such as forage utilization or trailing.

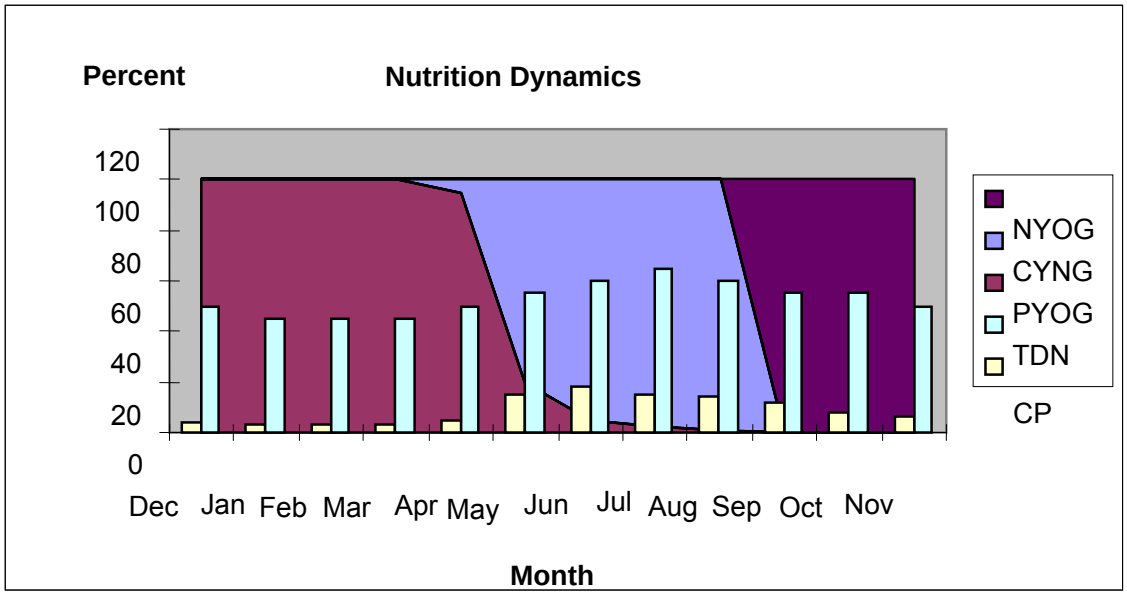

Figure 57. Nutritional curve showing seasonal change in total digestible nutrients (TDN), and crude protein (CP) from previous year old growth forage (PYOG), current year new growth forage (CYNG), and next year old growth forage (NYOG) (Sheehy 1995).

Table 38. Best use practices on seasonal rangeland on the Malheur River Wildlife Mitigation Project.

Ownership	Seasonal Range	Attributes	Habitat Value	Best Use
State	Winter, Spring/Fall	Dominant southerly aspect. Diverse communities (juniper, small meadow, cottonwoods, sagebrush mosaics) Old fields	High value to wintering wild herbivores, especially mule deer. Important mule deer fawning habitat. Late fall and early spring cattle grazing	Limit livestock grazing to late spring grazing at least 1 month prior to mule deer fawning. Move cattle quickly through the area. Concentrate use on annual bromes, Thurber's needlegrass, and squirreltail grass. Winter feed cattle on old fields and railroad grade near highway to buffer mule deer from highway.
BLM	Summer, Spring/Fall	Northerly aspect dominated by sagebrush but with diverse communities within the sagebrush type relative to aspect and elevation. Includes micro-communities (stream riparian areas, quaking	High value to all large grazing herbivores during late spring, summer, and fall. Important mule deer rearing habitat. Important sage grouse nesting and brood rearing habitat	Develop livestock grazing systems that minimize impacts on wildlife, especially sage grouse during nesting and brood rearing, and mule deer during early fawn rearing. Water is a critical limiting factor for all herbivores, especially livestock during all seasons and large wild herbivores during late summer and fall; design

Ownership	Seasonal Range	Attributes	Habitat Value	Best Use
		aspen patches, riparian deciduous shrub)		grazing system to minimize impacts on water sources, especially perennial streams with native fish species. Herding of livestock to minimize impact on sage grouse, ephemeral riparian areas, and native trout is the preferred option.
Private	Summer, Spring/Fall, Winter	Predominately river terraces and floodplain. High plant community diversity including: degraded sagebrush, natural marsh and riparian areas, irrigation ponds and ditches, and cropland.	Important security and nutritional habitat for upland game birds, waterfowl, fish, and domestic and wild herbivores. Degraded sagebrush communities near the river corridor attest to intensity of large herbivore use, especially cattle. Links state land to the north with private and BLM sagebrush uplands to the south. Focus area for improving wildlife habitat through physical improvements and reducing livestock impacts through nutrient substitution.	Integrate cropland and meadows into large herbivore grazing and habitat improvement strategies. Presence of highway corridor may require incorporation of game fences and animal traffic underpasses to reduce animal-vehicle interactions. Livestock grazing of meadows and crop residue can be used to enhance wildlife habitat of both uplands and river corridor.

5.6 Current Livestock Grazing Strategies

Cattle currently graze the Jonesboro Allotment under an annual grazing plan developed by the BLM and the BPT. The 2004 grazing schedule calls for two herds of cattle to graze the allotment over a seven-month period from April through October as summarized in Table 39.

Table 39. 2004 grazing schedule for two cow calf herds on the Project.

Pasture	April 1st – June 1st	April 1st – June 15th	June 1st – October 31st	June 15th – October 31st	October 15th - 31st
Sperry Creek	50 head				
Antelope Swale	Used for trailing				
Tim's Peak -			50 head		
Horse Camp					

Trail Creek		175 head			trail 50 head home
Dinner Creek				175 head	
Saddle Horse					trail 175 head home

In November, 2003 through February, 2004, 100 dry cows were pastured in the Road Gulch Allotment, north of the Malheur River. These lands are primarily Oregon State lands with BLM lands bordering the ridgeline.

Current pasture rotation is described below and shown in Figure 58. A similar grazing regimen is planned for 2005 (Figure 59). Note, however, that grazing was not planned for DSL lands north of the Malheur River in 2005.

Fifty cow-calf pairs, or bred cattle, entered the Sperry Creek pasture on April 1 and remained until June 1. The herd was then trailed through Antelope Swale to Tim's Peak and West Horse Camp pastures, where they remain until October 31. Cattle are allowed to trail to deeded pastures through the Trail Creek pasture starting October 15 with completion by the end of the month.

A second herd comprised of 175 cow-calf pairs or bred cattle entered the Trail Creek pasture on April 1 and remained until June 15. The herd then trailed to Dinner Creek pasture and will remain until October 31. Beginning on October 15, this herd will trail through Saddle Horse pasture and onto deeded pastures by the end of October.

Antelope Swale, Saddle Horse and Indian Creek Pastures will be rested this year, with Sperry Creek and Trail Creek Pastures rested next year. The turnout letter authorizes trailing use of Antelope Flat between Sperry Creek and Tim's Peak/Horse Camp for 50 head. It also authorizes 15 days of use of Saddle Horse on the trail to the home place from Dinner Creek for 175 head. Indian Creek is rested this year.

In addition, the portion of Horse Camp on the east side of Upper Hunter Creek fence built in 2001 is scheduled for use in conjunction with Tim's Peak Pasture between June 2 and October 31, 2004. The west half of what was Horse Camp pasture prior to 2001 is now called Upper Hunter Creek Pasture and the agreement is to rest it for at least three years (2001 through 2004) following completion of the fence. With the exception of possible trailing use or light spring use, it is advisable to continue to not graze this pasture to allow riparian habitat to recover and the slow process of healing the deep gully created by Hunter Creek to continue.

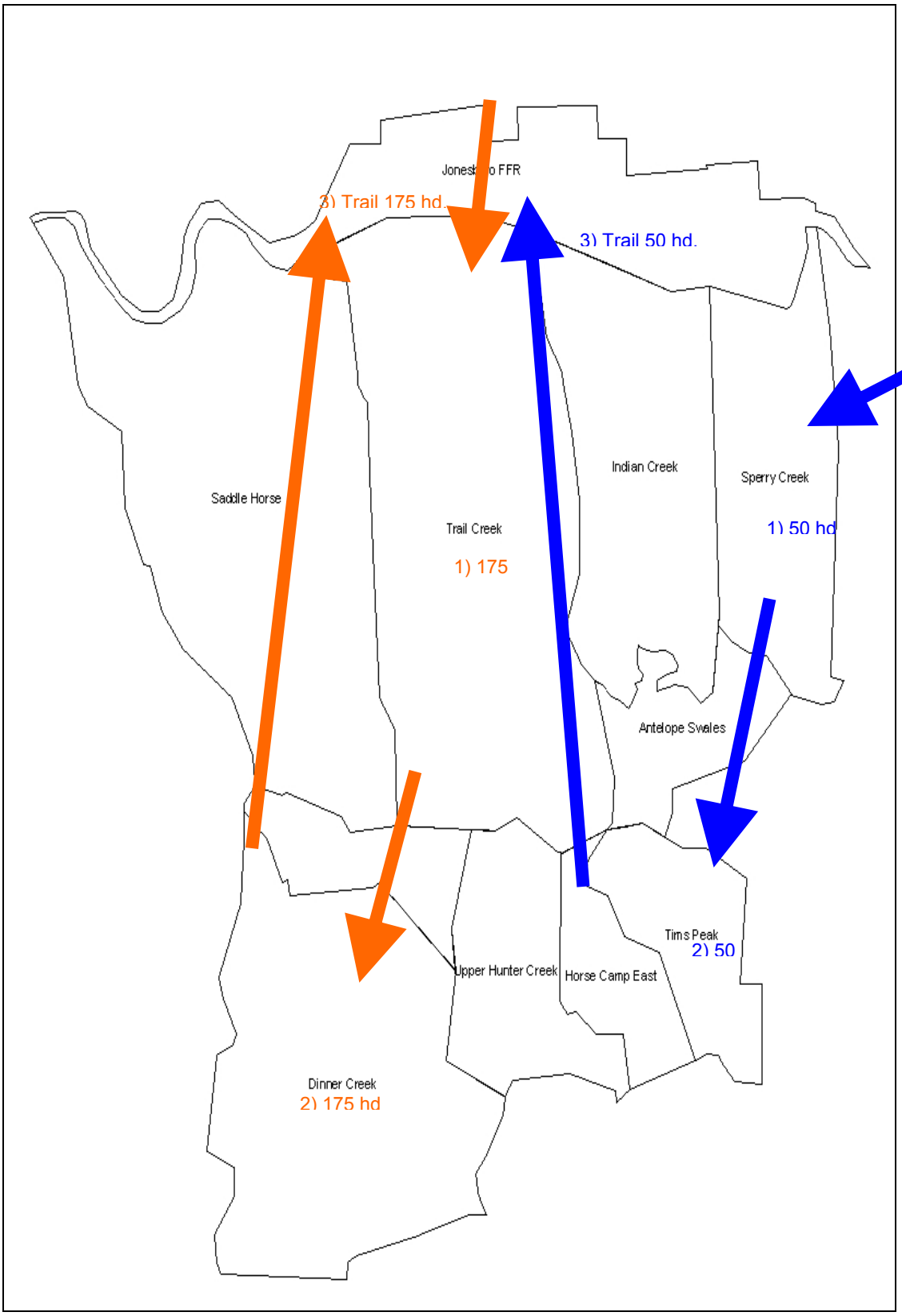

Figure 58. Current (2004) pasture rotation and stocking rates (two herds).

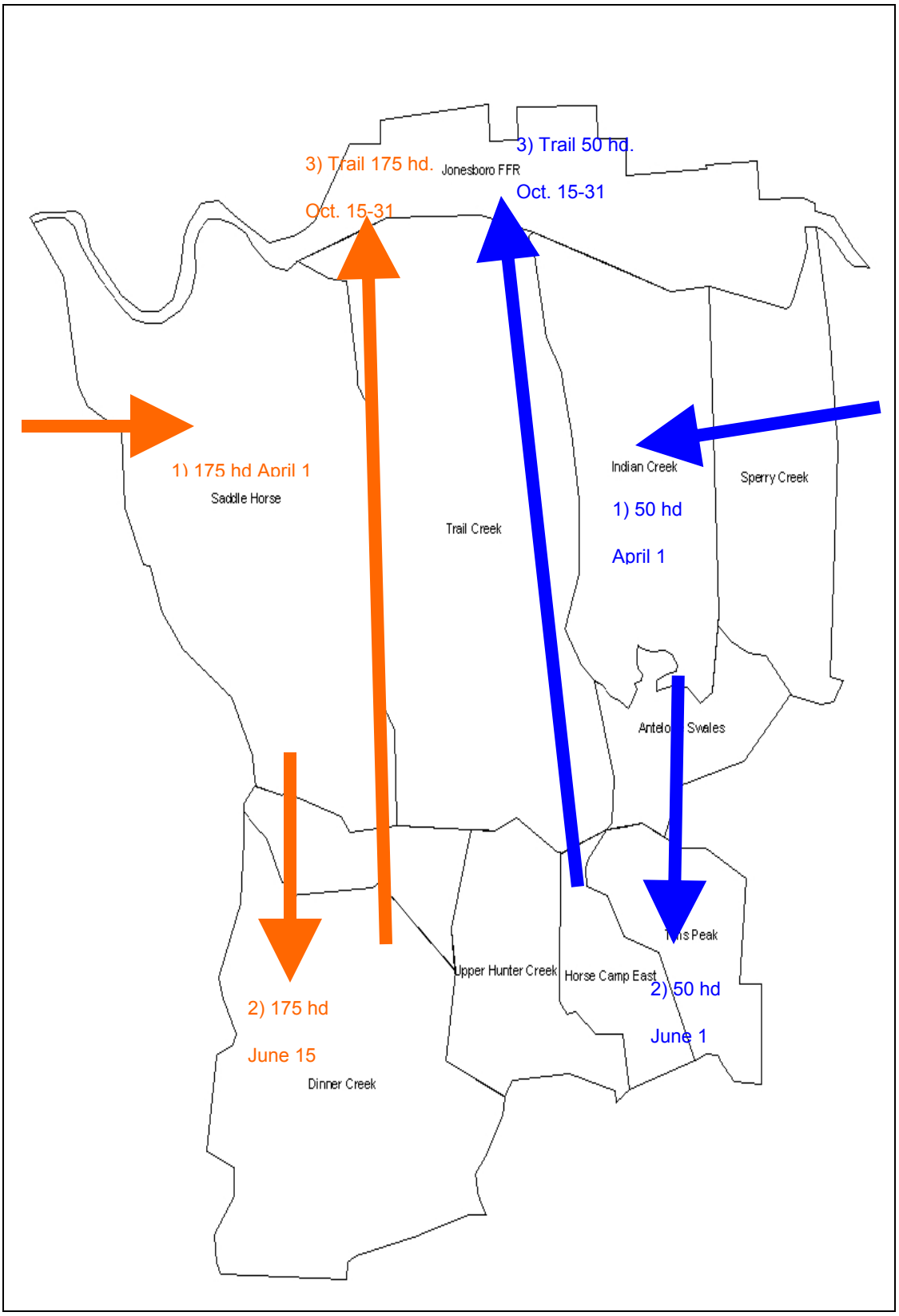

Figure 59. Planned 2005 pasture rotation and stocking rate plan.

5.7 Recommendations

ICAPS staff recommends changing from a two herd grazing system to a single herd grazing system. The same grazing schedule as the two-herd system is suggested, but the timing and duration of grazing pastures is adjusted by size of pasture, resource availability, and wildlife objectives as summarized in Table 40 and illustrated in Figure 60 (2005) and Figure 61 (2006). *Note, however, that larkspur infestations on DSL lands complicate suggested grazing strategies. As a result, livestock should be removed from DSL lands not later than the end of February* (J. Wennick, USFWS, pers comm., 2004). Included in the grazing schedule are opportunities for seasonally grazing wet meadow pastures and hay grounds with weaned calves or yearlings (Figure 62).

Table 40. Single cow-calf herd 2005 grazing schedule for the Malheur River Wildlife Mitigation Project.

Pasture	April 1st – June 1st	June 1st – June 15th	June 16th – July 15th	July 16th – October 31st	October 31st - March 31st
Road Gulch	225 head				
Indian Creek		225 head			
Tim's Peak -			225 head		
Horse Camp					
Trail Creek					
Dinner Creek				225 head	
Saddle Horse					225 head
Private lands					225 head

It is further recommended to establish a resident cow herd that can develop optimal foraging strategies and thus reduce negative impacts to native plant communities. Improving herd distribution across the landscape through time will increase diet mixing of cows, and decrease selectivity for only a few plant species.

Ecologically sensitive management can be achieved in several ways. For example, herd distribution across rangelands can be controlled by improving upland water sources, using feed supplements, and/or salt/minerals to attract livestock (Bailey et al. 2000). Utilization patterns can be monitored around attractants that can be relocated when grazing standards have been met. This encourages the cow herd to migrate seasonally throughout the pasture system in a way to minimize repeated trailing over the same ground. Attractants facilitate daily movements and grazing patterns of the herd situated around water sources. Livestock herding will accentuate cattle distribution and utilization patterns within each pasture and facilitate seasonal migration between pastures. Regularly scheduled herding will accompany monitoring of utilization by a step transect method to determine stubble height and herd impacts to water sources and sensitive areas.

Grazing strategies in weed-infested areas are designed to minimize seed and plant part dispersal. Early season grazing before flowering can control many weeds by reducing crown and root mass, and provide nutritious forage (Kennett et.al.1992; Hale 2002). If livestock have grazed weedy areas with viable seeds, then restricting animals in a control pasture or corrals for

several days to a week, will allow for seed passage through the animal and the site can be monitored for seed germination subsequent to herd departure. Using livestock to prepare degraded sites for reseeding grasses has shown promise, especially in areas where equipment access is restricted.

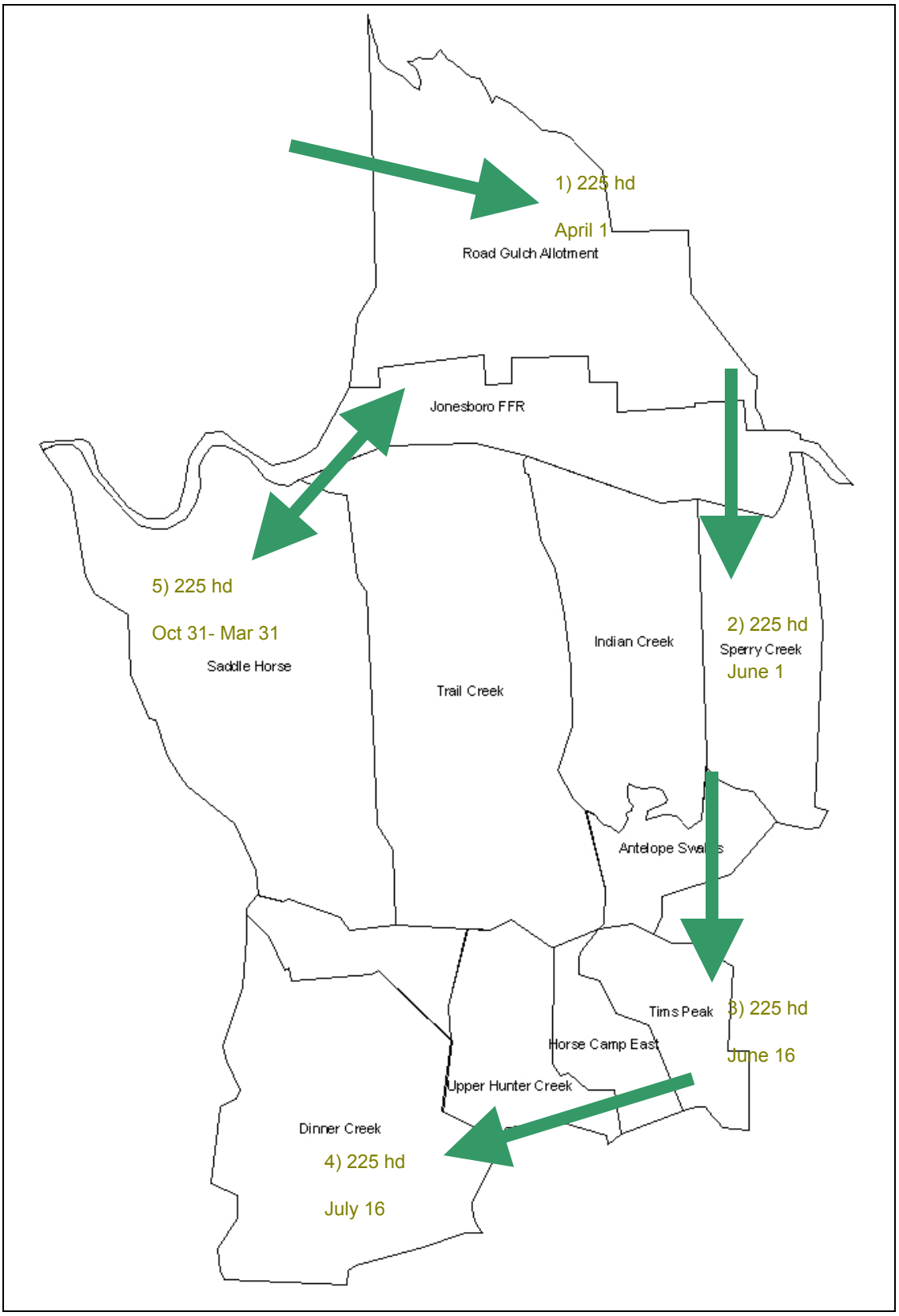

Figure 60. ICAPS recommended 2005 pasture rotation and stocking rates.

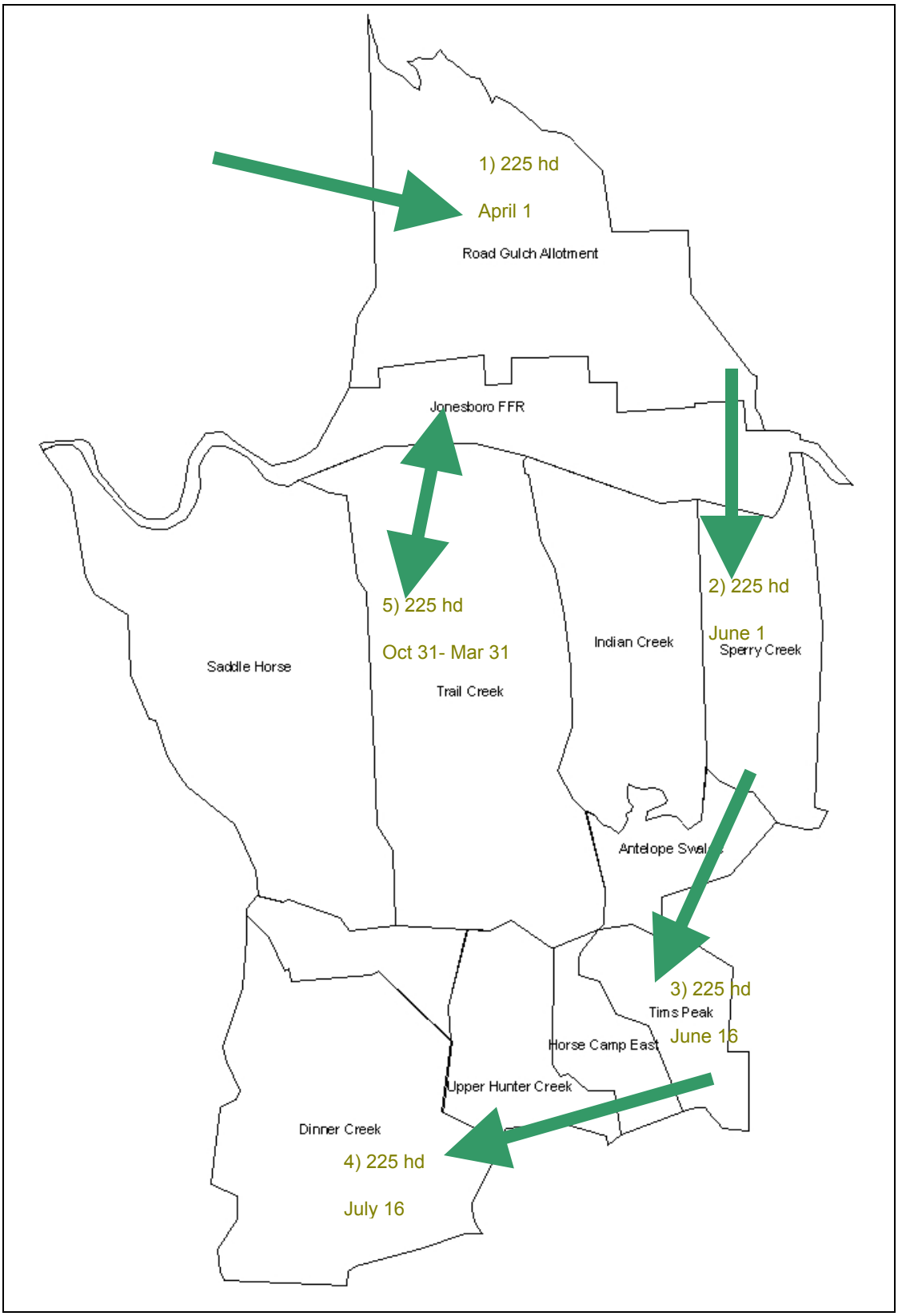

Figure 61. ICAPS recommended 2006 pasture rotation and stocking rates.

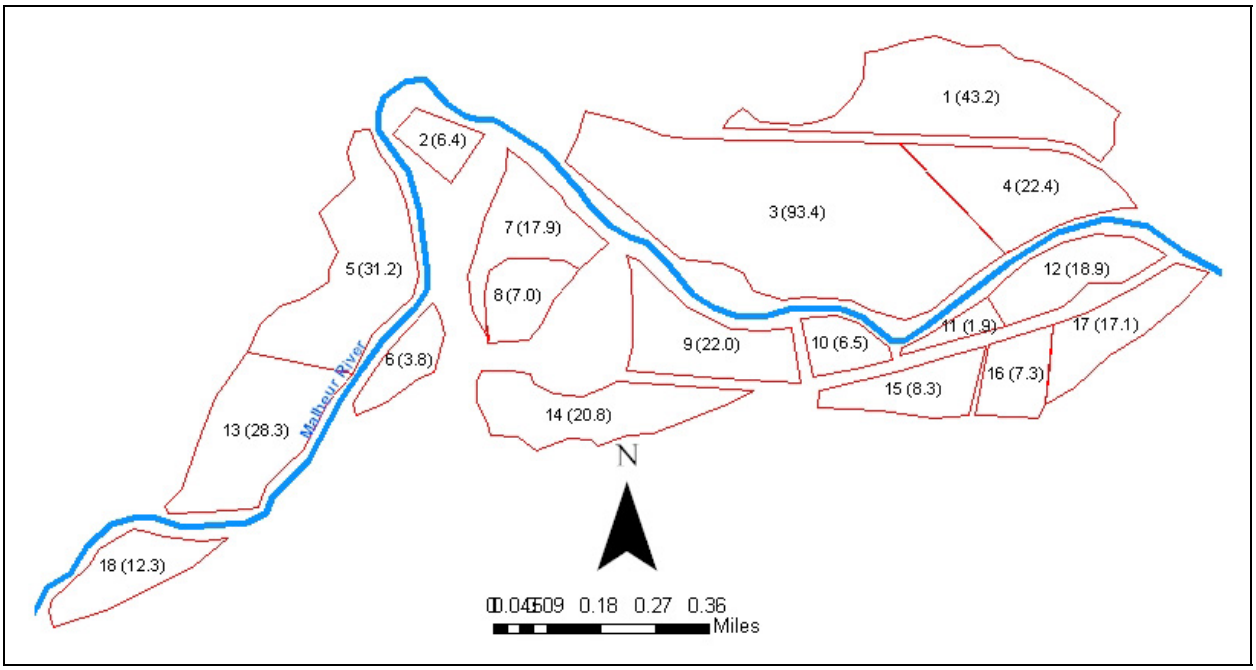

Figure 62. Potential wet meadow grazing pastures.

Specific Recommendations:

1. Build a contour fence along the lower slopes of Saddle Horse, Trail Creek, Indian Creek and Sperry Creek pastures to eliminate opportunities for cattle to congregate on degraded toe slopes and lower flats. Cattle distribution can be improved when similar terrain is fenced together to increase uniformity of range type and grazing patterns (Bailey et al. 1996). Lower slopes could be managed separately to reduce cattle loafing and improve ecological condition. Trail Creek pasture appears to receive the highest level of cattle trailing and loafing impacts due to its access by roads and trails. If time and money constraints limit building a toe-slope fence, then Trail Creek pasture should receive priority for fence construction.

2. Cattle should be familiarized to a mineral and/or crude protein supplement prior to turn out date. This will allow for supplements to be strategically placed in each pasture and act as attractants to improve distribution and grazing patterns. Supplement sites should be located no closer than ¼ mile from water sources and moved when area has sustained desired level of utilization and herd impact.

3. Dry cattle (post-weaning) should be allowed to remain in Saddle Horse pasture through January, as weather and forage availability permits. Crude protein supplements would allow maintenance conditions for individual cows on dormant grasses, and poor-condition cattle would be brought to the haystack. As cattle gestation progresses, close monitoring of herd health will be required.

4. Cattle winter-grazing the Saddle Horse pasture could provide a winter season rest to Road Gulch. Cows and calves should be allowed to graze this area for a short period after soils have firmed and annual grasses are pre-flower and leafy. Timing of grazing needs to

be flexible to allow enough soil moisture for bunchgrass regrowth, but would occur between April 1 and June 1.

5.8 Considerations

The Project has approximately 360 acres of private riparian wet - moist meadows and river terraces adjacent to seven miles of the Malheur River. Pastures are numbered one through 18, and range in size from three to 93 acres (Figure 62). Project managers could elect to graze wet meadow pastures as part of a comprehensive grazing plan.

The common livestock management practice in shrubsteppe is to feed cattle through the winter months on native meadows and improved river valley pastures. The costs associated with putting up and feeding winter hay could be reduced if dry cattle, subsequent to weaning in the fall, were moved from meadows to upland pastures with dormant bunchgrasses. The low nutritional requirements of dry cattle provide opportunities for utilization of lower quality dormant grasses. A return to winter grazing instead of winter hay feeding could free up these productive pieces of land for other purposes and increase management flexibility (Brandyberry et. al. 1994). The river valley provides nutritious growth for an extended growing season compared to adjacent bunchgrass uplands.

Due to the resilient nature of riparian pastures and meadows and availability of nutritious forage, grazing wet meadow pastures under specific guidelines should be considered. Growing cattle grazing these meadows in spring and summer can gain over two pounds per day through August with no supplementation (Angel 1997). In the context of a cattle ranch, the private lands along the Malheur River should be integrated with grazing management to achieve a nutritional balance with upland grazing, and reduce negative impacts on upland and transitional toe-slope range from season-long grazing. In addition, improved pastures can provide early season grazing allowing deferment of upland native grass pastures. Depending on irrigation availability and the amount of hay required for the resident cowherd, post-harvest hay grounds or reserved pastures could be used for calves weaned from their mothers, for yearling animals as finishing pastures prior to butchering, or as winter supplemental feed ground (Angel 1997). Grazing riparian pastures would require additional fencing to protect the Malheur River corridor and individual fencing of wet meadow paddocks.

Timing of weaning is dependent on cattle ownership, market conditions, and seasonal conditions. Typically, calves are weaned in late October or early November, but weaning calves earlier in the year (i.e., late August to September), would allow for the dry cows to return to dormant upland forage until winter snows limit forage availability. Calves could be sold and shipped to market or pastured on riparian meadows with heifer calves selected for replacements. Or if steer calves are retained, the calf herd could remain in selected pastures until the weaning process is completed. Subsequent to weaning, the calf herd could be reintroduced to the dry cowherd, or herded to a reserved upland pasture. Reintroduction to the dry cows will provide generational learning opportunities for the calves that will benefit future herd management, and not negatively affect either cow or calf.

Class of livestock used in the grazing schedule is flexible to meet seasonal forage availability and grazing strategies. Yearling cattle have advantages in the short term being athletic with ability to travel longer distances per day. This may facilitate herd distribution on upland ranges. Potential weight gains on irrigated and riparian pastures may be profitable on an annual basis. A disadvantage, however, is the missed opportunity to develop a herd of cows with knowledge of the landscape and with adjusted grazing behavior through training experiences between

managers and livestock. First year calves could be kept to develop a yearling herd, which could then graze separate from the cow herd, or be integrated into the herd after the weaning process is completed. A multigenerational herd could be herded in a traditional pastoral fashion and could include mother cows, first year calves, yearlings and replacement heifers. Multigenerational herds are found to promote learning experiences that enhance diet mixing and improve herd distribution (Provenza 1995, 1996, 2003). A multigenerational grazing scenario would likely require a long term, i.e.≥ 3 year, grazing lease with a livestock owner and may initially require a higher stocking rate to ensure a profitable, viable livestock operation.

An analysis of livestock ownership can be considered by comparing positive and negative aspects of developing a long-term lease with a local rancher, or leasing cattle on an annual basis (Table 41).

Table 41. A positive and negative comparison of livestock lease types.

Livestock Ownership	Positives	Negatives
Long term lease	• Resident animals "learn" pastures Low overhead • Low labor input • Community good-will	• None
Annual lease (high bid)	• low overhead • low labor input	• new managers/animals may not be familiar with ground

Grazing allotments are located on important mule deer and elk winter range and sage grouse habitat. Moreover, many tributaries of the Malheur River historically supported redband trout, and known populations of redbands remain in Canyon Creek and Hunter Creek within the Jonesboro Allotment. Cattle should be strategically managed to mitigate negative impacts on wildlife habitat, and where appropriate used intensively to manage annual grasses and for restoration and re-seeding of degraded sites.

5.9 Forage Utilization Metrics

Coordination between Project staff and the Vale District BLM Range Management Specialist is paramount for successful implementation of the grazing plan. Allowable utilization standards for upland and riparian plant species have been developed for the Jonesboro Allotment and percent utilization may be adjusted as necessary.

A simple method to estimate percent utilization and rangeland use is to measure stubble height, or height (in centimeters or inches) of herbage left ungrazed at any given time. This method would be used after stubble height standards for specific plant communities have been developed. For example, stubble heights for riparian areas may be specified to trap sediments and protect stream-banks. Estimating forage utilization is useful for interpreting changes in forage condition and trend, and in determining proper stocking rates and herd distribution. Utilization checks during the grazing season will help determine when the desired forage utilization level is reached.

Stubble height can be compared to ungrazed plant height of the same species, and a percent utilization applied to the stubble height. This method is based upon the principle that a certain percent of forage by weight can be estimated provided the total height of the plant and the clipped height (stubble) are known. The grazed plant is reconstructed to its ungrazed form in

order to estimate production or percent utilization. This reconstruction is accomplished through the relationship of plant height to weight. Each plant species has its own height-weight relationship (Range Analysis and Management Handbook 1984).

Standards for forage and browse utilization developed by USDA Regional Office task group and incorporated into Region Six Forest Plans, are based on height – weight curves. Generic height-weight curves have been developed for most native grass species key to the Project. Data was collected on the Wallowa-Whitman and Ochoco National Forests, and should apply to the sagebrush steppe plant community of the mitigation site.

5.10 Stubble Height Sampling Protocols

At specified intervals, measure the stubble height of the key species nearest to the toe of the right foot and record on the Stubble Height form (Appendix E). Measurements should be in inches or centimeters of leaf stubble height. For riparian areas, sampling should be done along both sides of a stream segment. When monitoring cattle use, the herder can follow a line of sight step transect behind the cattle herd and every ten steps record stubble height of key grasses (Sampling Vegetation Attributes 1996). Measurements of the ungrazed height of the same grasses should be recorded at seasonal intervals to build a site-specific database of growth curves needed for the height to weight relationships (Gierisch 1967).

5.11 Conclusion

The key to successful implementation of any livestock-grazing plan involves managing dynamically and remaining flexible. As a component of rangeland management, livestock grazing systems can contribute to ecological integrity and enhance wildlife habitat. Following a plan requires monitoring for change and if results are unexpected or undesired, management strategies should be adjusted accordingly. Planning involves understanding the potential for worst-case scenarios and directing management activities to create positive outcomes.

6.0 Habitat Evaluation Procedures

The U.S. Fish and Wildlife Service (USFWS) developed HEP to quantify the impacts of development projects on terrestrial and aquatic habitats by assessing changes, both negative and positive, in habitat quality and quantity. HEP is a habitat based approach to impact assessment that documents change through use of a habitat suitability index (HSI). This HSI value is derived from an evaluation of the ability of key habitat components to supply the life requisites of selected wildlife and fish species. HEP evaluation species models provide the basis for habitat variable assessments and mathematical aggregations of assessment results.

The HSI value is an index to habitat carrying capacity for a specific species or guild of species based on a performance measure (e.g. number of deer per square mile) described in HEP species models. The index ranges from 0.0 to 1.0 (Table 42). For example, an HSI of 0.3 indicates that habitat quality/carrying capacity is marginal while a HSI of 0.7 suggests that habitat quality is relatively good for a particular species. Each increment of change is identical. For example, a change in HSI from 0.1 to 0.2 represents the same magnitude of change as a change from 0.2 to 0.3, and so forth.

The HEP evaluation took place in 2001 and 2002 by individuals from the BPT, Washington Department of Fish and Wildlife, ODFW, BPA, CBFWA Regional HEP Team, and the USFWS. HEP models were selected based on habitat types and Columbia River Wildlife Mitigation loss

assessments and included mink (riverine habitats), yellow warbler (riparian shrub habitat), western meadowlark (grassland/shrubsteppe habitats), mule deer (shrubsteppe habitat), and black-capped chickadee (riparian deciduous forest). HEP model variables and habitat units are summarized in Table 43.

Table 42. A comparison of mathematical HSI scores and equivalent verbal expressions.

Habitat Suitability Index	Verbal Equivalent
0.0 < 0.2	Poor
0.2 < 0.4	Marginal
0.4 < 0.6	Fair
0.6 < 0.9	Good
0.9 < 1.0	Optimum

Table 43. HEP model variables and habitat unit summary for the Malheur River Wildlife Mitigation Project.

HEP Cover Species	HEP Variable	Habitat Units
Yellow Warbler	V1: deciduous shrub crown cover	
	V2: average height of deciduous shrub cover	24
	V3: deciduous-hydrophitic shrubs	
	V1: % of year with surface water present	
Mink	V2: % canopy cover of trees/shrubs within 100 m	5
	V3: canopy cover within 1 m of shoreline	
	V1: % cover of preferred shrubs <1 m	
	V2: # preferred shrub species	
	V3: Mean shrub height	
	V4: % cover of all shrubs < 1.5 m	
	V5: % cover palatable	
Mule Deer	V6: Presence of suitable agricultural crops within 1.6 km of project site	13, 746
	V7: Aspect	
	V8: Road density	
	V9: Topogroaphic diversity	
	V10: % evergreen canopy cover > 1.5 m	
	V1: % cover of herbaceous plants	
	V2: % herbaceous grass	
Western Meadowlark	V3: Avg. height of herbaceous canopy	15,510
	V4: Distance to perch sites	
	V5: % shrub canopy cover	
	V1: Percent tree canopy closure	
Black-capped Chickadee	V2: Average height of overstory trees	0
	V4: Number of snags 4 to 10 inches DBH/acre	
Total Habitat Units		**29,285**

6.1 HEP Survey Results

The HEP team's primary goals were to determine baseline habitat conditions and estimate habitat units on Project lands. HEP surveys were conducted on deeded property and lands owned by DSL with results extrapolated to BLM allotments comprised of like habitat types. Over 60 individual surveys/transects, ranging from 300 feet (≈100 m) to 1,000 feet (330 m), were conducted. Transect locations for the Malheur River, South Trail Creek, and Hunter Creek Units are shown in Figures 63-66.

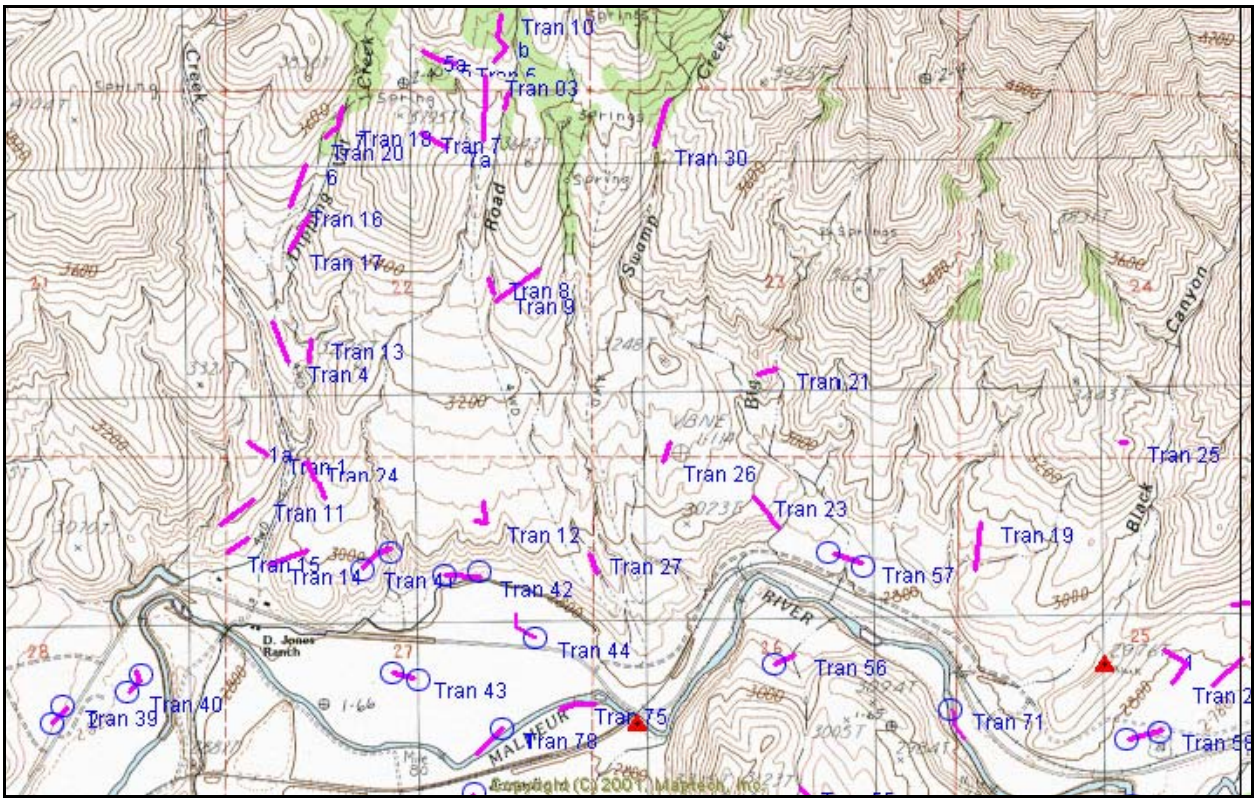

Figure 63. HEP transect locations on the Malheur Unit north of the Malheur River.

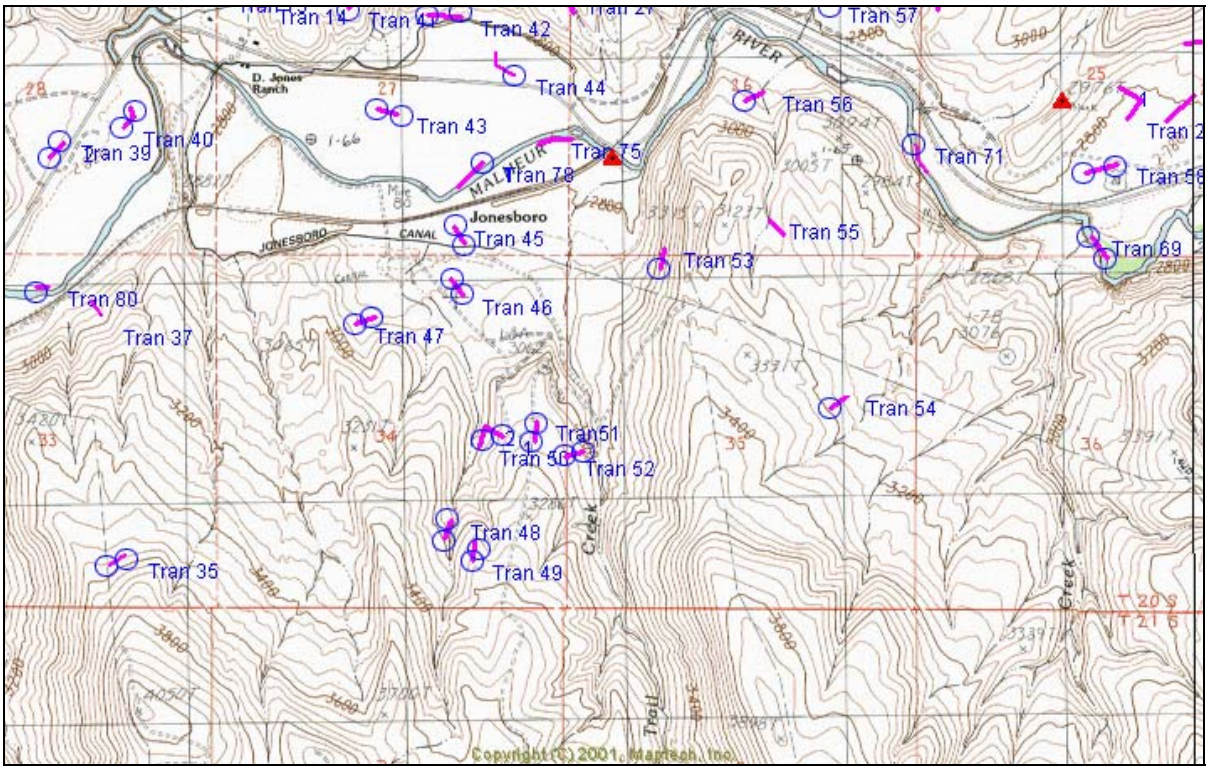

Figure 64. HEP transect locations on the Malheur River Unit south of the Malheur River.

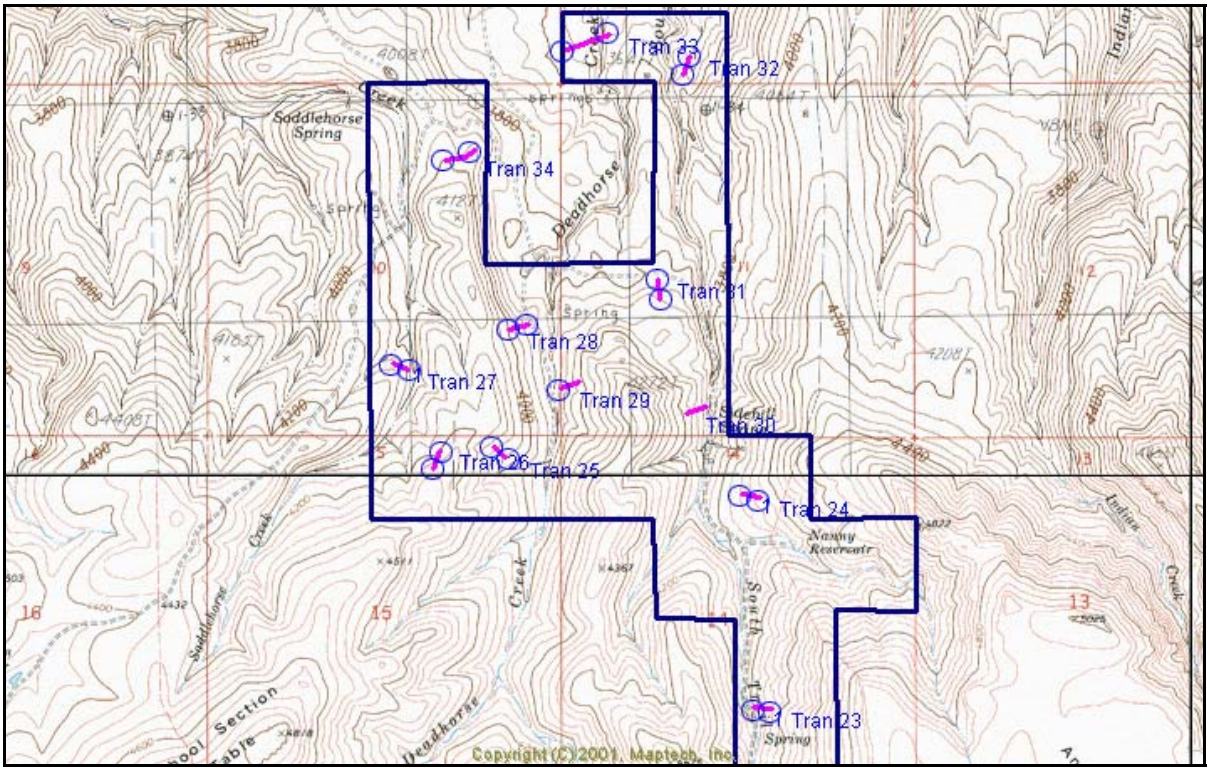

Figure 65. HEP transect locations on the South Trail Creek Unit.

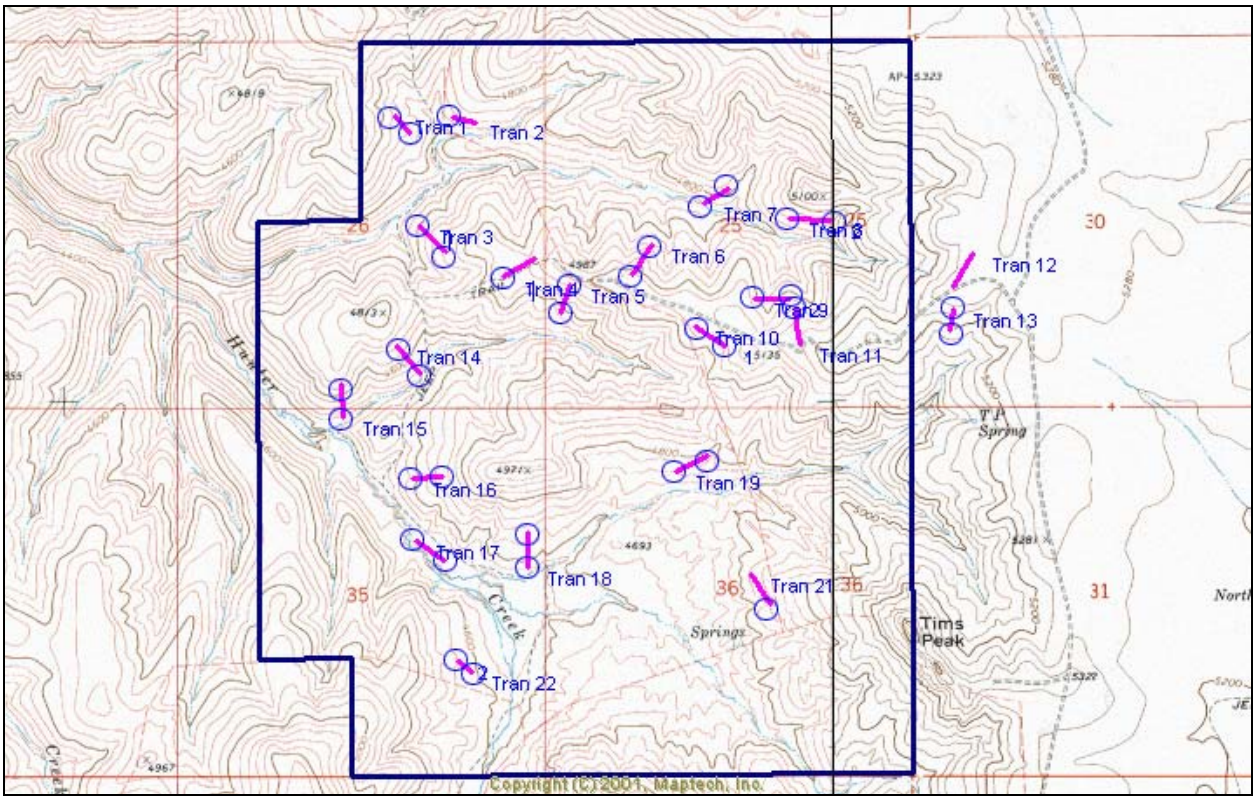

Figure 66. HEP transect locations on the Hunter Creek Unit.

HEP results on shrubsteppe habitat south of the Malheur River suggest that mule deer winter range and western meadowlark habitat are marginal (HSI: < 0.4). These habitat suitability indices are consistent with observed range conditions. Similarly, HEP results north of the Malheur River place mule deer winter range and western meadowlark in the marginal category; however, a greater percentage of individual mule deer habitat transects were in the "fair" range (HSI: between 0.4 and 0.6) than south of the Malheur River.

Although still marginal, western meadowlark habitat south of the Malheur River is more suitable than habitat north of the river (HSIs: 0.33 and 0.2 respectively). A combination of noxious weed invasion, poor cattle management, lack of bitterbrush, and a disruption of natural plant succession over the past century have compromised the area's ability to provide higher quality shrubsteppe habitat.

The average habitat suitability index for riparian shrub (yellow warbler) and riverine (mink) cover types were 0.28 (marginal) and 0.1 (poor) respectively due primarily to the lack of permanent woody deciduous/hydrophytic vegetation within the Malheur River corridor. Wildlife managers anticipate these HSIs will increase substantially in the next five years due to passive and active restoration of riparian shrub/riverine habitats.

The yellow warbler HSI for upland riparian shrub habitats at spring sites was 0.19 or poor. The low rating is due to the lack of hydrophytic shrubs. Similarly, black-capped chickadee habitat at spring sites is also poor (HSI: 0.0) due to deficiencies in tree canopy cover and/or suitable snags.

7.0 Project Access and Recreation Management

Public access to project lands is outlined in the Memorandum of Agreement between BPA and the BPT, which specifies that:

> *"The public shall have reasonable access to the Project. The Tribe may regulate access, provided that access and transportation regulations shall apply equally to tribal members and non-tribal members. The Tribe will not provide public access or use that will result in adverse impacts to wildlife, the reduction of wildlife habitat values, or the destruction of other natural resource values for which the Properties are managed, or impede the increase in HEP value of improvement HUs.*
>
> *Nothing in this Agreement limits the authority or ability of the Tribe to manage the properties for public safety and wildlife habitat conservation, or to preserve and protect cultural, historic, and religious sites, and to carry out and protect the federally guaranteed rights of the Tribe and its members. Nothing in this agreement limits or diminishes any retained right or privilege of the Tribe or its members afforded under federal law as a result of the status of the Tribe or Tribal members, provided that reserved rights will be exercised consistent with this Agreement."*

Many recreational opportunities exist for BPT members and the public alike including hunting, fishing, and camping. Access, however, must be controlled in order to protect habitat and wildlife resources. The BPT developed preliminary access regulations and is in the process of establishing hunting policies on project lands. Modification of access/recreation policies may occur through additional input from BPT/citizen advisory group members and/or wildlife managers (tribe, state, and federal).

7.1 Access

Public access is allowed by permit only. Individuals or groups wishing to visit the Project are required to sign in and out at the Field Office located at Jonesboro. Groups of six or more may visit by prior arrangement only. Some areas may be restricted seasonally or permanently to protect unique biological, cultural, geological or other values.

The site may be accessed from public roads, the Malheur River, or public lands. Neighboring private lands may be used to access the ranch only with landowner permission. Neighboring landowners may not charge fees to access Project lands, but neighboring landowners are free to exercise all rights associated with land ownership. Individuals who pay to access or hunt neighboring lands may not access Malheur River Wildlife Mitigation deeded property through those lands, and may immediately lose and/or be denied permission to enter therein.

7.1.1 Vehicle Access

Vehicles are not permitted off State Route 20, except for management purposes. Travel will be limited primarily to ranch roads. The general policy is to not allow the public to operate vehicles, ATVs or mountain bikes on the property; however, permission may be granted to operate such vehicles on an individual case basis (non-motorized carts and mountain bikes will be allowed on specified roads during big game hunting seasons).

An exception to this general policy occurs during big game hunting seasons at a primitive campsite at Robinson Canyon. During big game seasons, up to five campsites may be provided for permitted hunters at Robinson Canyon. Campers will be responsible for keeping a gate closed and locked while on the property. Vehicular access is allowed to this site by permit for educational groups, researchers, volunteers, or for management purposes. No potable water, electric hookups, or waste disposal is available. Access is limited to RVs or campers less than 30 feet in length.

7.1.2 Horse and Pack Animal Access

Horses and other pack animals are not permitted on the mitigation site except for management purposes and by permitted big game hunters.

7.1.3 River Access

The Malheur River can be accessed from State Route 20 or from project lands by foot. Access from boats to project lands is as described under general access policies.

7.2 Recreation

The primary recreational activities near the Project include hunting, fishing, and camping. As with access, the BPT is currently developing recreational policies for mitigation lands.

7.2.1 Hunting

Hunters are responsible for following BPT policies, Project access rules, and all state and federal hunting regulations. A valid Oregon hunting license or tribal identification card and appropriate tags or stamps are required. The type/number of animals, waterfowl, and game birds harvested must be reported to BPT wildlife staff upon completion of a hunt. Hunters accessing the ranch from Highway 20 must report harvest when checking-out.

Non-BPT hunters can access BLM and state lands through deeded property by permission only. Non-BPT hunters are allowed to hunt only game birds on lands owned by the BPT as long as this hunting does not interfere with BPT hunting. To apply for permission to traverse deeded lands, hunters (BPT or non-BPT) must submit a written request, along with their name, mailing address, and phone number to: Burns Paiute Fish and Wildlife Department, 100 Pasigo Street, Burns, Oregon 97720 (541) 573-1375.

Hunter's with access permits must check in at the field office located on the Project (Jonesboro). Hunters will receive two permits: one permit must be displayed on their vehicle, and the other must remain in their possession. Hunters must show their permit, license, and tag on demand while on the property.

Project wildlife staff will coordinate hunting season activities with appropriate ODFW staff and/or USFWS personnel. Youth hunters (under the age of 17) must possess a valid hunter safety card and must be accompanied by an adult who will not be allowed to carry a firearm.

7.2.1.1 Big Game

Tribal members possessing Land Owner Preference tags (LOP) can hunt deeded lands within the Project. Big game landowner permits are allocated by lottery. BPT members interested in

applying must purchase hunting licenses prior to submitting for the LOP tag drawing. BPT hunters with State of Oregon hunting tags for Malheur River Unit 166 can cross the deeded property to hunt on BLM and state lands. BPT wildlife biologists desire to restrict the harvesting of mule deer to 3 points or better while conducting initial research on local mule deer population and trends.

7.2.1.2 Game Bird/Waterfowl

Access for game bird hunting is by foot only. Hunters accessing the ranch from Highway 20 must sign-in prior to hunting and report harvest when signing-out after hunting. Game birds are primarily chukar partridge and California quail (mountain quail are currently a protected species).

Waterfowl hunting access is by foot except on the Malheur River, which may be accessed by boat on some reaches. All hunters must comply with BPT permit policies and appropriate Tribe, state and federal harvesting regulations and seasons.

The use of hunting dogs is permitted; however, dogs must be kept under voice and sight control. Dogs may not run at large during bird breeding seasons (April 1 through July 31).

7.2.1.3 Predators

Predator hunting is not permitted. Wildlife area personnel or their designated representatives will manage predators if deemed necessary by wildlife department management.

7.2.2 Fishing

Fishing access will be allowed to anyone possessing a valid Oregon fishing license. Anglers must comply with BPT access policies as well as state and federal seasons and regulations.

7.2.3 Camping

All campers will observe a “leave no-trace” policy. Upon vacating a campsite, campers will leave nothing behind and pack out all trash. Back country camping is allowed. Sites must be at least one mile or farther from public roads. Human waste must be buried.

Camping is not allowed on deeded land within ¾ mile of the mean high water mark on the south side of the Malheur River (camping is not permitted in wet meadow pastures north of the Malheur River either). All River camps are subject to BLM Wild and Scenic river regulations, including the use of a portable toilet system and a fire pan. State and BLM fire restrictions will be enforced, and additional restrictions may be imposed.

7.2.4 Fossil and Rock Collecting

Fossil and rock collecting is prohibited on the Project. Applicable laws protecting paleontological resources are strictly enforced. Researchers may submit proposals to project management.

7.2.5 Cultural Resources

State, federal and tribal laws prohibit the disturbance or removal of cultural resources. Violators are subject to criminal and civil penalties. Cultural resources include but are not limited to foods, weapons, weapon projectiles, tools, structures, pit houses, rock paintings, rock carvings, graves, human skeletal materials, or any portion or piece thereof. Visitors are required to report suspicious activities to project management.

7.2.6 Research and Education

Natural sciences research and educational activities are encouraged. Researchers should contact project management prior to submitting proposals. Educational groups should contact the BPT Wildlife Headquarters at (541) 573-1375 with requests for field visits.

8.0 Monitoring and Evaluation

This Monitoring and Evaluation (M&E) Plan lays out a preliminary framework that will allow for evaluation of the efficacy of employed strategies in achieving Project habitat objectives. The M&E plan emphasizes cooperative efforts among Project managers and other stakeholders, and is designed to:

- Evaluate success of habitat management strategies, via monitoring of wildlife species response. The results of focal species monitoring and evaluation efforts are expected to function as potential performance measures to monitor and evaluate the results of implementing management strategies and actions on focal habitats.

- Determine if management strategies and protection and enhancement measures are achieving desired habitat management conditions over time.

- Facilitate coordination and tracking of management activities, periodic review of progress, and a basis for recommended adjustments to management direction over time (adaptive management).

The M&E plan consists of a variety of quantitative elements, ranging from scientific wildlife and vegetation surveys, analyses of project location and acreage, to simple enumeration of land use projects/regulations. Organization of the monitoring and evaluation plan is as follows:

- Focal habitat monitoring methodology

- Focal species monitoring methodology

8.1 Habitat and Species Monitoring Protocols

Recommended monitoring and evaluation strategies outlined below, including sampling and data analysis and storage, are derived from national standards established by Partners in Flight for avian species (Ralph et al. 1993, 1995) and habitat monitoring (Nott et al, 2003). Deer and elk sampling methodology follow standard protocols established by the Washington Department of Fish and Wildlife (P. Fowler, WDFW, pers comm., 2004). In addition, protocols for specific vegetation monitoring/sampling methodologies are drawn from USDA Habitat Evaluation Procedure standards (USFWS 1980a and 1980b). A common denominator in the following

monitoring strategies is the establishment of permanent roadside and off-road census stations to monitor bird population and habitat changes.

Wildlife managers will include statically rigorous sampling methods to establish links between habitat enhancement prescriptions, changes in habitat conditions and target wildlife population responses.

8.1.1 Vegetation Monitoring and Evaluation

Specific methodology for selection of Monitoring and Evaluation sites within all focal habitat types follows a probabilistic (statistical) sampling procedure, allowing for statistical inferences to be made within the area of interest. The following protocols describe how M&E sites will be selected.

- Vegetation/HEP monitoring and evaluation sites are selected by combining stratified random sampling elements with systematic sampling. Project sites are stratified by cover types (strata) to provide homogeneity within strata, which tends to reduce the standard error, allows for use of different sampling techniques between strata, improves precision, and allows for optimal allocation of sampling effort resulting in possible cost savings (Block et al. 2001). Macro cover types such as shrub-steppe and forest are further sub-cover typed based on dominant vegetation features e.g., percent shrub cover, percent tree cover, and/or deciduous versus evergreen shrubs and conifer versus deciduous forest. Cover type designations and maps are validated prior to conducting surveys in order to reduce sampling inaccuracies.

- Pilot studies are conducted to estimate the sample size needed for a 90% confidence level with a 10% tolerable error level (Avery 1975) and to determine the most appropriate sampling unit for the habitat variable of interest (BLM 1998). In addition, a power analysis is conducted on pilot study data (and periodically throughout data collection) to ensure that sample sizes are sufficient to identify a minimal detectable change of 20% in the variable of interest with a Type I error rate ≤0.10 and P = 0.9 (BLM 1998, Hintze 1999, Block et al. 2001). M&E includes habitat trend condition monitoring on the landscape scale (Tier 1-HEP) and plant community monitoring (Tier 2) i.e., measuring changes in vegetative communities on specific sites.

- HEP surveys will be repeated at five-year intervals. Specific transect locations within strata are determined by placing a Universal Transverse Mercator (UTM) grid over the study area (strata) and randomly selecting “X” and “Y” coordinates to designate transect start points (or through use of a computer random coordinate program). Random transect azimuths are chosen from a computer generated random number program, or from a standard random number table. Data points and micro plots are systematically placed along the line/point intercept transect at assigned intervals. Sample sizes for statistical inferences are determined by replication and systematic placement of lines of intercept within the strata with sufficient distance between the lines to assume independence and to provide uniform coverage over the study site (project managers are encouraged to duplicate existing transects).

- Permanent vegetation monitoring transect locations are determined by placing a UTM grid over the strata and randomly selecting “X” and “Y” coordinates to designate plot locations as described for HEP surveys. One hundred meter baseline transect azimuths are randomly selected from a random numbers table. Ten perpendicular 30 meter

transects are established at 10 meter intervals along the baseline transect to form a 100m x 30m rectangle (sample unit). Micro plot (percent aerial cover, basal cover, nested frequency) and shrub intercept data are collected at systematic intervals on the perpendicular transects.

By systematically collecting and analyzing frequency, height, and percent cover data, vegetative trends can be determined and tracked. Likewise, the effectiveness of weed control methods can be evaluated and adjusted accordingly. Locations of target weeds e.g. knapweed, Medusahead, and other plant species of interest will be mapped using Global Positioning System (GPS) equipment. This information will be used to develop an annual weed control plan and document habitat/plant community trends.

Active restoration sites will be monitored to determine success/failure of restoration activities and to determine if management actions have been carried out as planned (implementation monitoring). In addition, monitoring results will be evaluated to determine if management actions are achieving desired management objectives (effectiveness monitoring) and to provide evidence supporting the continuation of proposed management actions.

Areas planted to native shrubs/trees and/or seeded to herbaceous cover will be monitored annually (post planting/seeding) until established to determine shrub/seeding survival, and causes of shrub/tree mortality and seeding failure e.g. depredation, climatic impacts, poor site conditions, poor seed/shrub sources. Causes of seeding or planting failure will be identified, and planting methods/site preparation modified as necessary to achieve management objectives. Monitoring will provide essential feedback for demonstrating adequacy of conservation efforts on the ground, and guide adaptive management.

8.1.1.1 Sampling Design

HEP is a standardized habitat-analysis strategy developed by the USFWS. It uses a variety of Habitat Suitability Indices for select wildlife species to evaluate the plant community as a whole (Anderson and Gutzwiller 1996). Sites are stratified by cover type, and starting points are established using a random number grid. Minimum length of a HEP transect is 600 feet on upland sites. Patches of cover must be large enough to contain a minimum transect without extending past a 100 foot buffer inside the edge of the cover type. (Riparian zone width within the subbasins may require modification of this 100-foot buffer requirement.)

1. Herbaceous measurements are taken every 20 feet on the right side of the tape (the right is always determined by standing at 0 feet and facing the line of travel). The sampling quadrat is a rectangular 0.5m^2 micro-plot or other suitable frame (micro-plot size is determined through coefficient of variation analysis during pilot study), placed with the long axis perpendicular to the tape, and the lower right corner on the sampling interval.

2. Shrub canopy cover is measured using a point intercept method if shrub cover is estimated greater than 5%. If the total shrub cover is anticipated to be >20%, shrub data are collected every 5 feet (20 possible “hits” per 100 ft segment). If shrub canopy cover is anticipated to be <20%, data are collected every 2 feet (50 possible “hits” per 100 feet segment). If shrub cover is estimated less than 5%, more accurate results are obtained using the shrub intercept method. Regardless of method, the sampling unit is a 100-foot segment of the transect.

Shrub height measurements are collected on the tallest part of a shrub that crosses directly above/below each sampling intercept mark. For shorter shrub classifications (e.g. all shrubs less than 3 feet), the tallest shrub is measured that falls within that category.

3. Tree canopy cover measurements are taken at five or ten foot intervals along the transect (point intercept using a spherical densitometer or similar instrument). As with shrubs, the sampling unit is a 100 foot segment of the transect. Measurement interval is determined by visually estimating tree canopy closure prior to initiating the survey. If canopy closure is less than 10%, a five-foot interval is recommended; greater than 10% canopy closure, a ten-foot interval is used. Basal and snag measurements are taken within a tenth-acre circular plot at the end of each 100 ft segment. The center point of the circular plot is the 100 ft mark of the transect tape, and the radius of the circle is 37.2 feet Belt transects can also be used to collect snag data. A tenth-acre belt transect is 44 feet wide by 100 feet long (sample unit) or 22 feet on each side of the transect tape, paralleling the transect tape.

Analysis: Transects are divided into 100-feet segments, and total transect length is determined using a "running mean" to estimate variance (90% probability of being within 10% of the true mean).

Sample size equation: $n = \frac{t^2 \times s^2}{E^2}$

Where: t = value at 90 percent confidence interval with suitable degrees of freedom
s = standard deviation
E = desired level of precision, or bounds

8.1.2 Wildlife Species Monitoring

Species response to habitat protection and manipulation activities is an effective tool to measure the success of habitat management objectives and strategies. Endemic wildlife species such as elk, mule deer, and sage grouse (shrubsteppe habitat) and migratory passerines including yellow warbler (riparian shrub/riverine habitat) were selected as monitoring species. Mule deer and yellow warbler are also HEP/BPA mitigation loss assessment species. All wildlife monitoring efforts should be a cooperative effort between the BPT, BLM, and ODFW. Suggested species monitoring protocols are described below.

8.1.2.1 Yellow Warbler: Riparian Shrub/Riverine Habitat

Sampling Strategy: Survey points will be placed among habitat types of interest using a stratified random design. Number of survey points in each habitat type will be determined using a power analysis with the goal of being able to detect a 25% increase in abundance of yellow warbler with a power of 0.8 or greater (H. Ferguson, WDFW, pers comm., 2004). This protocol is based on the point count survey (Ralph et al. 1993; Ralph et al. 1995), with each survey station referred to as a "point count station." In addition to these bird survey data, information about the distance at which individual birds are detected will also be collected, allowing absolute density estimated to be made using distance-sampling methodology (e.g., the program DISTANCE).

Methods: Yellow warblers will be surveyed on randomly selected (stratified) points along the riparian corridor. Each site will have four 100-m fixed-radius point counts (Ralph et al. 1993) established along a transect and spaced 200 m apart. Each point will be marked with a

permanent fiberglass stake (1 m electric fence post) and colored flagging will be placed on shrubs at 50 and 100 m from the point in each of the 4 cardinal directions to aid in determining distance. Counts at each point will be 5 minutes in duration during which all birds seen or heard will be noted, along with their sex (if known), distance from the point (within 50m, >50 but <100m, or beyond 100m), and behavior (singing, calling, silent, or flying over the site). Surveys will be conducted once each in May and June and within prescribed weather parameters (e.g., no rain and low wind).

Analysis: Analysis is described by Nur et al. (1999). Absolute density estimation (see Buckland et al. 1993) can be estimated using the program DISTANCE, a free program available on the internet (http://www.ruwpa.st-and.ac.uk/distance); an example is given in Nur et al. (1997). In brief: for species richness and species diversity, these can be analyzed as total species richness or as species richness for a subset of species; the same is true for species diversity. Species diversity can be measured using the Shannon index (Nur et al. 1999), also called the Shannon-Weiner or Shannon-Weaver index. Statistical analysis can be carried out using linear models (regression, ANOVA, etc.), after appropriate transformations (examples in Nur et al. 1999).

In addition, at any permanently established avian species monitoring site established within the Riverine Wetland habitat, structural habitat conditions will be monitored every 5 years as per Habitat Structure Assessment protocol (Nott et al 2003) (http://www.birdpop.org/DownloadDocuments/manual/HSAManual03.PDF

8.1.2.2 Elk: Shrubsteppe Habitat

Monitoring Methods: Annual aerial elk surveys will be conducted as funding permits each March using sightability protocol (Unswort et al. 1994). This survey provides data on population status, age/sex ratios, and herd distribution. It is important to maintain the accuracy of sightability surveys by surveying 70% of the survey zones. The survey usually entails 25-30 hours of helicopter time (Hiller); costs listed (550/hr. = $16,500 + $500 fuel trk. = $17,000). Other protocols may be used in place of and/or in addition to the above protocol. The harvest of bulls and antlerless elk will be monitored and evaluated using data from mandatory hunter reports.

Evaluation Strategies:

1. Use data from sightability survey and model to determine if the elk population is meeting population management objectives.

2. Use survey data to determine if bull escapement goals meet management objectives.

3. Monitor harvest levels for bulls and antlerless elk using the hunter reporting system.

8.1.2.3 Mule Deer: Shrubsteppe Habitat

Monitoring Methods: Mule deer populations will be monitored using a combination of pre and post hunting surveys and harvest data. Post-season buck survival and fawn production and recruitment will be monitored. Harvest data is used to monitor buck harvest trends, which is also an indicator of population trend.

Evaluation Strategies:

1. Use late summer-early fall (pre-season) ground surveys to determine pre-hunt buck/fawn to doe ratios.

2. Use winter aerial and ground surveys to determine post-hunt buck/fawn to doe ratios.

3. Monitor harvest level of bucks and anlterless deer using mandatory hunter report system.

8.1.2.4 Sage Grouse: Shrubsteppe Habitat

Monitoring Methods: Male greater sage grouse congregate during the spring on relatively traditional breeding sites, usually referred to as 'leks' or 'lek complexes'. Females visit these sites during the peak of the breeding season to 'select' and copulate with males. These lek surveys are designed to be consistent with similar surveys being conducted on an annual basis in all western states with populations of either greater sage grouse or sharp-tailed grouse.

Leks usually are difficult to observe. Lek counts should consist of a complete count of birds (differentiate by sex when possible). There should be at least 2 counts of each active lek, although one is better than none. Potential locations may need to be surveyed two to four times to be certain that birds are absent. This is particularly true for small and isolated populations. Leks with small numbers of sage grouse are difficult to find because noise levels are low. Counts should be spaced at least 10 day intervals between 10 March and 25 May. The peak of activity (female attendance and breeding) is early April in most years.

Searches can be conducted by 'listening' for displaying males at points along roads, trails, ridges, or fence lines. The sound that can be heard best is the low 'coo' note produced. Under perfect conditions, this noise can be heard for at least a mile. Listening points should be a maximum of 0.5 miles apart. Listening surveys can be initiated about 0.75 hours before sunrise and continued for two hours. Listen for at least 5 minutes per station.

If the lek complex cannot be clearly observed without disturbance, then birds may have to be counted when flushed. Flushing is best accomplished with at least two observers or one person with a trained dog, as peripheral birds often will not flush if the observer is too far away. Males are often best counted returning to the leks. In many situations, a viewpoint is available that permits careful observation of birds with the aid of a spotting scope. Multiple counts of a large lek in a single morning may be needed to insure an accurate and consistent count. This can be done by scanning from left to right and then from right to left and then repeating the procedure 10-15 minutes later. Observers should be aware that young males and/or males on the edge of lek may be difficult to see. Likewise young males may be difficult to differentiate from females

Lek counts should be conducted when the weather is good (wind < 10 MPH, no precipitation, temperatures > 20^{o}F, >50% bare ground). Weather matters less during the peak of the breeding season (late-March for greater sage-grouse). If the weather is not acceptable, it is likely the count will be abnormally low and should be repeated.

Counts may be low if the birds are disturbed by predators (golden eagles, red-tailed hawks, coyotes, etc.), by people (photographers, bird watchers, farmers, etc.), or by unknown factors. Greater sage grouse will often remain off the lek until the next morning once disturbed.

8.1.2.5 Sage Sparrow, Brewer's Sparrow, Sage Thrasher: Shrubsteppe Habitat

Sampling Strategy: Survey points will be established using a stratified random design. Number of survey points in each habitat type will be determined using power analysis with the goal of being able to detect a 35% increase in abundance of key species with a power of 0.8 or greater.

Methods: Birds will be surveyed on five sites in different vegetation sub-types and levels of fragmentation. Each site will have four 100 m fixed-radius point counts (Ralph et al. 1993) established along a transect and spaced 200 m apart. The outer points of the point-count circles will describe a rectangular plot of 16 ha that will be the focus of all survey work. Each point will be marked with a permanent fiberglass stake (1m electric fence post) and colored flagging will be placed on shrubs at 50 m and 100 m from the point in each of the 4 cardinal directions to aid in determining distance. Counts at each point will be 5 minutes in duration during which all birds seen or heard will be noted, along with their sex (if known), distance from the point (within 50 m, >50 but <100 m, or beyond 100 m), and behavior (singing, calling, silent, or flying over the site). Surveys will be conducted once each in May and June and within prescribed weather parameters (e.g., no rain and low wind).

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Appendix A

Sage grouse (*Draft Malheur Subbasin Plan 2004* - unedited)

The sage grouse is an upland gamebird species that is associated with sagebrush habitat. It is one of four focal species chosen for the subbasin to provide an indication of the health and functioning of shrub-steppe habitat within the Malheur watershed. The USFWS was recently petitioned to list the sage grouse as a Threatened or Endangered subspecies. Regional populations of sage grouse are experiencing notable declines. On January 5, 2004 the USFWS determined that divided listings for subspecies and regional populations were "without merit" based upon a lack of genetic and population evidence defining these smaller species groups as Distinct Population Segments eligible for species listing. However, the USFWS has yet to provide a determination of merit for the entire greater sage grouse population, which remains petitioned for listing as Threatened or Endangered. Such a determination was to be provided by the USFWS by March 29, 2004, but was not made available by the date of this writing.

Sage-grouse populations are known to be migratory or non-migratory (resident) (Beck 1975, Berry and Eng 1985, Connelly et al.1988, and Wakkinen 1990), depending upon location and associated landform. Where topographic relief exists, sage grouse often move to higher elevations from spring through fall as snow melts and plant growth advances (Interagency Sage Grouse Planning Team 2000). Non-migratory populations may spend the entire year within an area of 100 square kilometers or less in size. In migratory populations, seasonal movements may exceed 75 km, and home ranges may exceed 1,500 square kilometers (Interagency Sage Grouse Planning Team 2000). There may be two or more seasonal ranges in such cases. For example, there may be a breeding range, a brood-rearing range, and a winter range, indicating that migratory sage-grouse populations depend on large expanses of habitat.

Sage grouse breed on sites called leks (strutting grounds). The same lek sites tend to be used year after year (Interagency Sage Grouse Planning Team 2000). They are established in open areas surrounded by sagebrush, which is used for escape and protection from predators (Gill 1965, Patterson 1952). Examples of lek sites include landing strips; old lake beds or playas; low sagebrush flats; openings on ridges; roads; crop land; and burned areas (Connelly et al. 1981, Gates 1985). As grouse populations decline, the number of males attending leks may decline or the use of some leks may be discontinued. Likewise, as populations increase, male attendance on leks increases, new leks may be established, or old leks may be reoccupied. Annual counts of males on leks are used to assess population trends.

Christian Hagen, ODFW Biologist in the Malheur River WMU, coordinates ODFW monitoring of sage grouse populations within the Malheur subbasin. He also works with the Western Association of Fish and Wildlife Agencies – a constellation of state and Federal resources agencies – to develop a range wide assessment of the sage grouse populations. Mr. Hagen reports that up to 50 sage grouse lek sites may exist within the Malheur subbasin (C. Hagen, ODFW Biologist, pers. comm.). These potential sites were originally identified through a helicopter survey but have not been revisited since 1997.

ODFW has collected data at a single active lek site in the Malheur subbasin since the late 1950's and 6 lek sites have been monitored to help assess recent trends in population status since 1994. Population data resulting from this recent effort indicate that sage grouse populations in the Malheur watershed are currently stable. Since 1993 when specific productivity data for the species in the subbasin has been collected, ODFW calculates the average chicks/hen ratio at 1.5. Since this time, ODFW has allowed an average harvest of 91 birds per year (C. Hagen, ODFW Biologist, pers. comm.).

ODFW and other monitoring resource agencies have requested that additional specific information on regional sage grouse population abundance and distribution remain confidential until after the USFWS has made a definitive determination for the species. In general, sage grouse populations remain stable in the basin despite the negative impact of sage steppe habitat degradation. As the shrub component of the species preferred habitat decreases, the likelihood of abandonment of habitat and even historic lek sites increases. Shrubby vegetation, especially big sagebrush, is necessary to provide cover for species flocks and without this important habitat requirement sage grouse occurrence in the watershed may decline.

Figure 1 (below) showing the current and historic distribution of sage grouse throughout the species range was taken from *Greater Sage Grouse and Sagebrush-Steppe Ecosystems, Management Guidelines* (Interagency Sage Grouse Planning Team 2000). This report was developed by the Interagency Sage Grouse Planning Team, which includes the BLM, USFWS, USFS, ODFW and the Oregon department of State Lands. The management guidelines and supporting background information provided in the report are intended to promote the conservation of greater sage grouse and their sagebrush habitats on Oregon and Washington public lands administered by the BLM. Figure 1 reveals the extreme decline in sage grouse range in throughout North America. While these population declines range wide are notable, trends in sage grouse population in the vicinity of the Malheur subbasin are not easily detected.

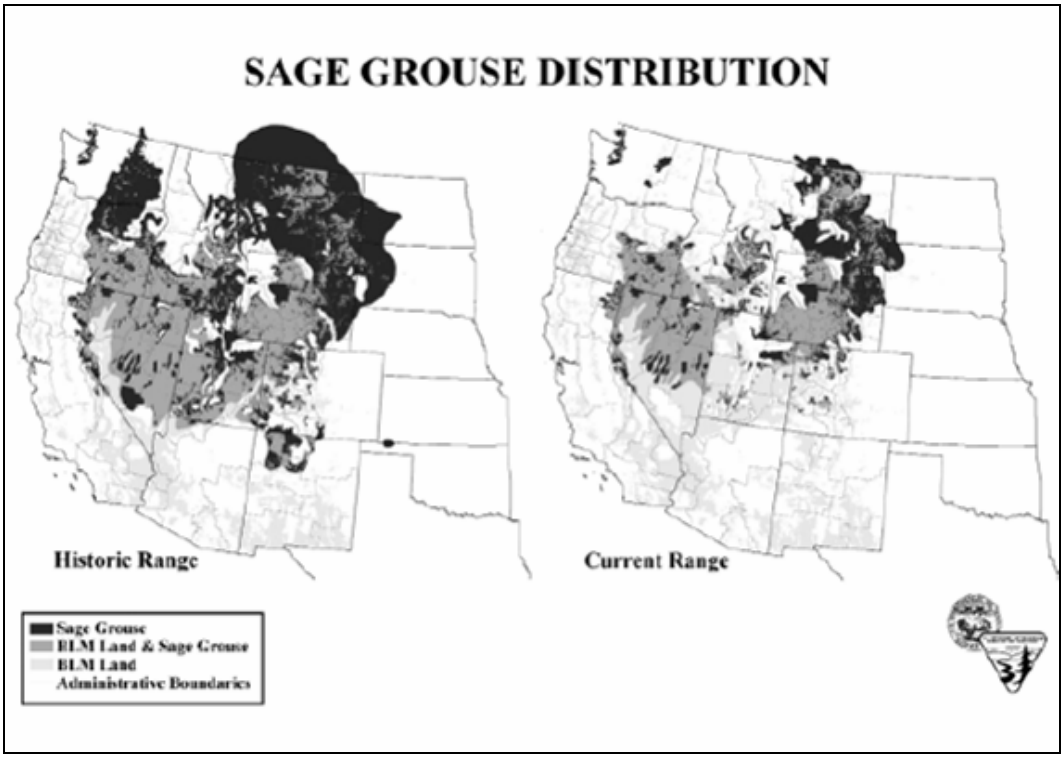

Figure A-1. Current and Historic Sage Grouse Range in North America (Interagency Sage Grouse Planning Team 2000).

Figure 2 shows the trend in sage grouse population change from 1966 through 1996 based on BBS[13] detection data. Although sage grouse have experienced precipitous declines on average across the species range, Figure 2 shows that populations may be increasing regionally in Southeastern Oregon. In the specific vicinity of the Malheur watershed, however, it is difficult to determine the exact trend toward sage grouse population change. Additional information on the species' historic and current population status will be made available as the USFWS continues to evaluate the petition for listing range-wide.

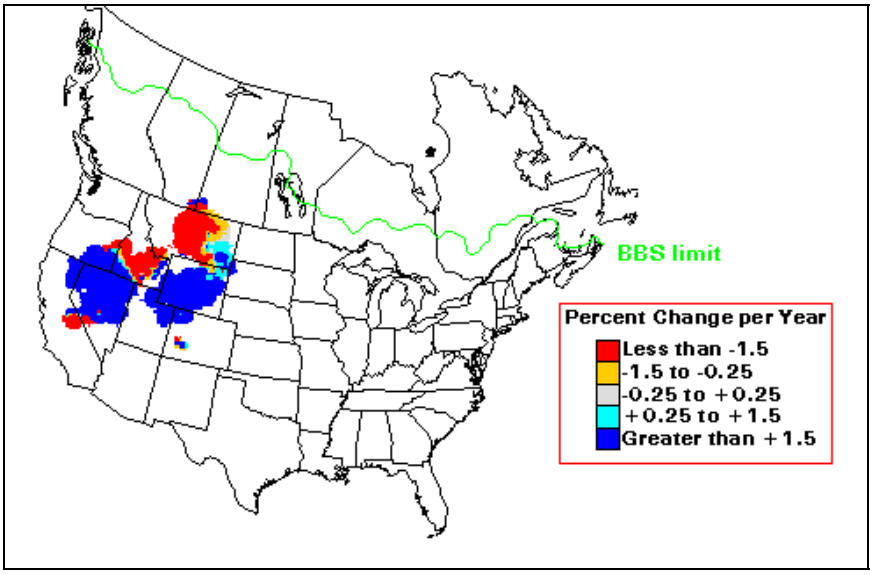

Figure A-2. Sage grouse BBS trend map, 1966 – 1996 (Ashley and Stovall 2004)

[13] The North American Breeding Bird Survey (BBS) is coordinated by the USGS and Canadian Wildlife Service. It is a primary source of population trend and distribution information for most species of North American birds. The survey unit is a roadside route of 39.4 km (24.5 miles) long. An observer surveys the route once each year during the peak of the breeding season for that region. The observer stops at 0.8 km (0.5 mile) intervals, and records all birds seen or heard within a 0.4 km radius circle of each stop during a 3-min sampling period. The starting point and direction of each route is randomly located within a degree block of latitude and longitude. Overall sampling efficiency of the BBS was evaluated and determined that trend analysis is limited for bird species with the following attributes: 1) not sampled by the BBS, 2) small sample-size, 3) highly variable, or 4) low relative abundance. Possession of one of these attributes does not necessarily eliminate the species from trend analyses. These species can be well surveyed by the BBS within portions of their breeding range or during certain time periods. However, long-term regional or survey-wide trend estimates for these species may be less accurate (http://www.mbr-pwrc.usgs.gov/bbs/introbbs.html).

Other BBS biases include:

1) Proportion of range in the survey area- Data is limited to survey routes. Analysis of survey data cannot tell us the proportion of the individuals of a species that is breeding outside the range of the survey. Species that are recorded only on the margins of the surveyed area are often of low sample size or are highly variable, but many species (e.g., Canada Goose) may have substantial populations within the survey area. Trends are always specific to the areas surveyed.

2) Roadside biases-The BBS is a roadside survey, and a major criticism of the survey has been that habitat changes along roadsides may not be representative of regional habitat changes. Trends from the BBS may therefore reflect only populations along roads rather than regional bird population changes.

3) Habitat biases-Within the range of the BBS, many habitats are not well covered, and species that specialize in those habitats are poorly sampled. Wetland birds and species occupying alpine tundra habitats are examples of groups that are thought to be poorly represented in the survey (http://www.mbr-pwrc.usgs.gov/bbs/introbbs.html).

As a shrubsteppe obligate species, sage grouse are generally associated (A) and/or closely associated (C) and dependent upon most grass/forbs and shrub structural conditions for breeding and brood rearing activities (B) (Table 1)[14]. In addition, this species' winter diet is exclusively sagebrush while insects and forbs are utilized throughout the spring and summer.

Table A-1. Sage grouse structural conditions and association relationships (NHI 2003).

Common Name	Focal Habitat	Structural Condition (SC)	SC Activity	SC Assoc.
Sage Grouse	Shrubsteppe	Grass/Forb-Closed	B	C
		Grass/Forb-Open	B	C
		Low Shrub-Open Shrub Overstory-Mature	B	C
		Low Shrub-Open Shrub Overstory-Old	B	A
		Low Shrub-Open Shrub Overstory-Seedling/Young	B	C
		Medium Shrub-Open Shrub Overstory-Mature	B	C
		Medium Shrub-Open Shrub Overstory-Old	B	A
		Medium Shrub-Open Shrub Overstory-Seedling/Young	B	C

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Berry, J. D., and R. L. Eng. 1985. Interseasonal movements and fidelity to seasonal use areas by female sage grouse. Journal of Wildlife Management 49:237-240.

Connelly, J. W., H. W. Browers, and R. J. Gates. 1988. Seasonal movements of sage grouse in southeastern Idaho. Journal of Wildlife Management 52:116-122.

Connelly, J. W., W. J. Arthur, and O. D. Markham. 1981. Sage grouse leks on recently disturbed sites. Journal of Range Management 52:153-154.

[14] The Northwest Habitat Institute (NHI), through the Interactive Biodiversity Information System (IBIS), identified structural conditions (SC) and structural condition activity associations for wildlife species that occur in Oregon and Washington States. Structural condition associations are important because that is the level at which most habitat management occurs. Structural conditions and associated tables can also be used to define desired future structural conditions, prioritize protection strategies, and guide wildlife managers in identifying important structural condition considerations when making species specific shrubsteppe management decisions. Land managers are also encouraged to review the key environmental correlates (fine filter) associated with structural conditions (course filter) in the NHI database (2003) to gain additional insights into habitat functionality and quality.

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Wakkinen, W. L. 1990. Nest site characteristics and spring-summer movements of migratory sage grouse in southeastern Idaho. M. S. thesis, University of Idaho, Moscow. 57 pp.

Mule Deer (*Draft Malheur Subbasin Plan 2004 – unedited*)

The Rocky Mountain mule deer (Odocoileus hemionus hemionus) is native to Eastern Oregon and the largest member of the genus found in Oregon (ODFW 2001). Historically, populations in Oregon have fluctuated. Explorers in the early 1800s reported a scarcity of big game, and then 20 years later, gold miners reporting abundant deer herds. This century has seen similar fluctuations in the State of Oregon. Scientific studies of the 1930s reported that between 1926 and 1933 Oregon's mule deer population ranged from 39,000 to 75,000 animals (ODFW 2001). The estimated population in 1996 was 260,700, which was 18 percent below the established statewide management objective of 317,400 mule deer. Mule deer populations have been generally declining throughout western North America during the last several years (ODFW 2001).

Female mule deer generally breed as yearlings (18 months old) and adult does typically produce twins each year when sufficient habitat is available. In Oregon, fawns are born in mid-May to early June, approximately 7 months after breeding. Fawn survival to breeding age largely determines the growth or decline of mule deer populations. Major factors contributing to mortality include nutrition, weather, habitat quality, predation, and accidents, among others (ODFW 2001).

Mule deer occupy a wide range of habitat types: from desert shrub-steppe to coniferous and deciduous woodlands. In general, however, mule deer occupy more open, rugged areas. Although mule deer commonly are considered to be "browsers", they consume a wide variety of plant materials and in some seasons graze extensively (ODFW 2001). During summer, deer are scattered over much of eastern Oregon. Winter weather forces deer to migrate to lower elevations. Winter is a critical period of life for mule deer when they rely on occasional browsing of shrubs and trees for survival. Sagebrush, bitterbrush, rabbit-brush, juniper, and mountain-mahogany, are among those species typically browsed (ODFW 2001). In the most productive winter ranges of Central and Southeastern Oregon, favorite shrubs such as bitterbrush and mountain mahogany stand above the snow, in typical years, providing winter food and shelter. The importance of mountain mahogany as transitional forage for mule deer compelled inclusion of the mule deer as a Malheur Subbasin focal species associated with mountain mahogany habitats.

Mule deer populations throughout the Malheur subbasin are experiencing notable declines (W. Van Dyke, ODFW Biologist, pers. comm.). The population size MO for mule deer within the Beulah WMU is established at 13,700 individuals. This MO had been nearly met up until 1996 when the Beulah WMU mule deer herd size was estimated at around 13,000 individuals. Since 1996 the Beulah WMU herd has suffered steady declines and is currently estimated at around 10,000 deer.

The Malheur River WMU mule deer population has experienced trends similar to that of the Beulah WMU herd. The population size MO for mule deer in the Malheur River WMU, like that of the Beulah WMU, is established at 13,700 individuals. The Malheur River herd was estimated at over 11,000 deer through around the mid 1990s, and then the population began to decrease (R. Garner, ODFW Biologist, pers. comm.). The current size of the Malheur River WMU mule deer herd is approximately 10,700 individuals, 78% of the desired population MO (R. Garner, ODFW Biologist, pers. comm.).

Combining current population estimates for the Beulah and Malheur River WMUs, the approximate size of the mule deer herd in the Malheur subbasin is 20,700 individuals.

Combined population size MOs for these two WMUs indicates that ODFW has determined that the subbasin should support a minimum of 27,400 deer. These estimates indicate that the population of mule deer occurring in the Malheur River subbasin currently exists at about 25% under ODFW population size MOs.

Table 1 below provides harvest statistics on mule deer for the Beulah and Malheur River WMUs. Decreases in the percent success experienced by hunters in these WMUs reflect declining mule deer populations.

Table A-2. Rocky Mountain Mule Deer Harvest in the Beulah and Malheur River WMUs 2000-2002 (ODFW unpublished data).

WMU/Year	# of Hunters	Hunter Days	Antlerless	Total Buck	Total Deer	% Success
Beulah 2000	2761	13777	311	1199	1510	55
Beulah 2001	3230	16157	475	1376	1851	57
Beulah 2002	3174	17197	395	1149	1544	49
Malheur R. 2000	2374	15218	25	1016	1041	44
Malheur R. 2001	2496	13145	22	1090	1112	45
Malheur R. 2002	2639	17236	8	896	904	34

Noted declines in mule deer populations within the Malheur Subbasin result from a combination of factors. First, mule deer predation by cougars and coyote in the vicinity of the Malheur Subbasin is thought to be at record high levels (W. Van Dyke, ODFW Biologist, pers. comm.). Cougars are known to take all age classes of mule deer, while coyote predation is principally focused on fawns and weakened individuals within a herd. Such predation pressure has, in recent years, resulted in both low fawn/adult ratios and decreased adult survival (W. Van Dyke, ODFW Biologist, pers. comm.).

The second, and most robust, factor influencing declines in mule deer populations within the Malheur Subbasin, is the degradation of shrub-steppe habitat – specifically, the reduction in available mountain mahogany and other shrub species. A habitat requirement and key environmental correlate for Malheur Subbasin populations of mule deer is the presence of shrub forage species in shrubsteppe winter habitat. A combination of influences including fire suppression and range use patterns has resulted in the encroachment of juniper into shrub-steppe habitat. Juniper, with its extensive hydrological demands and ability to withstand altered fire regimes, out-competes native shrub species including mountain mahogany and bitterbrush. Such shrub species are a necessary component in mule deer winter and transitional habitat in that they provide forage for deer above deep snow cover. Without these important shrubby forage species, winter habitat in the Malheur Subbasin cannot maintain historic mule deer populations.

Mule deer are generally associated (A) with most, if not all, structural conditions found in shrubsteppe habitats. This generalist species utilizes both grass/forbs and shrub habitats during breeding (B) (Table 2).

Table A-3. Mule deer structural conditions and association relationships (NHI 2003).

Common Name	Focal Habitat	Structural Condition (SC)	SC Activity	SC Assoc.
Mule Deer	Shrubsteppe	Grass/Forb-Closed	B	A
		Grass/Forb-Open	B	A
		Low Shrub-Closed Shrub Overstory-Mature	B	A
		Low Shrub-Closed Shrub Overstory-Old	B	A
		Low Shrub-Closed Shrub Overstory-Seedling/Young	B	A
		Low Shrub-Open Shrub Overstory-Mature	B	A
		Low Shrub-Open Shrub Overstory-Old	B	A
		Low Shrub-Open Shrub Overstory-Seedling/Young	B	A
		Medium Shrub-Closed Shrub Overstory-Mature	B	A
		Medium Shrub-Closed Shrub Overstory-Old	B	A
		Medium Shrub-Closed Shrub Overstory-Seedling/Young	B	A
		Medium Shrub-Open Shrub Overstory-Mature	B	A
		Medium Shrub-Open Shrub Overstory-Old	B	A
		Medium Shrub-Open Shrub Overstory-Seedling/Young	B	A
		Tall Shrub-Closed Shrub Overstory-Mature	B	A
		Tall Shrub-Closed Shrub Overstory-Old	B	A
		Tall Shrub-Closed Shrub Overstory-Seedling/Young	B	A
		Tall Shrub-Open Shrub Overstory-Mature	B	A
		Tall Shrub-Open Shrub Overstory-Old	B	A
		Tall Shrub-Open Shrub Overstory-Seedling/Young	B	A

References

Ashley, P.A., S. H. Stovall. 2004. Southeast Washington Subbasin Planning Ecoregion Wildlife Assessment.

NHI (Northwest Habitat Institute). 2003. Interactive Biodiversity Information System. A wildlife information database established and maintained by the Northwest Habitat Institute. Corvallis, OR.

ODFW 2001. 2001 big game statistics. Oregon Department of Fish and Wildlife. Portland, OR. 117 pp.

California Bighorn Sheep (*Draft Malheur Subbasin Plan 2004 - unedited*)

Historically, 2 subspecies of bighorn sheep (*Ovis canadensis*) occurred in Oregon. The Rocky Mountain subspecies (*O. c. canadensis*) ranged through the northeastern corner of the State from the John Day-Burnt River divide, north and east to the Snake River and the Oregon-Washington state line. The California subspecies (*O. c. californiana*) occurred in Southeast and South-central Oregon and throughout much of the John Day and Deschutes River drainages (ODFW 2001). Settlement of the west resulted in over hunting, changes in land use, introduction of livestock and associated diseases, which negatively impacted native bighorn populations, and bighorn were completely extirpated from Oregon by 1945 (ODFW 2001). The species is included as a Malheur subbasin focal species in association with rugged high-elevation shrub-steppe habitat in the watershed.

Re-introduction and re-establishment of bighorn sheep herds has been successfully accomplished in various suitable locations throughout Oregon. This includes a herd of California bighorn sheep, which were introduced in the rugged terrain of the subbasin existing north of Riverside and south of Juntura. In 1987 and 1988 approximately 17 individuals were introduced in the higher altitude regions located north of the Warm Springs Reservoir around Black Butte (Figure 6). Although little is known about the specific historic distribution of bighorn sheep in this area, re-introduction was initiated because of the perceived suitability of habitat in the localized region (R. Garner, ODFW Biologist, pers. comm.).

Bighorn sheep live among the rocky slopes of mountainous terrain and open meadows high-altitude meadows where they forage. Seasonal species movement typically occurs between elevations of 2,500-5000 feet in the winter, to elevations of 6000-8500 in the summertime, to minimize exposure to extreme weather (Monson, 1980). Within the Malheur subbasin, the bighorn sheep herd is confined to the lower end of the species' elevational range (Black Butte elevation is 5,513 feet), but general movement to lower elevations during the winter is still common. The sheep are unable to paw through thick snow to access vegetation, and thus typically follow the development of suitable forage plants to higher elevations as they begin to grow in the spring. In the summer and in arid desert areas, if it becomes too hot or water holes are severely depleted, bighorn sheep will rest in the daytime shade and resume their feeding at night to conserve water, even though they are ordinarily diurnal animals (Wehausen, 2002).

Typical environments where bighorn sheep have been found include alpine meadows, temperate foothill regions of coniferous and deciduous forests, low-lying scrubland, grasslands and deserts. Bighorn sheep are extremely agile on precipitous slopes, and use these areas for lambing, bedding, mating, and escaping predators (Monson, 1980). The more open areas used for feeding are only considered safe if flanked by steep rocky cliffs. The bighorn sheep's muscular bodies and hard hooves allow deft maneuvering on these steep mountains, and they are known to race up the hillside at 15 miles per hour, jumping 20 feet across deep crevices, and using footholds of only 2 inches wide (Blood, 2000). Such agility allows bighorn sheep to outrun their predators which have less-sure footing.

The current population of California bighorn sheep in the Malheur subbasin has expanded from the small, introduced herd to a current estimate of approximately 100 individuals. California bighorn sheep are a Federal Species of Concern and an Oregon Natural Heritage Program List 4 species, indicating taxa that are "of conservation concern but are not currently threatened or endangered" (ONHP 2001). The rugged terrain in which the species is found typically limits opportunities for hunting. Within the Malheur subbasin, ODFW allows an extremely restricted hunt of the Riverside herd. Over the past 5 years, bighorn sheep harvest has been limited to

less than 5 individuals a year. The herd is surveyed at least once a year by ODFW and it is thought that the population is thriving and will continue to grow within the limits of the suitable habitat available in the watershed (Figure 1).

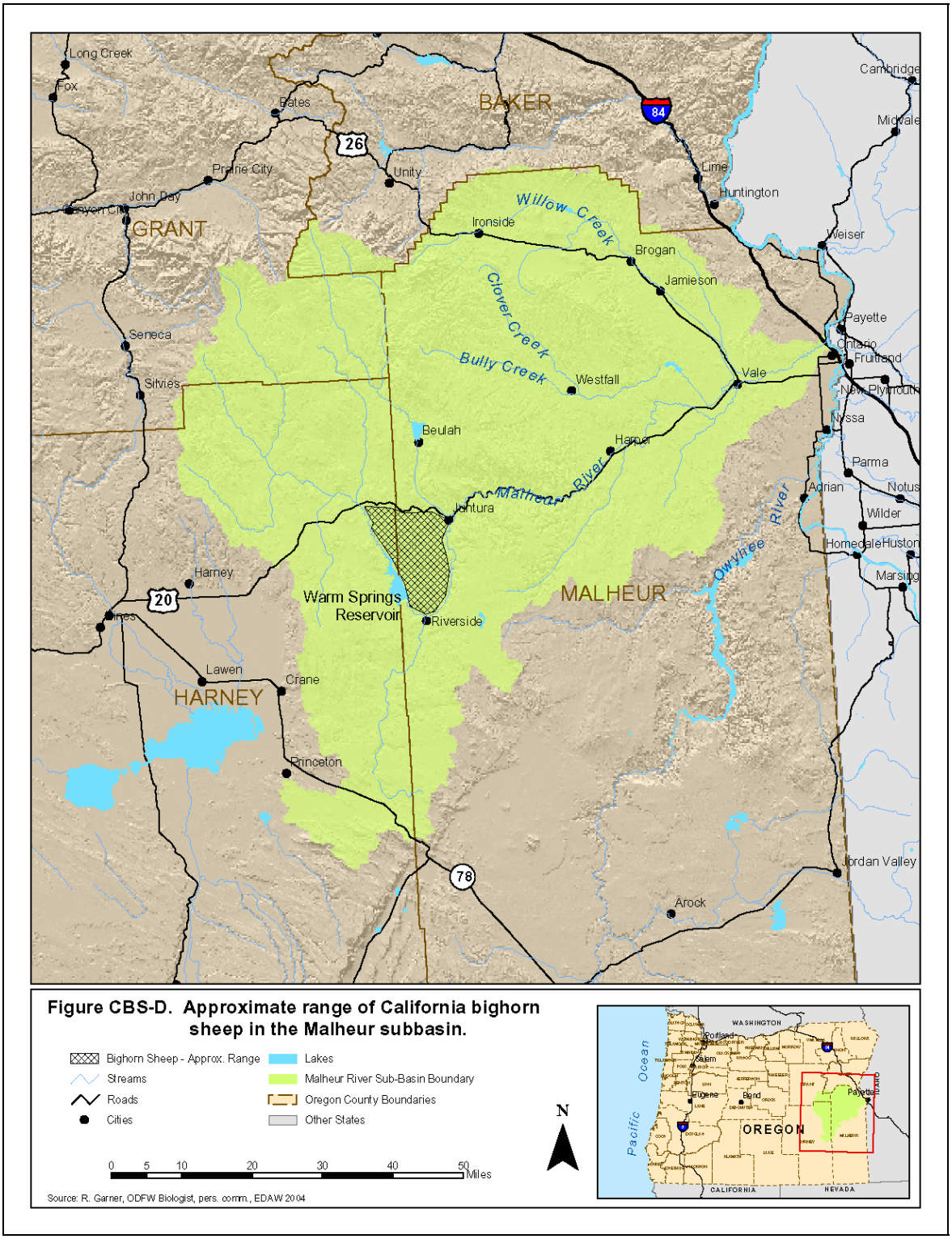

Figure A-3. Approximate Range of California Bighorn Sheep in Malheur Subbasin.

Rocky Mountain Elk (*Draft Malheur Subbasin Plan 2004 – unedited*)

Two subspecies of elk occur in Oregon: the Roosevelt elk (*Cervus elaphus roosevelti*) and the Rocky Mountain elk (*C. e. nelsoni*). Roosevelt elk occur throughout western Oregon, with concentrations in the Cascade and Coast Range Mountains (ODFW 2003a). Rocky mountain elk occur in eastern Oregon with major populations in the Blue Mountains and South-central Oregon (ODFW 2003a). Rocky Mountain elk have potential for occurrence throughout the Malheur Subbasin, and the species was chosen as a Subbasin plan focal species to provide an indication of the health and functioning of mixed coniferous forest habitat.

Rocky Mountain elk are intensely monitored and managed by ODFW. Oregon's Elk Management Plan (ODFW 2003a) provides specific elk Management Objectives (MOs) for winter population size and post-season bull ratios in each WMU. Although the Malheur Subbasin includes portions of 6 WMUs, this species assessment focuses on the Beulah and Malheur River WMUs, which comprise the vast majority of the Malheur watershed.

In general, populations of both subspecies of elk in Oregon have stabilized after being severely impacted by settlement in the 1800's, and successfully recovering following transplantations, hunting restrictions and measures for recovery implemented throughout the early 1900's (ODFW 2003a). Elk populations were reduced to only a few small herds along the coast and in Northeast Oregon by about 1910. The Oregon legislature provided protection for elk in 1899 by making it illegal to sell meat from wild animals and by closing elk season from 1909 through 1932 (ODFW 2003a). As elk populations rebounded from near decimation, complaints from private individuals about elk damage increased and elk hunting restrictions were lifted. After a 45% statewide increase in Rocky Mountain elk populations in the 1970's, elk populations within Oregon stabilized, and, in 1981, MOs for population size and bull ratios were established for most Rocky Mountain elk WMUs. Figure 50 provides estimates of Oregon State elk populations from 1979 through 2001.

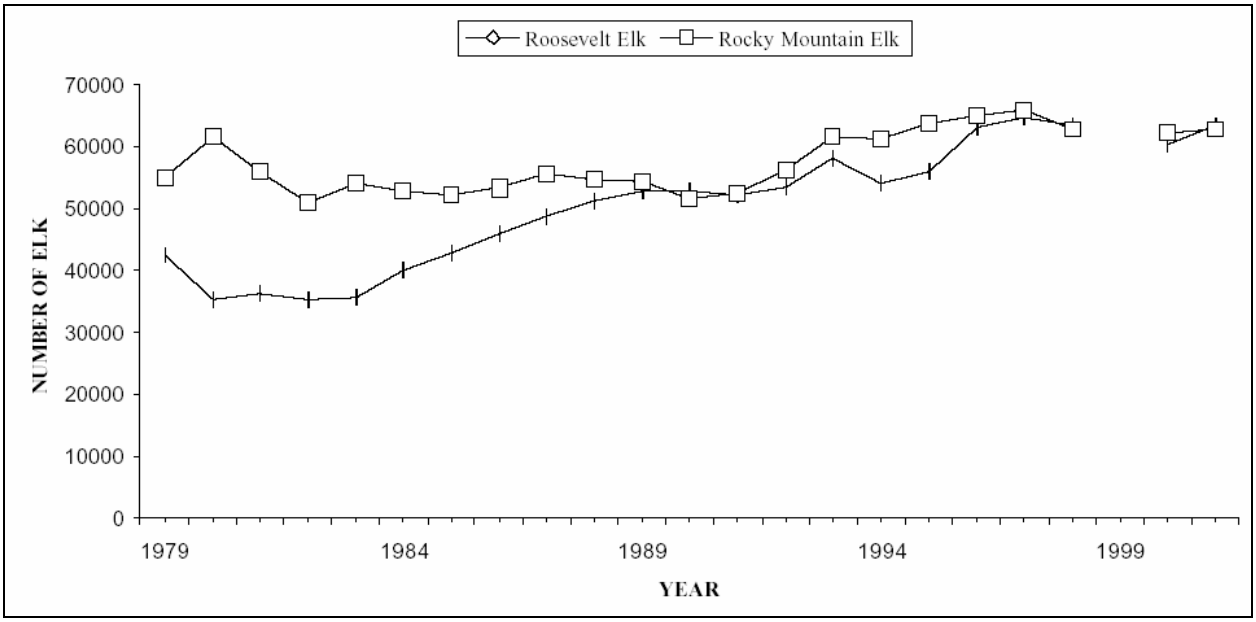

Figure A-4. Elk Population Estimates in Oregon, 1979-2001 (taken from ODFW 2003a).

In the Beulah and Malheur River WMUs, elk populations are known to be stable and management now focuses on meeting MOs and minimizing elk damage complaints. Population size MOs for the Beulah and Malheur River WMUs are 16,000 and 1,500 individuals respectively (W. Van Dyke and R. Garner, ODFW Biologists, pers. comm.). These MOs have been met approximately within each WMU for at least the last five years. Combined elk populations from the Beulah and Malheur River WMUs include a current elk population herd size for the Malheur watershed of approximately 17,500 individuals.

Table 1 below shows recorded bull and calf ratios for elk in the Ochoco-Malheur Zone (which includes the Beulah and Malheur River WMUs) for the years 1999 through 2001 (post-season ratios reflect the previous biological year herd composition). Recent bull and calf ratios for 2002-2004 herd composition surveys, which are conducted in March each year, are consistent with ratios calculated for 1999-2001 and WMU MOs (J. Hurtado, ODFW Assistant Staff Biologist, pers. comm.).

Summer elk forage consists of a combination of lush forbs, grasses, and shrubs high in nutrients that are easily digestible. Generally, higher elevation wet meadows, springs, and riparian areas in close proximity to forested stands offer these conditions for the longest period. Such areas provide nutritious forage and moist, cool places for bedding and escaping summer heat and insects. Generally elk populations in the vicinity of the Malheur River Subbasin move from higher-elevation areas located in the northern portion of the watershed in the summer, to lower-elevation winter grounds beginning in September or October. During mild winters, elk may not move far from summer range. Elk may use intermediate areas called transition range. Transition range is typically used in the late fall or early spring as migratory elk move between summer and winter ranges. Even with Rocky Mountain elk, some reside year-round in traditional winter and transition range.

Table 2 below provides a summary of elk harvest in the Beulah and Malheur River WMUs for 2000-2002. As mentioned, elk populations in these WMUs are considered stable and healthy and hunting restrictions are managed to meet defined MOs and minimize elk damage on private and agricultural lands.

Optimum elk habitat is thought to consist of a forage cover ratio of 60% forage area and 40% cover (Thomas et al.1979). Cover quality is defined in two ways; satisfactory and marginal. Satisfactory cover consists of stands of coniferous trees that are > 40 feet tall, with a canopy closure of > 70%. Marginal cover is defined as coniferous trees > 10 feet tall with a canopy closure of > 40%. Cover provides protection from weather and predators. Forage areas are all areas that do not fall into the definition of cover. Optimal elk use of forage areas occurs within 600 feet of cover areas (Reynolds 1962, Harper 1969, Hershey and Leege 1976, Pedersen and Adams 1974). Proper spacing of forage and cover areas is very important in order to maximize use of these areas by elk (Thomas et al. 1979).

Within the Malheur subbasin, the 60/40 forage/cover ratio described above is only met in the coniferous forest areas found in the northern higher-altitude portions of the watershed. However, agricultural lands and shrub-steppe habitat regions provide suitable wintering grounds. ODFW current concerns in regard to elk management in the Malheur watershed focuses on: 1) reducing elk conflicts and damage complaints in agricultural and residential areas; and, 2) maintaining sufficient forage on historic natural wintering grounds (W. Van Dyke, ODFW Biologist, pers. comm.). These two issues are largely intertwined. Juniper encroachment and the general degradation of shrub-steppe habitat has resulted in a reduced shrub component and minimized available forage for elk on historic wintering grounds.

Table A-4. ODFW Elk Survey Results for WMUs in the Ochoco-Malheur Zone, 1999-2001 (ODFW 2001).

		Elk Classified in 2001				Bulls Per 100 Cows					Calves Per 100 Cows			
Unit	Watershed District	Bulls	Cows	Calves	Total	2001	2000	1999	P3Yr	MO	2001	2000	1999	P3Yr
Northside	John Day	133	896	280	1309	15	11	7	11	10	31	44	33	36
Murderers Cr.	John Day	164	742	213	1119	22	15	21	19	15	29	35	34	33
Beulah	Malheur	62	261	59	382	24	17	17	19	15	23	31	31	28
Malheur River	Malheur	67	444	142	653	15	14	16	15	16	32	49	50	43
Silves	Malheur	109	652	249	1010	17	20	19	19	16	38	52	47	46
Ochoco	Deschutes	216	1217	536	1969	18	14	19	19	20	44	46	53	48
Grizzly	Deschutes	21	49	17	87	43	22	31	31	15	35	52	84	57
Maury	Deschutes	43	292	145	490	15	23	19	19	20	50	52	36	51
Ochoco/Malheur	Zone	815	4553	1641	7005	18	16	17	17	-	44	44	42	41

Table A-5. Rocky Mountain Elk Harvest in the Beulah and Malheur River WMUs 2000-2002 (J. Hurtado, ODFW Assistant Staff Biologist, pers. comm.).

WMU/Year	# of Hunters	Hunter Days	Antlerless	Total Bulls	Total Elk	% Success
Beulah 2000	3179	17607	353	321	674	21
Beulah 2001	3334	19795	379	389	768	23
Beulah 2002	2991	18623	148	238	386	13
Malheur R. 2000	2665	16818	312	234	546	20
Malheur R. 2001	2348	15088	239	251	490	21
Malheur R. 2002	2447	15659	198	169	367	15

This has resulted in increased herd movement into developed agricultural areas. ODFW has designated the east side of the Beulah WMU as an “elk de-emphasis zone” and has altered management to remove elk from this area.

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Pronghorn (*Draft Malheur Subbasin Plan 2004 - unedited*)

The pronghorn is an ungulate species that is unique to North America. Although often called "antelope", the species has no living relatives in the old world (unlike deer and elk), and pronghorn are not related to true antelope of Africa and Asia (ODFW 2001). This wide-ranging herd species is typically associated with arid sagebrush habitat and open rangeland, and occurs throughout eastern Oregon and the Great Plains of North America. Pronghorn are game species managed by ODFW and species populations hold no formal State or Federal protected status in Oregon (ONHP 2003). Pronghorn was chosen as one of four subbasin focal species providing an indication of the health and functioning of shrub-steppe habitat within the Malheur watershed.

The Oregon Gap Analysis Program – currently managed by the Oregon Natural Heritage Program in cooperation with ODFW, Oregon State University, EPA, Defenders of Wildlife, the Nature Conservancy, USFWS and USGS – used gap analysis (Kagan et al. 1999, Scott et al. 1993) and scientific modeling to produce a map of the current and historic distribution of pronghorn in Oregon (Figure 1 and Figure 2). Although this is useful as habitat information, it is based on potential habitat for pronghorn and not on actual population distribution patterns.

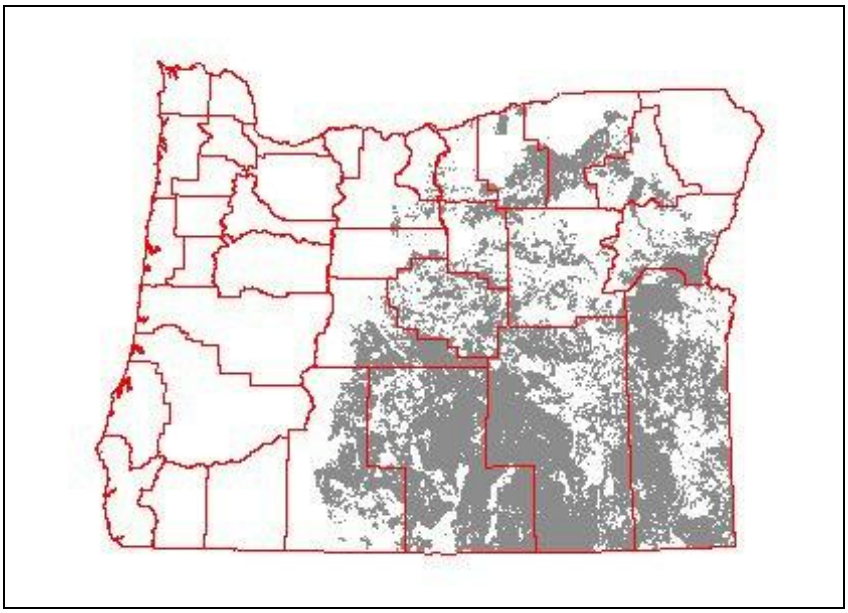

Figure A-5. Current Distribution of Pronghorn Habitat in Oregon from Gap Analysis (ONHP Website 2004).

Comparison of Figure 1 and Figure 2 reveals a general decline in pronghorn habitat throughout Oregon. However, in Eastern Oregon and the vicinity of the Malheur, declines in pronghorn distribution are notably minimal and are consistent with patterns of habitat loss and development. Within the Malheur watershed in specific, Gap Analysis shows a change in distribution of pronghorn habitat away from developed areas in the eastern portion of the subbasin, concentrating populations in remaining suitable shrub-steppe habitat and open rangeland. As with other ungulate species of the subbasin, in recent years this has resulted in increased conflicts between pronghorn and private landowners in agricultural areas (see below).

Pronghorn are ODFW-managed game species, although there exist no formal MOs for populations within subbasin WMUs. ODFW district biologists for the Beulah and Malheur River management units report recent pronghorn population estimates of approximately 1000 and 3000 individuals respectively (W. Van Dyke, ODFW Biologist, pers. comm.). However,

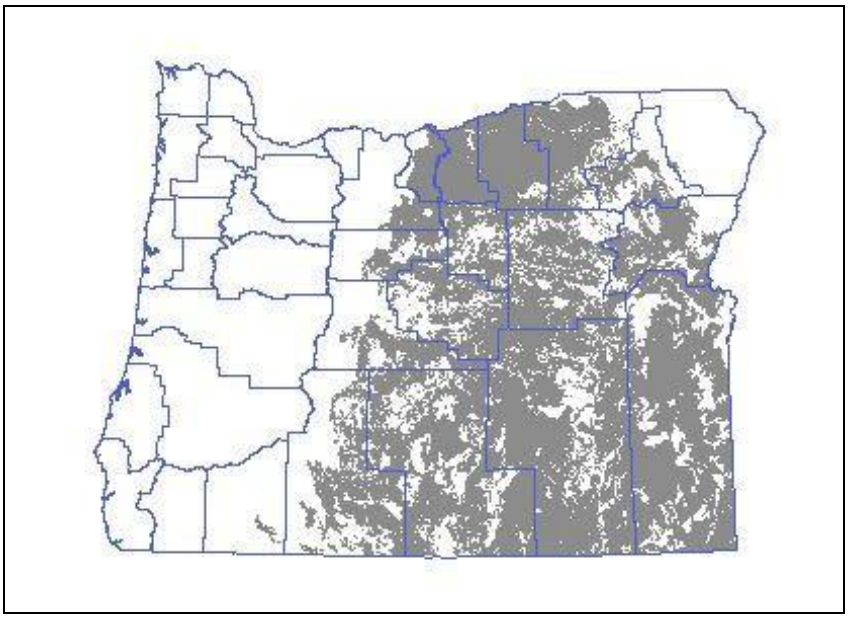

Figure A-6. Historic Distribution of Pronghorn Habitat in Oregon from Gap Analysis (ONHP Website 2004).

pronghorn are known to have large home ranges (10 to 20 square kilometers; Csuti et al. 1997) and may exhibit large herd movements in response to seasonal availability of forage.

ODFW allows restricted controlled hunts for pronghorn in both the Beulah and Malheur River WMUs. In both units, tags issued for the controlled hunts are limited and are awarded through public drawing (ODFW 2004). The 2004 Beulah WMU controlled hunt is scheduled for August 14 through August 22. In the Malheur River WMU, two pronghorn controlled hunts are scheduled: August 14 through 22 for the eastern portion; and, August 25th through September 2nd for western portion of the unit. In the Beulah unit, hunters with tags are allowed one pronghorn of either sex. In the Malheur River unit, the pronghorn bag limit is one of either sex. In 2003, 103 tags were issued fro the Beulah WMU and a total of 208 tags were issued for the Malheur River unit. Accounting for hunter success, total pronghorn harvest over the past five years between combining Beulah and Malheur River WMU estimates ranges between approximately 170 and 220 hunted.

ODFW report similar issues of habitat loss and degradation affecting pronghorn populations within the Malheur subbasin as described in regard to other herd ungulates. Pronghorn herds require large areas with suitable shrub and grass/herb forage over which to range. Shrub-steppe habitat degradation in the subbasin – and, specifically, decline in the habitat shrub component – has, in recent years, forced pronghorn wintering herds into areas where conflicts with land owners are common. Walter Van Dyke, ODFW district biologist for the Beulah WMU, reports a substantial increase in pronghorn grazing on private lands over approximately the past 3 years. This trend is likely to continue to the extent that loss and degradation of suitable habitat and available forage continues in the Malheur watershed.

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Yellow Warbler, Beaver, Mink, and Black-capped Chickadee

Life histories for these species are located at
http://www.nwrc.usgs.gov/wdb/pub/hsi/hsiindex.htm

Table A-6. Oregon List of Special Status Fish and Wildlife Species

Common Name	Scientific Name	Status
Fish		
Hutton Spring Tui Chub	*Gila bicolor ssp.*	*T
Borax Lake Chub	*Gila boraxobius*	*E
Foskett Spring Speckled Dace	*Rhinichthys osculus ssp*	*T
Warner Sucker	*Catostomus warnerensis*	*T
Snake River Chinook Salmon (Spring/Summer)	*Oncorhynchus tshawytscha*	*T
Snake River Chinook Salmon (Fall)	*Oncorhynchus tshawytscha*	*T
Lower Columbia River Coho Salmon	*Oncorhynchus kisutch*	E
Lahontan Cutthroat Trout	*Oncorhynchus clarki henshawi*	*T
Lost River Sucker	*Deltistes luxatus*	*E
Shortnose Sucker	*Chasmistes brevirostris*	*E
Oregon Chub	*Oregonichthys crameri*	E
Southern Oregon Coho	*Oncorhynchus kisutch*	T
Lower Columbia River Steelhead	*Oncorhynchus mykiss irideus*	T
Middle Columbia River Steelhead	*Oncorhynchus mykiss gairdneri*	T
Snake River Steelhead	*Oncorhynchus mykiss gairdneri*	T
Snake River Sockeye salmon	*Oncorhynchus nerka*	E
Upper Columbia River Spring Chinook	*Oncorhynchus tshawytscha*	E
Lower Columbia River Chinook	*Oncorhynchus tshawytscha*	T
Bull Trout	*Salvelinus confluentus*	T
Birds		
Brown Pelican	*Pelecanus occidentalis*	*E
Aleutian Canada Goose	*Branta anadensis leucopareia*	E
Bald Eagle	*Haliaeetus leucocephalus*	*T
American Peregrine Falcon	*Falco peregrinus anatum*	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	E
California Least Tern	*Sterna antillarum browni*	*E
Marbled Murrelet	*Brachyramphus marmoratus*	*T
Mammals		
Gray Wolf	*Canis lupus*	*E
Kit Fox	*Vulpes macrotis*	T
Wolverine	*Gulo gulo*	T
Washington Ground Squirrel	*Spermophilus washingtoni*	E

* Denotes those species listed by the federal government
T = Threatened
E = Endangered

Appendix B

Presence/Absence of Bull Trout at Jonesboro, Oregon

2002

(Author: Jason Fenton, Burns Paiute Tribe Fish and Wildlife Department)

The purpose of this study conducted by the Burns Paiute Tribe and the Oregon Department of Fish and Wildlife is to document whether bull trout (*Salvelinus confluentus*) reside in the Malheur River on the Jonesboro property located 11 kilometers east of Juntura, Oregon (Figure 1). Bull trout are considered a coldwater species and are dependant on temperatures. The Malheur River at Jonesboro, Oregon flows through an area that is heavily impacted by irrigation and cattle grazing. Water temperatures during the month of August can reach in excess of 23°C. The two dams that are upriver of the study site have no upstream passage for fish that are entrained through the dams. Agency Valley Dam has been documented in the past to have bull trout pass through (Schwabe 2000).

The objectives of this study are:

- Document the presence/absence of bull trout.
- Determine what species of fish reside in the Malheur River at Jonesboro.

This study was conducted 20-23 August, 2002.

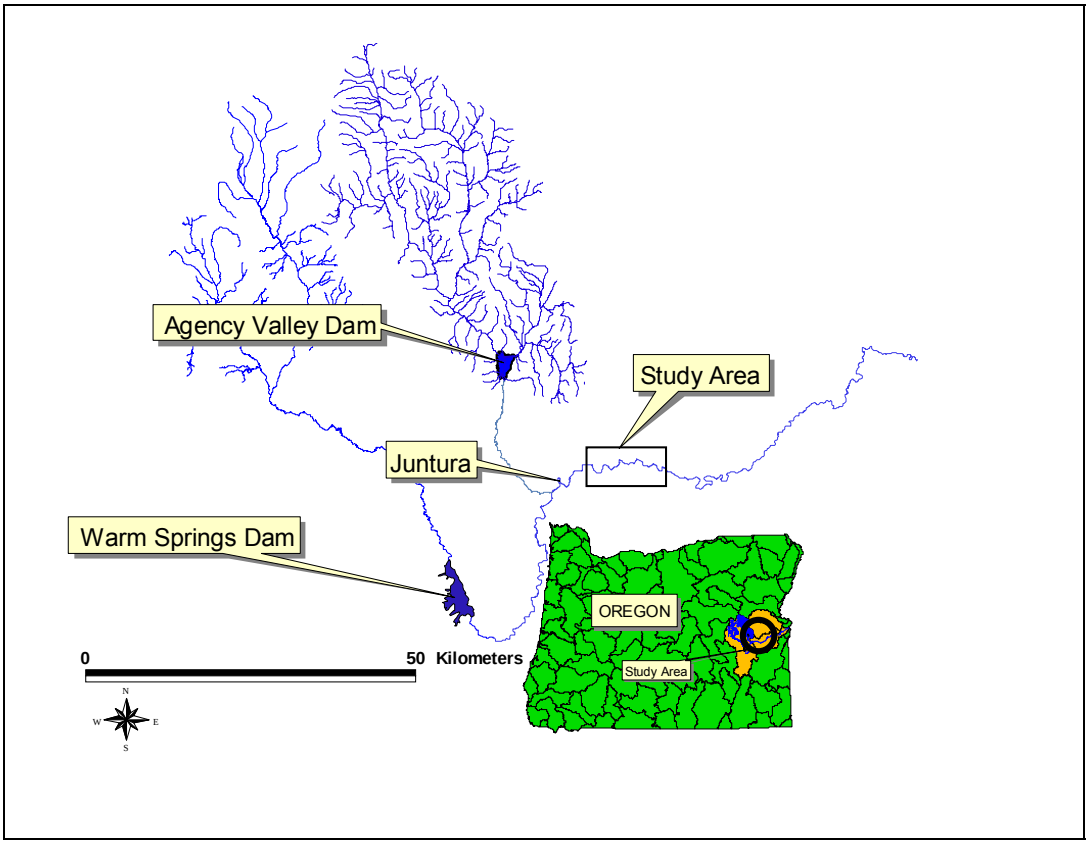

Figure 1. Location of Study Area at Jonesboro, Oregon. 2002. Malheur River Basin

Methods

Nine units along an 11-kilometer reach of the Malheur River at Jonesboro were selected as representative habitat sites (Figure 2). Each unit consisted of at least two riffles and two pools. If an area was over one meter deep, it was not considered for the study. The shocking team started at the bottom of the unit and worked upstream to the end, which usually was a pool at the bottom of a riffle.

A shocker with a generator mounted in a small drift boat with two handheld probes was used for this study. One person walked behind the boat to steer and to control the safety shut off switch. One person on either side of the boat held a shocker probe. A person with a dip net accompanied each shocker probe.

All fish that were captured were placed into a holding bucket. Aerators were used to supply oxygen to the captured fish. All fish that were captured were tallied and all salmonids were measured. After processing, the fish were released into the nearest pool.

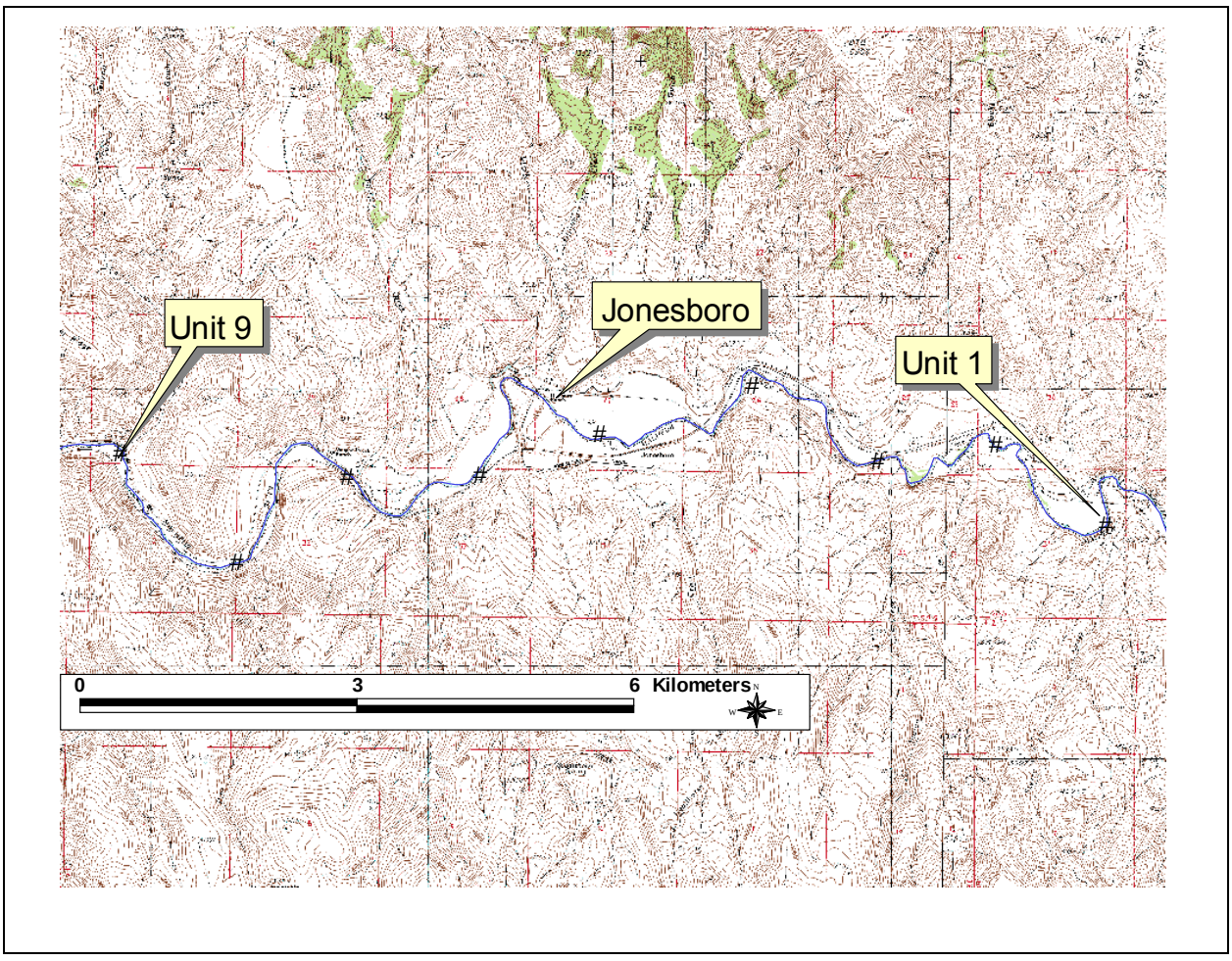

Figure 2. Study Area at Jonesboro, Oregon. 2002. Malheur River Basin.

Results

The units that were shocked in the Malheur ranged from 17°C to 23°C. The shocking of the Malheur River at Jonesboro resulted in the capture of nine different fish species:

- Bridge lip sucker (*Catostomus columbianus*)
- Coarse scale sucker (*Catostomus occidentalis*)
- Northern pike minnow (*Ptychocheilus oregonensis*)
- Redside shiner (*Richardsonius balteatus*)
- Speckled dace (*Rhinichthys osculus*)
- Long nose dace (*Rhinichthys cataractae*)
- White crappie (*Pomoxis annularis*)
- Chisel mouth chub (*Acrocheilus alutaceus*)
- Rainbow trout (*Oncorhynchus mykiss*)

With the exception of the white crappie and the rainbow trout, all other species of fish were distributed evenly throughout the study area (Table 1).

Table 1. Number of Fish Caught in Malheur River at Jonesboro, Oregon, August 2002.

Unit #	Bridge Lip Sucker	Coarse Scale Sucker	Northern Pike Minnow	Red Side Shiner	Speckled Dace	Long Nose Dace	White Crappie	Chisel Mouth Chub	Rainbow Trout
1	18	29	3	12	18	2	0	5	1
2	34	7	1	6	4	0	0	5	1
3	27	15	1	22	1	2	0	0	3
4	78	16	10	43	12	0	1	27	7
5	79	21	2	2	6	3	0	8	1
6	7	27	12	8	19	0	0	7	0
7	4	20	8	5	31	8	1	2	0
8	55	2	1	5	36	7	0	1	0
9	18	30	3	33	19	7	0	4	2
Total	**320**	**167**	**41**	**136**	**146**	**29**	**2**	**59**	**15**

No bull trout were observed during the study.

Discussion

There were pools in this stretch of river that were too deep to sample. It could be possible for bull trout to reside in these pools if the water temperature was cool enough towards the bottom. Since bull trout have been found to pass through Agency Valley Dam there is a possibility that

some have survived. Since the spawning ground for bull trout is above the dams, it would seem that without any fish passage, any bull trout that could survive in this area would soon become non existent. More work needs to be done to determine if bull trout do reside in the Malheur River below the dams. Some of the deeper pools where the water temperatures may be cooler and should be snorkeled to determine if the bull trout could survive until winter. However, it is unlikely that any adult bull trout are over wintering in this area. The Tribe has documented that in the spring, adult bull trout are migrating upstream towards the headwaters (Schwabe 2000). Adult bull trout that were below the reservoir tended to hang out in the tailrace below Beulah Reservoir. If these bull trout are not trapped and hauled above the dam, summer water temperatures may be too high for any survival. Bull trout that return in the fall are not in danger of entrainment since the water has by that time been shut off.

References

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Use of a Driftboat Electrofisher to Determine Presence/Absence of Bull Trout (*Salvelinus confluentus*), and other Species Present at Jonesboro, Oregon

2003

(Author: Burns-Paiute Tribe Fisheries)

Introduction

The Malheur River Mitigation Property is located approximately 8 miles east of Juntura, Oregon. This property was acquired the Burns Paiute Tribe in November of 2000 with funding provided by Bonneville Power Administration. The ranch includes 6700 acres of property along the Malheur River, as well as approximately 25,000 acres of BLM and state lease land. The 6700 acres adjacent to the river were recently used for growing alfalfa and meadow grass, the lease land is fairly steep and is used for grazing and hunting. Irrigation releases from the reservoirs upstream have significantly altered the historical flow regimes through the property. Currently passive restoration is in use to negate activities that have caused degradation in the past.

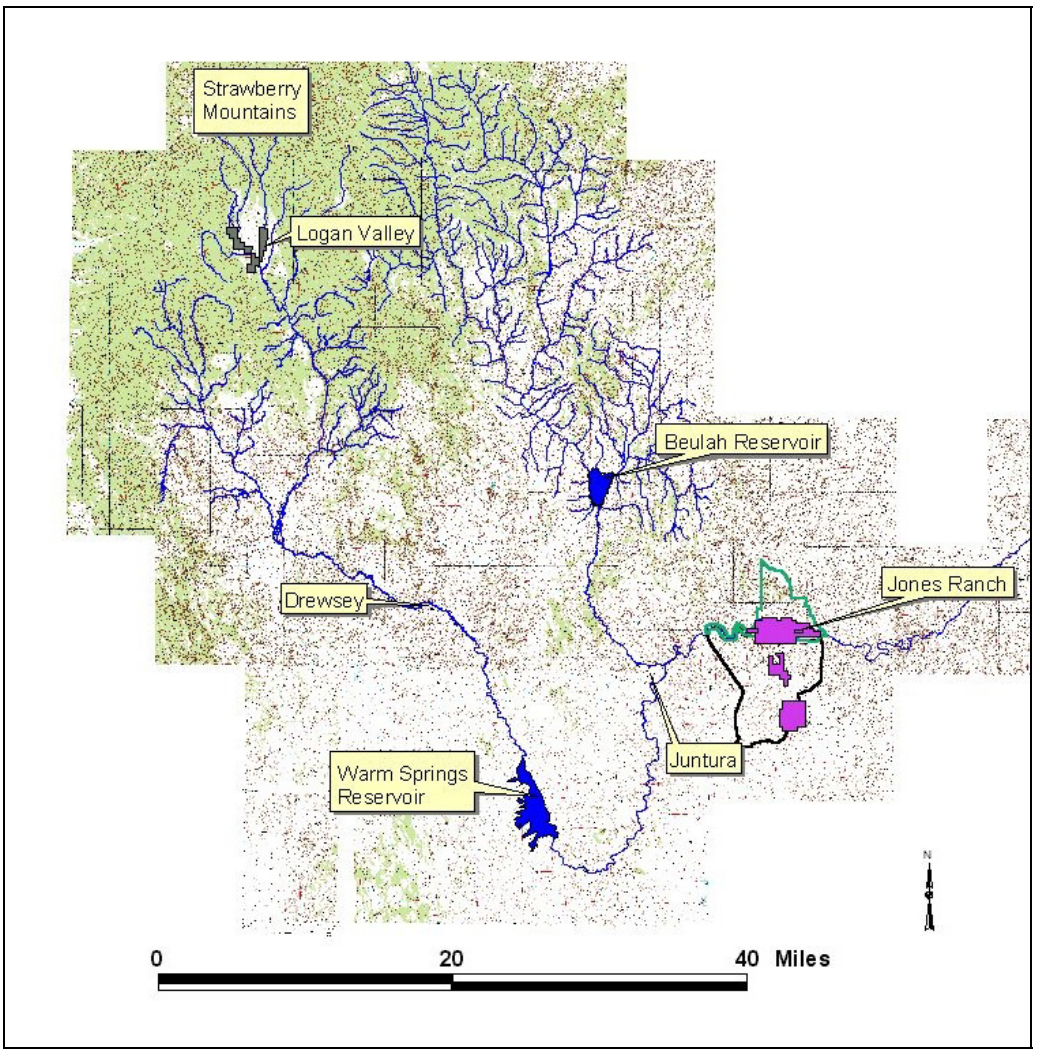

Figure 1. Location of Presence/Absence Research at Jones Ranch, 2003.

Historically, redband trout, bull trout, and anadromous salmonids inhabited the area of the Malheur River at Jonesboro. With the construction of the Columbia, Snake River, and Malheur River dams anadromous salmonids no longer have access to the Malheur River. Also, upstream of the property, Beulah Reservoir and Warm Springs Reservoir have no fish passage facilities, blocking up and downstream migration of resident fish species. In 1999 and 2000 it was documented that fish were entrained over the spillway at Agency Valley Dam (Schwabe, 2000), but in 2001 and 2002 no bull trout were observed below the dam. The possible cause of this is that in 2000 water release was switched to flow valves rather than over the spillway (Fenton, 2002). Bull trout are highly dependant on temperature; this is a limiting factor at Jonesboro because in August temperatures can exceed 23 C.

The purpose of this study is to:

- Determine presence/absence of bull trout in the Malheur River at Jonesboro.
- Determine other fish species present in the Malheur River at Jonesboro.

Methods

Sampling of the Malheur River on the deeded property of the Malheur River mitigation site was conducted on May 28, 2003. Presence absence sampling was conducted using an Oregon Department Fish and Wildlife 16 foot driftboat electrofisher. The use of a driftboat is a safer and more effective approach in the higher volume of water expected during the irrigation season. National Marine Fisheries Services (NMFS) electrofishing guidelines were used to minimize the effects electrofishing have on native fish species. All fish species were identified and all measured (fork length in inches).

The drift boat shocker can only effective fish one side of the river at a time, so alternate banks were sampled per site. The north bank was sampled at site number 1, 3, 5, and 7. South bank was sampled at site 2, 4, and 6. Two persons were needed to sample, one boat operator and one person to collect fish via dip net. The boat drifted downstream and the boat operator positioned the boat close to the sampled banks that had cover from riparian vegetation. The netter controlled the power switch to the electro-fishing equipment. Two 5 gallon buckets were positioned in the boat to hold fish collected during each pass. Data on fish was collected onshore once the minimum of 400 seconds was obtained.

A total of seven sites were sampled (Table 1). Legal coordinates were taken at the beginning and end of each site. Site length was determined by shocking effort (seconds). A minimum of 400 seconds of electrical application was applied at each site (Table 1).

Table 1. Drift boat electrofishing site description of the Malheur River on the wildlife mitigation lands of the Burns Paiute Tribe. The Malheur River was sampled on May 28, 2003 and all sites are within RM 80 to 90.

Site	Sample Duration (seconds)	Start Site Coordinates (Decimal Degrees)	End Site Coordinates (Decimal Degrees)	Site Description
Site 1	435	N 43.78944 W117.94850	N 43.79267 W117.93899	Located 50m downstream of diversion dam on west end of property.
Site 2	411	N 43.79332 W117.93840	N 43.79788 W117.93453	Agriculture field above ranch house.
Site 3	407	N 43.80102 W117.93201	N 43.79672 W117.92516	Just below bridge at ranch house.
Site 4	445	N 43.79588 W117.91753	N 43.79688 W117.80807	Large agriculture field below house.
Site 5	423	N 43.80240 W117.90332	N 43.80013 W117.89570	700m downstream of old railroad bridge.
Site 6	453	N 43.79397 W117.88778	N 43.79195 W117.88073	400m below confluence with Black Canyon Creek and Malheur River.
Site 7	506	N 43.79513 W117.87629	N 43.79573 W117.86969	650m downstream of confluence with Indian Creek and Malheur River

Results

Site 1 has a species richness value of 6. The 6 species collected and identified include:

- Bridgelip sucker (*Catostomus columbianus*)
- Chiselmouth chub (*Acrocheilus alutaceus*)
- Coarsescale sucker (*Catostomus occidentalis*)
- Northern pike minnow (*Ptychocheilus oregonensis*)
- Speckled dace (*Rhinichthys osculus*)
- Long Nose dace (*Rhinichthys cataractae*)

The relative abundance of at site 1 ranges from a high collection of northern pike minnow (29.2%) to a low collection of longnose dace (4.2%)(Figure x1).Fish species collected at site 1 are all endemic to the Malheur River subbasin.

At site 2, the species richness value increased to 7. The 7 species collected and identified include:

- Bridgelip sucker
- Chiselmouth chub
- Coarsescale sucker

- Northern pike minnow
- Redside shiner (*Richardsonius balteatus*)
- Speckled dace
- Long nose dace

The relative abundance of at site 2 ranges from a high collection of redside shiner (28.6%) to a low collection of speckled dace (7.1%) and chiselmouth chub (7.1%)(Figure x2). Fish species collected at site 2 are all endemic to the Malheur River subbasin.

Site 3 has a species richness value of 6. The 6 species collected and identified include:

- Bridgelip sucker
- Chiselmouth chub
- Coarsescale sucker
- Northern pike minnow
- Redside shiner
- Speckled dace

The relative abundance of at site 3 ranges from a high collection of northern pike minnow (25.5%) and speckled dace (25.5) to a low collection of coarsescale sucker (6.9%)(Figure x3). Fish species collected at site 3 are all endemic to the Malheur River subbasin.

Site 4 has a species richness value of 6. The 6 species collected and identified include:

- Bridgelip sucker
- Chiselmouth chub
- Coarsescale sucker
- Northern pike minnow
- Redside shiner
- Speckled dace

The relative abundance of at site 4 ranges from a high collection of northern pike minnow (27.0%) to a low collection of redside shiner (2.7%)(Figure x4). Fish species collected at site 4 are all endemic to the Malheur River subbasin.

Site 5 has a species richness value of 7. The 7 species collected and identified include:

- Bridgelip sucker

- Chiselmouth chub
- Coarsescale sucker
- Northern pike minnow
- Redside shiner
- Speckled dace
- Long nose dace

The relative abundance of at site 5 ranges from a high collection of coarsescale sucker (25.8%) to a low collection of northern pike minnow (6.4%)(Figure x5). Fish species collected at site 5 are all endemic to the Malheur River subbasin.

Site 6 has a species richness value of 6. The 6 species collected and identified include

- Bridgelip sucker
- Channel catfish (*Ictaluras punctatus*)
- Chiselmouth chub
- Coarsescale sucker
- Northern pike minnow
- Speckled dace

The relative abundance of at site 6 ranges from a high collection of coarsescale sucker (23.0%) to a low collection of channel catfish (3.8%)(Figure x6). Fish species collected at site 6 are all endemic to the Malheur River subbasin except for the collection of 1 channel catfish.

Site 7 has a species richness value of 7. The 7 species collected and identified include:

- Bridgelip sucker
- Chiselmouth chub
- Coarsescale sucker
- Northern pike minnow
- Redside shiner
- Speckled dace
- Long nose dace

The relative abundance of at site 7 ranges from a high collection of northern pike minnow (22.8%) to a low collection of speckled dace (8.7%) (Figure 2). Fish species collected at site 7 are all endemic to the Malheur River subbasin.

In summary, seven sites on the Malheur River were sampled with a total of eight fish species (Table 2). No salmonid species were collected from any of the seven sites. Channel catfish was the only non-native fish species collected in the 2003 survey. A total 227 fish were collected during this survey. Relative abundance was greatest for North Pike Minnow and least for channel catfish.

Table 2. Total count of all fish species collected in the 2003 sample effort on the Malheur River (RM 80 to 90). Fish were collected using a driftboat electrofishing unit at seven sites. Sampling was conducted on the Malheur River Mitigation site that is managed by the Burns Paiute Tribe for Fish and Wildlife.

Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Total
Bridgelip sucker	5	2	6	3	4	6	9	**35**
Channel catfish	0	0	0	0	0	1	0	**1**
Chiselmouth chub	2	1	4	5	5	5	8	**30**
Coarsescale sucker	6	2	3	5	8	6	9	**39**
Northern pike minnow	7	2	11	10	2	3	13	**48**
Redside shiner	0	4	8	1	3	0	7	**17**
Speckled dace	3	1	11	13	6	5	5	**44**
Long nose dace	1	2	0	0	3	0	6	**13**
Total	**24**	**14**	**43**	**37**	**31**	**26**	**57**	**227**

Discussion

Presence absence surveys were conducted via a raft electrofisher on the Malheur River mitigation property in August 2002. Bridgelip and coarsescale sucker were the dominant fish species representing approximately 53% of total fish collected and the relative abundance of northern pike minnow was less than 5% (Schwabe et al. 2003). In 2003, relative abundance of bridglip and coarsescale sucker is less than 33% and the relative abundance of northern pike minnow is approximately 22%. The variation in relative abundance is likely the result of different sampling method conducted in 2002 and 2003.

Detection of fish species varied among the surveys in 2002 and 2003. Species collected in 2002 and not in 2003 are white crappie and rainbow trout. Species collected in 2003 and not in 2002 are channel catfish.

Based on past and current creel data below Agency Valley Dam, presence/absence surveys at Jonesboro, and existing habitat conditions, it is likely that there are no bull trout below the dam due to a decrease in entrainment. No bull trout have been creeled since 2000 and bull trout have not been observed in the two years that presence/absence survey has been conducted at Jonesboro. Entrainment over Agency Valley Dam has been documented in the past (Schwabe et al. 2001) and historically bull trout utilized the entire North Fork Malheur and Malheur Rivers as overwintering habitat. It is highly unlikely that bull trout could sustain a population below the dam due to the lack of spawning habitat.

Spatial and temporal distribution of salmonids has been identified in the Malheur River subasin by past and current telemetry studies. Sampling of the Malheur River during various seasons and flow regimes may provide some insight into salmonid habitat utilization of the Malheur River on the deeded lands of the Tribe. To date, the Burns Paiute Tribe Fish and Wildlife Department have conducted a low flow survey in August and a high flow survey in May. In 2002, the Tribe initiated a low flow survey in November, but due to unseasonable cold temperatures and ice formation over the river, the survey was cancelled. Low flow surveys in the spring and fall should be conducted in the future when water temperatures are optimal for salmonids.

Appendix C

How can Grazing Heal Land?
by Wilma Keppel
www.http://managingwholes.com/land-grazing.htm

Conventional wisdom says grazing damages land -- yet the same land a few cattle or sheep damage today often supported thousands or millions of wild grazers less than 200 years ago.

Explorers' accounts tell of lush grass, flowing springs and rivers, and abundant game in areas that today are damaged or turning to desert. If grazing damaged land, nature could never have built those landscapes in the first place. What's going on? And how can managers restore damaged land by putting animals back on it? It seems improbable, but it works.

What do grazers do in nature?

Under natural conditions, grazers are nature's gardeners:

- Their hooves create seed-to-soil contact, helping dormant seeds to germinate and establish.
- They break soil crusts that keep seeds from growing.
- They trample standing vegetation into mulch that protects the soil and keeps it moist.
- Their guts act like living compost piles, turning vegetation into high-quality fertilizer.
- By pruning stale growth, they keep forage plants at peak production.
- Pruning a plant's top causes its roots to self-prune. These dead roots become new soil.

It's an exquisitely balanced interplay of biological processes that let an estimated 60,000,000 bison build prairie soils up to 3 meters (9 feet) deep across the vast plains of North America. Today it supports millions of wildebeest, zebra, impala, and other game in East Africa.

But, when humans exterminate predators and put up fences, the system breaks down. It depends on mobile herds -- tightly bunched against predators -- moving into an area, grazing and trampling it intensively, then moving off to escape their own dung and urine. This gives plants time to recover before the next graze -- to regrow not just their tops, but their roots as well. Without predators, even wild grazers scatter over a landscape, bite the same plants again and again, and cause desertification just like domestic livestock.

Using livestock to heal land

Managers can re-create nature's conditions well enough to heal land by:

- Using fences or herding to keep grazers bunched.
- Using salt, molasses, or other treats to get them excited so they knock down dead growth and trample soil, rather than stepping carefully. This isn't a great solution, because herds chased by predators run and trample a lot more. But it's a start.
- Limiting grazing periods, with enough rest between grazings for plants to recover fully.

Surprisingly, the key factor in making this all work long-term is holistic decision-making. This involves using everything we do already to make decisions, plus:

- Managing for what we want to happen (our goal), rather than just trying to avoid problems or reach narrow objectives.
- Treating nature as a complex whole that does things we can't predict simply from studying its parts.
- Monitoring our progress and correcting course to assure we get the results we want. The key is to track what actually happens, and make our course-corrections as early as possible -- and to stay on course when what we do works. How land responds depends on climate, weather, management, history (what seeds are in the ground, how much topsoil remains), and many other factors.
- Managing the whole to create social, ecological, and financial benefits.
- Using extra tools, techniques, and knowledge that support this process.

What results can this kind of land management produce?

Financial benefits:

- Increased profitability.
- Decreased costs.
- Greater financial resilience.
- More money goes toward what people value.

Social benefits:

- Greater involvement by family, customers, and community members.
- Families get to stay on the land; ownership remains local.
- More viable local businesses; greater income for the community.
- More people see land restoration is possible and get to help it happen.

Environmental benefits:

- Greater biodiversity; return of native perennials and wildlife.
- Fewer predator and pest problems, due to better stock management and year-round food supplies for predators.
- Less flooding and erosion as water sinks into the soil instead of running off. Dry wells and springs start to produce water, seasonal streams flow year round again.
- Vegetation covers bare soil and gullies, eroded streams start to fill in.

- The ecosystem develops tremendous resiliency, and can weather droughts and heavy rains that used to cause major problems.

- Biological productivity and biodiversity increase, often dramatically. Forage production often doubles or triples.

Hope for the future

Desertification and degraded land are age-old problems. When civilizations damage the resource base that sustains them, they collapse. Well-known examples include Mesopotamia and Easter Island.

Because of the long time spans involved, most people don't realize that the majority of the world's desert was created by people. For example,

- Once grassland and forest, North Africa grew grain to support the Roman Empire. Writing in 440 B.C.E., Herodotus praised Libya for its deep black soils and abundant springs.

- The desert surrounding Salt Lake City, Utah, had grass high enough to touch a horse's belly when Mormon settlers arrived in 1847.

- Until the arrival of humans, much of northwestern Australia was rain forest. Significant tracts survived under Aboriginal management.

Today desertification is happening faster than at any time in human history. According to the United Nations Convention to Combat Desertification, desertification affects about one-sixth of the world's population and 70% of the world's drylands, amounting to ¼ of the planet's total land area.

By managing holistically, we now have the ability to start turning the world's human-created deserts -- the Sahara, the Gobi, South Africa's Karoo, much of the western U.S.A. -- back into the grasslands and forests they once were. We can begin restoring our degraded landscapes in ways that provide abundant habitat for wildlife and grow topsoil. We can thus sequester carbon, increase the land's biological productivity, and work toward restoring nature to abundant good health.

And by ensuring a healthy nature and healthy agriculture, we can sustain civilization for ourselves and for future generations.

Appendix D

Low Stress Livestock Handling Techniques
Bud Williams Stockmanship School Notes
http://www.foothill.net/~ringram/budnotes.htm

In order for you to be able to work animals in a low stress manner you must change your basic attitude about livestock. This will probably be the most difficult thing for many managers to do.

- Old paradigm: "I'm going to make that animal do what I want."
- New paradigm: "I'm going to LET that animal do what I want."

- Old paradigm: "That miserable (ornery, wild, stupid, hateful, cow-calf, bull, sheep, pig, goat, horse, broke back, went the wrong way, missed the gate, charged me, got sick, died, ...)."
- New paradigm: "What did I do to cause that animal to react that way?"

People who are familiar with low stress handling methods of working livestock know the aim is to work animals with the least amount of stress possible. In fact, livestock can be worked in ways that actually takes existing stress off them. It is a bonus that the job is done faster and with less cost than conventional methods.

Control

In trying to control animals in the old way, you are giving up any chance of getting the kind of control I am talking about. Forget all of your excuses: She is afraid of the gate. She remembers getting hurt in the chute. She has never been in the chute before. etc., etc., etc.,

- believe that the individual animal is responding to what you are doing right now

The method of working cattle that is used today was developed in the Southwest over 100 years ago. It required rough, tough people just to survive under the conditions that existed. They developed a system that suited their temperament with no thought of the animals. Because of the turmoil and commotion that existed with this system, the sensitive people left the livestock industry. Therefore, this system has perpetuated itself. In fact, it is considered sacred.

Two factors causing people to show a great deal of interest in low-stress methods of stockmanship are: (1.) Animal welfare: People are becoming more concerned about the humane treatment of animals, and (2.) Economics: It is a proven fact that stressed animals do not perform as well as unstressed ones. The methods I use reduce stress in both the animals and in the people working them.

The methods used by Bud Williams have proven themselves with reindeer, elk, fallow deer, horses, hogs, sheep and goats, as well as with cattle. While his method of stockmanship is quite simple, it is very difficult for people to learn because it often goes against human behavior. Remember as a stockman, you are supposed to be the smart one, and it is up to you to change to accommodate the animal.

The traditional method of driving animals consists of trying to frighten the animal away from the person, hopefully in the direction the person wants it to go. Using fear and force to move animals is very stressful to them. Low stress methods take the animal's natural behavior into consideration but makes humans change their natural behavior.

There are certain things animals want to do as long as they are in a normal mental state.

1. They want to move in the direction they are headed.

2. They want to follow other animals.

3. They want to see what is pressuring them.

4. They have very little patience.

Proper position on the stockman's or herder's part and nothing more is enough pressure to allow moving animals any place they are physically able to go. By being in this position, the animals will want to move in the desired direction. Excessive pressure will put an animal into a panic condition where none of these things apply.

One of the most important and probably least understood things is how to use the movement of animals to help you. When a herd of animals is moving it is almost perpetual motion. The lead animal draws the back animal. As it steps up, this puts pressure on the lead animal so it keeps going. It takes so little to keep this going, but it also takes so little to stop it. When the movement stops sometimes it takes a lot to get is going again. Also, if the herder helps too much, it may be hard to stop.

When driving animals, the direction of the herd is important, but the direction of the individual animals within the herd is just as important. When a person is moving around the herd to different positions, they should at all times be aware of any changes of direction in the individual animals. This will tell the person if his position is right or wrong.

As pressure is applied to move the animals, it must be released when they move, either by the herder stepping back, or by the fact that they moved ahead and that takes the pressure off. Constant pressure with no let-up or excessive pressure is what panics animals. Loud noise is almost always excessive pressure. When animals try to cut back they are being pressured too much, or from the wrong spot. When the herder crowds the back animal too hard and there is no place for it to go, it will try to cut back. That is why the front animals should have pressure applied to them. As they move, there is room for the back animals to move into as they are pressured. The front animals should be pressured from the side. This allows the animals to move away from our pressure, which it wants, and for it to be going where we want it to. Millions of animals are worked from the back, pushed and yelled at, but this does not make it the best way to work animals.

- **Do not apply pressure from behind the animals.**

You can walk or ride along behind livestock all day and not cause any problem as long as you aren't pressuring them. There is always a correct position. This position moves as the animal moves. The angle you move at in relation to the animal determines if you will maintain the proper position. The speed you move is important, but not as important as the angle.

- **The animals need to feel they have two ways to go.**

Your position will cause them to choose the proper one. If they feel trapped or surrounded they will panic and want to cut back. At this point, they no longer want to follow the other animals. When pressure is applied to get a certain response, be sure to relieve the pressure when you

get that response by stepping back or allowing the animal to move a step or two before following.

- **Minimize loud noises and yelling.**

Noise louder than normal conversation is not only stressful to the animals, but detrimental to your objective.

- **Work the leaders.**

If they are worked properly the back will follow with little or no effort. Read your animals. They will tell you what your position should be. Don't try to anticipate what the animals will do as this will put you out of position and likely cause the very thing you are trying to prevent.

- **Use back and forth movement.**

Moving back and forth while getting closer to the animals will tend to cause them to move away from you.

- **Move parallel to livestock in the same direction to slow herd**

Moving parallel with the herd in the same direction will tend to slow the animals down. This is very helpful if you are trying to settle animals that have too much movement. It is very detrimental if you are driving a herd since you tend to kill any movement the people on the back end are trying to generate.

- **Move parallel to livestock in the opposite direction to speed up herd**

Moving parallel to livestock in the opposite direction (front to rear) will tend to speed them up. Remember, animals want to continue in the direction they are headed. When they see you coming, they will try to hurry past you.

Conclusion

Basic attitudes about livestock behavior need to change and human behavior towards livestock need changing also. Stockmen and herders need observe and recognize if their position to their animals is right or wrong and take responsibility for what the animal does. Assuming this responsibility will allow the human to continue learning its own.

See also: www.stockmanship.com/herding.htm (2004)

Appendix E

Stubble Height and Ungrazed Height (in.)										
Date						**Examiner**				
Allotment Name						**Pasture Name**				
Species	**1**		**2**		**3**		**4**		**5**	
Sample	**G**	**U**	**G**	**U**	**G**	**U**	**G**	**U**	**G**	**U**
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
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29										
30										
31										
32										
33										
34										
35										
36										
Total										
Average										

G = Grazed

U = Ungrazed

Stubble Height and Ungrazed Height Summary					
Species	**Total stubble height**	**Total ungrazed height**	**Number of plants**	**Average stubble height**	**Average ungrazed height**
Totals					
Notes:					